Factors influencing the societal acceptance of new energy technologies: Meta-analysis of recent European projects

Deliverable 3.1, 3.2 and 4

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*C*ultural Influences on *R*enewable *E*nergy *A*cceptance and *T*ools for the development of communication strategies to promot*E* ACCEPTANCE among key actor groups

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Contents

List of tables

List of figures

Executive summary

Introducing the project Create Acceptance

This summary provides results of research that has been conducted as part of the EU-funded project Create Acceptance. Create Acceptance is supported by the European Commission under its Sixth Framework Programme (Project no. 518351). This report describes the results of the activities carried out for the second work package 'WP2', which was coordinated by NCRC-Finland. Create Acceptance is coordinated by ECN (the Netherlands), and involves research institutes in Italy (CNR/CERIS), Finland (NCRC), Spain (EcoInstitut), Germany (OEKO), United Kingdom (SURF), France (IAE), Iceland (INE), Hungary (MAKK), Poland (IEO) and South Africa (UCT). More details about the Create Acceptance project can be found at http://www.createacceptance.net.

Often, successful adoption and diffusion of innovations is assumed to be merely an issue of securing the techno-economic dimension. In practice, many technological projects are facing severe resistance from various stakeholders. Aligning the views of these stakeholders and finding an agreed common view on the innovation lies at the heart of good management practices for successful technology development. Successfully diffusing innovations relies on creating the societal acceptance of the technology.

The project Create Acceptance contributes to facilitating the implementation of new and emerging sustainable energy technologies by assessing optimal conditions for the implementation of these new technologies in terms of socio-economic aspects, consumer preferences and citizen needs. The objectives of this project are to increase the competitiveness of RES (Renewable Energy Sources) and RUE (Rational Use of Energy) technologies by developing a tool that can measure, promote and improve social acceptance of these technologies.

Introduction and aim of Work Package 2

Public opinion surveys show widespread support for using renewable energy sources and increasing energy efficiency. Yet new energy technologies often fail to make the transition from research to deployment successfully, and demonstration and early deployment projects can even provoke social controversies. This indicates that our understanding of the non-technical forces shaping the application of new energy technologies, particularly at the local and regional level, is still underdeveloped.

The aim of Work Package 2 has been to make an analysis of the historical and recent acceptance of new energy technologies (energy efficiency and geothermal energy, bioenergy, wind and ocean energy, solar energy, hydrogen and CO_2 capture and storage) in the different regions in Europe (Nordic countries, West Europe, Central Europe, and South Europe) and South Africa in order to identify determinants of success and failure. A special focus has been placed on hydrogen, CO_2 capture and storage, biomass, solar and wind energy technologies. The work conducted in WP2 has two major audiences:

1. It provides input for further work within Create Acceptance on the development and testing of a multi-stakeholder tool for assessing and promoting societal acceptance.
2. It has developed a compendium of best practices for managing social acceptability in the field of new energy technology, based on lessons learned from both good and bad practices in different parts of Europe. This compendium is further framed in an extensive analysis of the conditions for new energy projects in EU Member States.

The present report includes the following deliverables of Work Package 2: D2.1 Database of region profiles, D2.2 Assessing region specific attitude and D2.3 Assessing indicators of success. The present version is a Draft Report, and will be complemented with three more case studies, including the research on South Africa; the final version of the report will be published at the end of 2007.

Research approach and design

A review of prior literature in the field revealed that the phenomenon of ‘social’ or ‘societal’ acceptance is poorly conceptualised. This makes it difficult to compare or accumulate findings from previous studies into a coherent picture of the societal acceptance of new energy technologies in Europe today. Some studies measure ‘public acceptance’ in terms of public opinion surveys, others focus on acceptance by specific social groups.

In WP2, we have conceptualised societal acceptance in terms of the social networks that build up around concrete new energy applications, and the ways and extent to which alignment is achieved among the expectations of the project managers and stakeholders, and the resources and demands of the local context. The theoretical foundation of the study is the emerging research tradition of technological transitions. Pilot and demonstration projects are here understood as early encounters of the technology with societal stakeholders, and as such, as important forums for mutual social learning and the development of socially acceptable technological solutions.

In order to study recent and historical controversies and successful applications, a database was collected in the form of previous projects from different parts of Europe and dealing with the different technologies (Annex 1 of this report). This database consists of 27 project case studies (Table S.1), and will be complemented with three more case studies by June 2007. Moreover, an overview report of the political, socio-economic and energy profiles of the covered regions, including an overview of general attitude towards the deployment of various new energy technologies in the respective regions has been compiled, which serves as a background and overall context for the case studies (Annexes 2-6 of this report).

Table S.1 *Overview of the cases in terms of technology and regional coverage*

	Energy conservation	Biomass	Wind	Solar	Hydrogen	CO_2 capture and storage (CCS)	Other
WEST EUROPE	Hannover social marketing for energy efficiency (Germany)	Crickdale Bioenergy Power Station (UK) Bracknell Biomass CHP Energy Centre (UK)	EOLE 2005 wind energy programme (France) Cap Eole wind project in Albi (France)		London CUTE hydrogen fuelling station (UK)	CRUST CO_2 capture & storage project (Netherlands)	Blue Energy (salinity power) (Netherlands)
		Bioenergy Village Jühnde (Germany)			Berlin H2ACCEPT bus trials (Germany)	Schwarze Pumpe CO_2 capture and storage project (Germany)	
NORTH EUROPE	Low energy housing (Finland)	Västerås Biogas Plant (Sweden) Lund Biogas Plant (Sweden)			ECTOS hydrogen project (Iceland)	Snohvit CO_2 capture & storage project (Norway)	
EAST & CENTRAL EUROPE		Pannon Power biomass conversion (Hungary)	Suwalki region wind project (Poland) Szelero Vep wind project (Hungary)	Pommerania region solar energy project (Poland)			Podhale region geothermal project (Poland)
SOUTH EUROPE	Trinitat Nova Ecocity energy efficiency project (Spain)	Umbria local biomass projects (Italy)		Barcelona Solar Ordinance (Spain)			
				PV Accept solar project (Italy)			
BEYOND EUROPE				Solar home systems (South Africa) Solar water heaters (South Africa)			

The cases have been analysed using a five-step framework, developed by project partner SURF, focusing on (1) the visions articulated at early stages of the project and the social interests to which they referred; (2) the actors and expectations involved in the project; (3) the engagement of various publics in the project and the way in which expectations were negotiated; (4) the way the vision was translated into action; and (5) success in terms of outcomes - i.e., the gap between visions and actualities - and in terms of processes - i.e., the extent to which different social interests were coordinated in the project.

A meta-analysis of the cases has been conducted, allowing us to identify factors influencing societal acceptance that are (a) dependent on specific characteristics of various new energy technologies, (b) dependent on specific characteristics of the national and local context and (c) dependent on procedures for stakeholder participation and project management. On the basis of this analysis, we were thus able to provide recommendations for management procedures that promote the societal acceptance of new energy technologies.

All partners in the Create Acceptance project have participated in the data collection and analysis of the case studies. Moreover, the meta-analysis has also been supported by collaborative inquiry sessions based on preliminary analyses and structured questions. Thus, the project has been able to make use of the multidisciplinary competences present in the project group.

Results

One of the important observations of the WP2 research was that societal acceptance is shaped by historical and accumulated experiences of individual new energy projects. The social networks that mobilize around such projects can even extend to the regional and national level. Positive experiences gained at individual sites (in our cases, for example, in Spain and Germany) can expand to a broader regional level or even influence national policies. Likewise, local controversies can expand, as has occurred in the establishment of national-level advocacy organizations in the UK and France.

The previous literature and statistics pointed to some regional, national and local differences in the uptake and acceptance of new energy technologies, including ones that are not fully explained by differences in natural endowments. These differences are not, however, due to inherent characteristics of different nationalities, or even fully explicable in terms of individual policy instruments. They are the result of a co-evolution of new technologies, their institutional contexts, and social action and meaning. One important component in this co-evolution is the way in which individual new technology projects *interact* with their local historical, cultural, institutional, social, economic, material and geographical context. Thus, societal acceptance is not necessarily an issue of accepting or rejecting a specific technology, but rather pertains to the way in which the technology is introduced in a new context. Important features influencing the process include the policy, economic, social, cultural and infrastructural conditions existing in different locations, as well as the timing of projects vis-à-vis changing framework conditions.

In terms of how projects are introduced, many of our findings confirm the observations made in previous empirical and review studies. Some management principles and procedures appear to be widely applicable to many kinds of new energy projects. Socially acceptable projects tend to (1) be locally embedded, (2) provide local benefits, (3) establish continuity with existing physical, social and cognitive structures and (4) apply good communication and participation procedures. Moreover, our case studies suggest that in order to produce the desired techno-economic outcomes (in addition to creating societal acceptance), projects may also need (5) the capacity to leverage the social support they have gained to overcome difficulties in financing, policy instability or lacking market power. Due to the geographical scope of the study and the range of technologies considered, we have also been able to identify some specific contextual factors and features of the different technologies that suggest specific priorities for project managers aiming to achieve societal acceptance.

In the report, we have outlined on the basis of our analysis central challenges that project managers encounter when attempting to introduce new energy technologies in a manner that promotes societal acceptance. These include the challenges of:

1. introducing appropriate projects in appropriate contexts
2. identifying critical issues and stakeholders for evolving technologies
3. reflecting on action at appropriate stages
4. interacting with the ‘right people’ in the ‘right way’
5. combining successful processes with successful outcomes.

1. The challenge of introducing appropriate projects in appropriate contexts

Different country and local contexts set different conditions for the emergence of societal acceptance. We have identified a set of contextual features that project managers and partners should investigate before launching a project (Table S.2). Recent data on some of these issues - pertaining to the national level - are provided in Annexes 2-6. It is important to note that such factors operate on both the national and the local level, and should be investigated separately for both levels.

Table S.2 *Factors pertaining to the national and local context influencing project success*

Factors pertaining to the national and local context
Government policies:
• Types of government policies on new energy technologies and related topics.
• Stability of national policy.
• Policy culture (consensus, negotiation, confrontation).
• Centralisation of national government.
Socio-economic factors:
• Availability and perception of natural resources.
• Energy prices.
• Technology and other input prices, costs.
• Perception of foreign investment.
• Importance of energy independence.
• National competing technologies and industries.
• Interest in employment opportunities and regional economic development.
Cultural factors:
• Trust in institutions.
• Tradition of top-down vs. bottom-up initiatives.
• Environmental awareness.
• Historical experiences.
• Attitudes to new technology.
Geographic factors:
• Climate.
• Availability of suitable locations.

Three kinds of managerial implications can be derived from these contextual factors. Firstly, they can be used to identify more or less suitable contexts for different projects. Secondly, they can be used to alert project managers to special features of the local context that need to be taken into account when designing and carrying out projects. Thirdly, policy makers can use them to develop an awareness of the suitability of different policy contexts for the deployment of new energy technologies. Even more importantly, project managers should make use of all opportunities to explore the context of their projects. Section 7.3 of the report indicates some of the ways in which previous projects have gained knowledge of their context, while at the same time developing relationships with their stakeholders.

2. The challenge of identifying critical issues and stakeholders for evolving technologies
Different technologies and different projects have different critical stakeholders and desirable outcomes in terms of societal acceptance. Table S.3 presents some critical issues and success factors for different new energy technologies (not including technologies represented by only one case study) on the basis of *recent* experiences; with time, new issues may emerge to join them. It is important to note that the critical issues that we have identified are based on a limited set of cases and are highly site-specific. The issues identified are thus indicative of the range and variety of issues arising in connection with different technologies, rather than conclusive or exhaustive. Moreover, it is also important to understand the culturally and historically evolving nature of societal acceptance: some impacts and relationships only become evident in concrete applications of the technologies and in the kinds of social dynamics that they initiate. Hence, societal acceptance is an evolving and changing phenomenon because it does not relate only to the technology itself but to the economic and social networks that build up around it.

Table S.3 *Critical issues and success factors for different new energy technologies*

	Key problems and uncertainties	Factors likely to promote success
Household energy efficiency	• High public awareness and participation needed • Existing public acceptance high but understanding low • Individual investments; high transition and transaction costs • Competing technologies	• Financial incentives • Information campaigns • Support through social networks • Potential to promise users autonomy from suppliers
Bioenergy	• Siting issues • Input logistics: managing economics and social and environmental impacts • Variable level of public awareness and understanding in different regions	• Respecting existing (regional) networks • Integrating local information into project design • Management of local benefits and drawbacks • Potential to enhance local energy independence
Wind power	• Siting issues • Land-use intensity • Local costs and benefits and their equitable distribution • Diverging views on landscape preservation • Concerns about health and environmental impacts • System operation concerns (intermittency)	• Adaptation to local context • Management of local benefits and drawbacks • Involving local residents in the process
Solar energy	• Costs • Difficulty of developing economies of scale • Small-scale applications require significant user involvement • Mistrust in technology as a reliable energy source • Small-scale PV: gaps in grid connection rules and procedures • Insufficient competences in installation firms	• Possibility to link decision making to other (construction) decisions and specify or mandate simple technologies • Demonstration investments at public institutions • Potential to enhance local/personal energy independence • Prosperous and fresh image

	Key problems and uncertainties	Factors likely to promote success
Hydrogen	• Siting of distribution infrastructure • Reputation of the operator or initiator • Relations between expectations and current implementation scale • Management of risks	• Roots in fresh, clean technology • Risk tolerance in context • Shared investment • Sense of shared benefits
CO_2 capture and storage	• Low public awareness and understanding • NGO resistance on issues of principle • Potential exposure to legislative requirements • Immature technology: high investment, low income • Perception that large companies are involved in order to improve image • Storage and safety issues emerging?	• High interest in the research community • Possibilities for shared investment and common ownership?

3. The challenge of reflecting on action at appropriate stages

In the context of managing a new energy project, successful reflection on action can be translated into questions that need to be asked at different stages of the project. Table S.4 presents a summary of the questions that our case study projects had to address pertaining to the societal acceptance of their projects. We suggest that if projects desire to create societal acceptance, they will start asking these kinds of questions early on, but continue monitoring their social impacts and stakeholder relations throughout the project, and develop a reflective approach to issues and new information arising in the course of action.

Table S.4 *Questions that can help projects to increase the likelihood of creating societal acceptance*

Questions to be answered at the design stage	Questions to be answered during implementation
How does the project interact with the local context (or alternative contexts considered): • What kinds of external effects does it involve; does it require user adaptation? • In which ways might it benefit or harm the local context (physical, economic, social or symbolic) and how equitably are the benefits and risks distributed? • What synergies or competition may the project involve with other ongoing developments? • How does it relate to historical experiences and the existing competences of those present in the local context? Who are potential partners and stakeholders of the project on the local, national and international level: • Whose resources could be important for the project: who might be important 'bridges', 'champions' or 'multipliers'? • Who might the project influence and who might exert an influence in it? • How does the project relate to its stakeholders' interests and concerns? How will stakeholders be involved and their concerns addressed: • How will stakeholders be informed about the project and how will its vision be communicated? • How will information about stakeholder's concerns be collected? • How early can stakeholders be involved in the project and what aspects of the project design could they influence? • How will different stakeholder's interests be represented? • How will stakeholder involvement be integrated in the time frame of the project?	How are communications managed on an ongoing basis: • How does the project keep 'in touch' with its stakeholders (formal and informal channels)? • Do new stakeholders emerge as the project evolves? • How can stakeholders monitor the progress of the project and the unfolding of its impacts How is competence developed during the project? • In what ways can stakeholders interact with the project as it unfolds? • What competences are needed for making use of local resources and how do such competences develop? • Is there evidence of mutual learning and adaptation? How does the project deal with issues that arise during the project: • Issues of representation and division of responsibilities and powers? • Resolving potential conflicts among different stakeholders' interests? • Dividing attention between stakeholder management and other aspects of project management (technical, operational, market, financial, etc.) When and how should the project 'take stock' and reflect on achievements and remaining problems: • Evaluation and milestones? • Opportunities for modifying the project according to lessons learned?

4. The challenge of interacting with the 'right people' in the 'right way'

In this context, 'right people' refers to partners that bring resources and support the project but also enable the project to interact with its external environment, and to the stakeholders who are influenced by or can influence the project. The case study projects show that there are no *a priori* reasons for any stakeholder group to represent any other group (i.e., e.g., no obvious reasons for municipal decision makers or NGOs to have the same expectations as local residents). This challenge requires that project managers identify the stakeholders, issues and concerns in the project context (for example, the extent and types of external effects resulting from the project; the potential user adaptation required; and the potential links of the project to broader policy debates).

The 'right way' of interacting ensues from the kinds of concerns, issues and people involved. Examples of better and worse practices in the cases indicate some generic issues: starting early and continuously, the importance of articulating concerns, mutual learning, and the need to ensure clarity of purpose and division of power and responsibilities. Formal structures usually facilitate the process and make it more transparent, empowering and credible, but should be complemented with face-to-face interaction and 'keeping in touch'. Project managers should not only involve stakeholders, but also involve themselves.

5. The challenge of combining process success with outcome success

Taken together, and considered against the historical background, the cases highlight the importance of successful processes - i.e., societal acceptance - for the future of individual projects, and for the future of other similar projects that will follow them, i.e., societal acceptance also has a 'public good' aspect. This is one reason for policy makers and institution-builders to support such efforts, also beyond their immediate impact on outcomes.

Ideally, projects should be successful both in terms of (techno-economic) outcomes and in terms of processes (i.e., societal acceptance). The projects analysed in the case studies show that this is possible, and socially acceptable processes also tend to contribute to successful techno-economic outcomes. Yet in order to achieve successful outcomes, project managers need to consider other aspects of the project, as well, including technological, operational, market and financial issues. Project managers thus face the challenge of integrating different management tasks and balancing between the potentially conflicting demands of different stakeholders.

Contribution of the report to the Create Acceptance project

Work Package 2 contributes to the following stage of the Create Acceptance project, Work Package 3, which aims to develop a multi-stakeholder tool for managing new energy projects, in five different ways:

- First, the report provides confirmation of the need to revise the original Socrobust tool, as identified already in the WP1 report (Jolivet et al., 2006). Societal acceptance is indeed one factor that can influence the successful introduction of new energy technologies, and hence project managers need to take into account a broader range of factors than proposed in the original Socrobust tool. One of the fundamental issues raised by this report is that project managers should not only consider how the project can *change its context*, but also how the project can *adapt to its context*.
- Second, the report has identified specific opportunities and threats that relate to the societal acceptance of new energy technologies under the conditions presented by different local and national contexts. This has also allowed us to identify factors that are likely to promote project success, and which are thus desirable features to include in new energy projects where possible.
- Third, the case studies in Annex 1 can serve as 'learning histories' for project managers to explore potential issues that arise in different contexts and in connection with different technologies and project designs.
- Fourth, the report has initiated the task of structuring the issues related to managing societal acceptance by identifying different types of stakeholders and their roles, decisions influencing societal acceptance made at different stages of the project, managerial tasks and questions to be answered in connection with societal acceptance, and potential conflicts that can arise with other managerial tasks. This work will continue in WP3 of the Create Acceptance project.
- Fifth, the report and its underlying analysis have also produced recommendations for how societal acceptance should be understood and investigated in the work of WP3. The methodological approach developed in WP2 demonstrated the importance of the analysis being framed within a systemic, multi-level technological transitions framework. The novelty that the five-step methodological approach developed here adds is that it provides a basis to research the relationships between societal acceptance, technology development and local contexts.

1. Introduction

Renewable energy and energy efficiency have an important role in Europe in combating climate change and other harmful effects of energy production, in increasing the security of energy supplies, in making efficient use of natural resources, and in ensuring the competitiveness of European industry. Although public opinion surveys also show widespread support for renewable energy sources and energy efficiency in Europe (Eurobarometer, 2006), new energy projects often fail because of a lack of stakeholder acceptance. Thus, in recent years, there has been increasing attention to the concept of 'social acceptance' or 'societal acceptance' of renewable energy sources (PV Accept, 2005; H2Accept, 2005; Accsept, 2006). Nonetheless, our overall understanding of how acceptance emerges, or fails to emerge, is still quite limited.

The present report aims to identify patterns and factors influencing societal acceptance. This is done by analyzing 27 case studies. The case studies are located in different geographic regions - West Europe, North Europe, Central and Eastern Europe and South Europe, as well as in different local settings within these regions. Moreover, they also include two case studies from South Africa, which enable a comparative perspective as well as a special focus on the role of poverty in the societal acceptance of new energy technologies. Unlike previous studies, we consider a wide range of new energy technologies: energy efficiency, bioenergy, wind power, solar energy, hydrogen and CO_2 capture and storage, as well as geothermal energy and the novel technology of 'blue energy', i.e., obtaining electric power from differences in water salinity. The analysis focuses on cases exhibiting various degrees of successfulness both in terms of societal acceptance (which we term 'process success') and in terms of the achievement of their initiators' expectations (which we term 'outcome success').

The report is the final report of Work Package 2 of the Create Acceptance project. It has two main target audiences:
- Firstly, it aims to provide guidance for further stages of the Create Acceptance project. The report identifies key factors that should be considered when designing a multi-stakeholder tool for socially robust new energy projects.
- Secondly, it also aims to serve as a useful orientation guide for practitioners and policy makers in the field. The report can be used to identify good practices and potential pitfalls in managing the societal acceptability of new energy technologies.

This report is structured as follows: An overview of the existing knowledge base is presented in Chapter 2. We identify the most important knowledge gaps, which form the focus of the present study. The framework used to analyse case studies of previous experiences is presented in Chapter 3. Chapter 4 presents an overview of the case studies conducted, describes the successes and failures encountered in those cases, and explains how the analytical framework was employed to identify factors contributing to success and failure.

Chapters 5, 6 and 7 examine the role of different factors that contribute to success or failure in the case studies. First, we focus on the different new energy technologies investigated in the case studies in Chapter 5. We identify specific features of these technologies that relate to societal acceptance. Next, we examine influential features of the context that need to be taken into account in project design and implementation in Chapter 6. Finally, we turn to more general (technology- and context-independent) factors related to project organisation and social interaction in Chapter 7, such as stakeholder involvement, project management, and how trust and the alignment of stakeholders' interests emerge. We also highlight the role of project managers in adapting new energy technologies to the local context.

Chapter 8 presents a concise summary of the main conclusions and recommendations in the form of an annotated checklist of the challenges that new energy project managers encounter, and Chapter 9 outlines the contribution of this work package to the Create Acceptance project.

Annex 1 presents the full case studies. Annex 2 presents key energy figures for European countries. Annex 3 provides some background data on indicators of public awareness of new energy issues in different countries. Annex 4 provides a background document on the energy and policy profiles of the regions investigated. Annex 5 presents an evaluation of the relevance of a range of national cultural factors for new energy projects and Annex 6 provides some comparative data from surveys pertaining to those cultural factors.

2. Previous research on societal acceptance

This chapter first defines what we mean by societal acceptance in this report. Then, an overview is presented of the challenges encountered when new energy technologies are adopted into the mainstream of environmental and energy policies and the strategies of mainstream corporations. We then outline some previous observations concerning the influence of contextual and project factors on the societal acceptance of new energy technologies (Section 2.3). The final section presents a summary of the existing knowledge and identifies important knowledge gaps that the present report aims to address.

2.1 Defining societal acceptance

The terms ‘social’ or ‘societal’ acceptance are increasingly used in connection with new energy technologies (PV Accept, 2005; H2Accept, 2005; Accsept, 2006). Yet the concept is often used to refer to different phenomena. Deuten et al. (1997), have defined social acceptance as one of three components of societal embedding (the other two being integration into relevant industries, markets, and users’ existing practices and cultural repertoires; and admissibility according to government and sector rules and standards). Here, social acceptance refers to *acceptance by the public*. Deuten et al. (1997) argue that social acceptance has been achieved when the following conditions are fulfilled: “societal concern is not unduly large, there has been sufficient articulation of the pros and cons so that choices can be made consciously, and the new product is actually used.”

While the definition by Deuten et al. (1997) provides a good starting point, it also raises some questions. How do social concerns emerge in the process of innovation (see Jolivet and Maurice, 2006) and do innovations inevitably raise social concerns? How are pros and cons articulated and where? How, by whom, and for whom are ‘conscious choices’ about technology made? We address these questions by investigating societal acceptance from a multi-level and multi-actor perspective described in Chapter 3.

Moreover, when speaking of ‘social acceptance’ it is important to distinguish between the acceptance by different social groups (Khan, 2000) and acceptance on different scales of application (Rohracher et al., 2005). Different kinds of innovations also involve different types of adaptation needs and concerns for different stakeholders. For example, renewable energy is often produced in an extensive manner, and hence needs to be adapted to a range of locations. New energy technologies also usually require active support from society in order to compete with conventional energy sources. For the purposes of the present report, we therefore define societal acceptance as existing when:

- There is support for the technology among the expert community and national and local policy makers.
- The general public has an informed and largely positive view of the technology.
- Concrete applications do not meet significant obstacles from local policy-makers, residents, the NGO community or other representatives of social interests.
- When the opportunity arises, ordinary people are willing and prepared to adopt the applications in their own contexts and to support them with positive actions.

It is important to note, however, that social groups such as ‘the general public’, ‘neighbours’ and ‘consumers’ are overlapping categories rather than intrinsic qualities of specific individuals. Individuals can have many roles and be members of many of these different ‘groups’ at the same time, and the issue of which group they represent at some point in time depends on how they interact with the technology (e.g., voting, opinion polling, purchasing, living next door, campaigning, etc.).

While ‘social acceptance’ is becoming a commonly used term, we choose to use the term ‘societal acceptance’ in order to grasp this notion of acceptance by multiple societal groups. ‘Societal acceptance’ here refers to the institutionalisation of action and meaning concerning the technology within and between social groups (including policy makers), which leads to the alignment of different social interests to support the application of the technology in society. ‘Alignment’ here refers to how various social interests are coordinated and connected to the technology project in a way that serves both the project and the social interests (for a more detailed discussion, see Chapter 3).

It is important to understand that societal acceptance cannot be reduced to the characteristics of the technology, or to characteristics of the social groups who accept it or fail to do so. Acceptance arises in interaction between the technology, social groups and other features of its application context. Here, *context* refers to the historical, cultural, institutional, social, economic, material and geographical settings that surround, shape and are shaped by the technology (see Section 6.1 for a more detailed definition). In this report we further structure the analysis of context by making an analytical distinction between the local and the national context in a geographical sense (the distinction is analytical because local and national context often are mutually shaping, interact and overlap). Through these aspects of ‘context’, we bring other contextual features into our analysis, such as institutions, social movements, policy cultures, timing of policy developments vis-à-vis the project, etc. Stakeholders (see Chapter 7) are an important part of the context, and their involvement in the project is one of the ways in which context influences the project.

Societal acceptance, or the lack of it, often becomes apparent in ‘concrete projects’ such as pilot and demonstration plants. Concrete projects confront their application contexts with a number of changes such as visual changes, new power relations, financial risks, or increased local traffic and emissions. Stakeholders become involved - either invited by the project manager or on their own initiative - and bring in their visions and expectations, which can be radically different from those of the project manager. Societal acceptance, in other words, does not merely ‘exist out there’, but is the outcome of the interactions between a project and its contexts and stakeholders. Societal acceptance hence needs to be explained rather than assumed.

2.2 The mainstreaming of new energy technologies: more and less successful experiences

Many of the innovations considered today in the context of ‘new energy technologies’ have their origins in local experiments. They were based on conceptions of ‘appropriate’ technology, and were made by and for their prospective users with a view to support more ecological and self-sufficient lifestyles. For example, many authors locate the origins of wind energy in local experiments in Denmark and elsewhere by ‘alternative technology’ enthusiasts. They were based on locally available resources, and were purposively small-scale and distributed (e.g., Ingemann, 1999; Jamison, 2001). Kemp et al. (2001) and Smith (2005) have described such local experiments in alternative technology as socio-technical niches that aimed to challenge the existing regime[1] of large-scale and unsustainable technologies.

Experiences in Denmark and Germany show how these niches have, indeed, grown to challenge the existing regime, even though some commentators may argue that they have lost some of their original character. Denmark, for example, enjoys both community support and commercial success in wind energy and bioenergy. Many authors attribute this successfulness to the long-standing tradition of community ownership and civic engagement in renewable energy. For ex-

[1] The concept of ‘regime’ refers to the ‘rules’ of the dominant technological system. For more details see Section 3.1.

ample, it is estimated that approximately 150,000 families have an ownership stake in wind energy projects (Lauber, 2002). Due to this cooperative tradition, acceptance of renewable energy is high, and there are few reports of local controversies concerning renewable energy (Sørensen, et al., 2001; Predac, 2003; Szarka, 2006). Other features explaining the successful expansion of this niche include long and stable political coalitions in favour of renewable energies (Van Est, 1999), early policy support (especially the feed-in tariff) and involvement of the scientific community (Krohn, 2002), public participation in land use planning (McLaren Loring, 2006) and a national innovation system that promoted knowledge transfer between turbine producers, turbine owners and researchers (Kamp, 2004).

The successfulness of wind power and combined heat and power production (CHP) in Denmark has been examined by Vleuten and Raven (2005) from the perspective of distributed generation and a long historical view. Their historical analysis shows that the legacy of distributed generation - in terms of technologies, actors and institutions - dates back to the early years of electrification. In Denmark, distributed generation co-existed with the centralised grid until the 1950s and 1960s, and some remnants of a distributed system were maintained by the rural cooperatives throughout the century. Moreover, communities maintained ownership of local power distributing companies even when connected to the grid. As wind turbines - also dating to the early years of the century - matured in the 1970s, they were linked to a hybrid centralised-distributed power generation system. In this situation, the wind turbine revival built on the experiments from the 1960s in grid-connected turbines and the legacy of the small power cooperatives of the start of the century. This provided the basis for the establishment of numerous ‘wind turbine associations’ in Denmark in the 1970s and 1980s, which in turn led to the widespread ownership and ensuing societal acceptance.

In the early years of Danish wind market development, the concept of citizen-owned wind farms spread to neighbouring countries, and met with fertile ground in Germany. The framework conditions for its successful adoption include the similar feed-in-tariff scheme applied, the availability of preferential loans, as well as the high level of environmentalism, relatively wealthy rural population and the local tradition of working through local associations. Due to these features, and the availability of suitable ownership and governance structures, local citizen wind farms became an important vehicle to develop the wind energy industry to its present state of maturity (Enzberger et al., 2003). Reusswig and Battaligini (2006) add to this explanation by emphasizing the alternative energy politics that arose in the wake of the anti-nuclear movement in Germany. They argue that many proponents of this movement felt a need to do something concrete and constructive, and that this led to the birth of the citizen’s wind energy movement. As a result, it is estimated that at its peak, citizen-owned wind farms accounted for 90% of all installed wind turbines in Germany (Szarka, 2006).

Enzenberger et al. (2003) have stressed the specific historical conditions in which the citizen ownership schemes evolved as a necessary way to raise capital for early wind farm investments in Germany, while at the same time providing a natural avenue for public participation and the development of societal acceptance[2]. This pattern has not been visible in other countries with a growing wind energy industry, which started to apply the technology at a later period under different technological and financial constraints and opportunities (e.g., Szarka, 2006). As wind energy technology has matured and upscaled, the capital structure of investments have changed, resulting in a growing share of closed-ended funds, venture projects, utility ownership and foreign investment. Due to the different policies, forms of economic organisation and historical-cultural experiences, the citizens’ role in wind farm development has been quite different in the UK and France, for example. In fact, some citizens in these countries have developed quite different types of grassroots organisations, i.e., sophisticated national-scale associations to oppose

[2] This is, however, not the only factor influencing diffusion of renewable energy in Germany: policy support schemes such as the early application of the feed-in-tariff (e.g., Johnson & Jacobsson, 2002; Lauber and Mez, 2004), as well as differences in planning procedures.

the development of wind energy (e.g. Szarka, 2006; see also the EOLE 2005 wind energy programme case in Annex 1).

These and related examples show how cultural, economic and technological development in renewable energy are strongly intertwined and historically path-dependent[3] (see e.g., Jacobsson et al., 2004, see also the Bioenergy Village Jühnde case in Annex 1). They indicate that in certain national and local contexts, renewable energy technologies have been 'in the making' for decades. They have gradually matured in specific institutional and cultural contexts, combining scientific and industry expertise with the development of user competences and positive experiences. The development of the technology has co-evolved with culturally appropriate institutions that fit the technology. These experiences have most likely also influenced the cultural meaning attached to the technology in those contexts.

Naturally, it would take much too long for every country and every local context to 'invent' their own renewable energy and the institutions to support it. As the challenges to energy policy have mounted, national-level legislation and initiatives have fed into the need for EU-wide policies and programmes to develop and institutionalise new energy sources. These, in turn, such as the *Directive on the promotion of the electricity produced from renewable energy* (2001/77/EC), have translated into new national policies and programmes. In recent years, policy developments and policy convergence, along with the maturation of many key technologies, have spurred the interest of private investors, venture capitalists and large energy companies. The 'traditional' renewables have also been joined by increasing experimentation with 'newer' new energy technologies such as hydrogen, CO_2 capture and storage and solar power plants.

New energy has also grown to enjoy widespread support in opinion polls and surveys of energy attitudes. For example, the special Eurobarometer Survey (2006) indicates that the overall public opinion about renewable energy and energy efficiency is favourable. For example, when asked to select two alternatives for reducing EU dependency on imported energy resources, solar power was the alternative gaining most support among EU citizens (48 %), closely followed by promoting advanced research for new energy technologies (41%, with hydrogen and clean coal mentioned as examples). Wind power was the third most preferred alternative (31%), followed by regulation to reduce dependence on oil (23%) and developing the use of nuclear energy (12%). In spite of this widespread public support, individual renewable energy projects in many countries continue to encounter resistance by citizen groups.

In summary, there have been great advances in mainstreaming new energy technologies, which is visible in the growth rates of renewables in the European energy mix (see Annex 2) and in the introduction of innovative policies and programmes to further promote them. But on the 'downside' there has been a shift from local 'appropriate', if small-scale, technology adoption to top down policies that may sometimes be insensitive to the local context (see Annex 1 case studies Crickdale Bioenergy Power Station and EOLE 2005 wind energy programme). Such growth and technical evolution would not be possible without the contribution of 'mainstream' players, but their involvement in renewable energy deployment has been accompanied by the introduction into renewable investment of a 'normal' capital budgeting logic. Financial pressures are not so prominent as long as new technologies are within the domain of R&D projects, but when moving from demonstration to deployment, projects are likely to meet more stringent cost and time requirements.

We can thus see that the technologies have matured and the institutional context for new energy has evolved. But at the same time, local embeddedness has decreased and time for mutual adaptation between projects and contexts has been squeezed. In short, new energy projects encounter

[3] 'Path dependence' refers to an evolution pattern in which history determines some of the alternatives available in the current time. History is understood as an 'irreversible branching process' (David, 2000); once a 'path' has been taken, it is difficult to change to an alternative one.

many typical problems of energy technology transfer (cf. Green, 1999) on a European scale. The long historical view on the evolution of institutions and cultural traditions connected to renewable energy indicates that copying the successful policies or institutions to other countries may not lead to the same results. An example of this is provided by Raven (2005): attempts to copy the cooperative idea from Danish biogas plants to the Dutch context failed because the relationships between the actors in the new context were different.

The situation places special demands on projects if they want to replicate original 'success stories'. The following sections outlines some lessons learned to date about managing the societal acceptance of new energy projects, as well as remaining knowledge gaps.

2.3 Key lessons from previous studies: factors influencing societal acceptance

The previous section pointed to an ambivalent role of the general public in supporting new energy initiatives on the one hand, but opposing them on the other. The fact that support and opposition have risen in different countries raises the question of whether there are obvious regional differences in this respect, and more generally places issues of *local context* on the agenda. One could also surmise that some citizens are more supportive because they have more knowledge and experience with specific technologies. More and more, social research in the field is however focusing on how new energy technologies interact with communities and society, and how specific governance and management patterns influence those interactions to *create alignment* among different interests.

Influence of regional differences and local context
There are some indications of regional differences, both in the track record of individual projects and their acceptance, and on the 'public acceptance' level of public opinion surveys. For example, Predac (2003) reports that local opposition to renewable energy projects has emerged in the UK, France and Greece, but not in Denmark or Germany. On the level of public opinion, the Eurobarometer (2006) also shows that there are some differences both in the role that citizens see for new energy in solving the energy challenges of Europe, and in their preferences for specific renewable energy sources. For example, fewer than one-fifth of the Italian respondents selected wind as one of two alternatives to solve energy problems, whereas almost 60% of the Danes saw it as a future solution, and it was also rated highly by Estonians and the Irish. Similarly, fewer than one-fifth of the Lithuanians saw solar energy as a solution for the future, in contrast to almost 80% of the Cypriot respondents. Advanced technologies (including clean coal and hydrogen) were the favourite solution in the Nordic countries and in the Netherlands[4].

Differences in public perception of different renewable energy sources are clearly partly due to natural endowments, but equally clearly also due to other factors. For example, solar energy was the most preferred alternative in Southern European countries, but also in Slovenia, Slovakia, Poland and Hungary, as well as in Austria, France, Luxembourg and Germany. For example, Tsoutsos (2002) has analysed the diffusion of solar technologies in Europe, and points out that solar energy is very advanced in Greece, but not in other Mediterranean countries - whereas it is relative highly diffused in Austria and Germany. Early investment, favourable policies and well-developed markets are other factors identified by Tsoutsos (2002), but he also refers to the environmental awareness of the population as an important factor. Environmental awareness, however, does not self-evidently explain the preference for specific renewables[5]. For example, De-

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4 Energy efficiency was not included as an option in this survey, nor was bioenergy (see Chapter 4 for some more details on these technologies).

5 Attitudes toward science and technology may be a factor underlying some differences in attitudes toward 'advanced new technologies'. People in the Netherlands and the Nordic countries score highest in the 'knowledge test' item in the Eurobarometer (2005b) survey about science and technology, and rate highly on a number of (but not all) measures of positive attitudes toward science and technology.

vine-Wright (2004b) has critically examined the way in which public communications influence the way in which energy issues and problems and opportunities are perceived. Moreover, historical experiences due to the accumulation of past applications and projects also seem to have an impact on public perceptions of different technologies.

Public perception as reported in surveys is obviously not the same as consumer acceptance or acceptance on the local level (e.g., Ek, 2004). A great deal of research effort has been invested in recent years to study the nature of local resistance and its underlying reasons. Early work often referred to the NIMBY (not-in-my backyard) phenomenon. A number of studies have attempted to assess the importance of this phenomenon for attitudes to renewable energy, for example, by comparing the attitudes of people living close to energy plants to those living further away. The findings seem to be mixed: e.g., Meijnders (2005) found more mixed attitudes to biomass plants among close neighbours. In contrast, Wolsink (2000) and Devine-Wright (2004a) have found counter-evidence: for example, in Devine-Wright's review of previous studies, physical proximity, time and a range of psychographic factors failed to consistently explain acceptance or resistance (see also Szarka, 2006).

Prior research has also started to emphasise the social nature of sensemaking. *Social references* seem to influence both acceptance and resistance to renewable energy technologies. For example, friends and neighbours seem to be important references for investing in solar panels (Fischer and Sauter, 2004). Similarly, friends' and relatives' opinions were found to be important determinants of people's views on local renewable energy projects (Devine-Wright, 2005). Social learning, social mobilisation and social amplification of positions and viewpoints appear to be factors worth considering when studying the societal acceptance of renewable energy projects.

Wolsink (2000) and Devine-Wright (2004a) argue that local residents are not opposed to developments because of NIMBY issues, but because they are insufficiently engaged in decision-making, and their needs are not taken into account in the planning process. Positive experiences from community ownership programmes - also in other contexts than Denmark and Germany - appear to support this interpretation (e.g. Sørensen et al., 2004; Leany et al., 2001; Hain et al., 2005). Predac (2003) and Johansson and Turkenburg (2004) have also pointed to differences in spatial planning procedures as a factor underlying the variations in public support and opposition in different countries. Thus, the main factor that seems to emerge as an explanation for variations in local support or resistance is the level of participation of local residents in the planning process (see also McLaren Loring, 2006). Few studies, however, have examined carefully what happens when residents participate in the process, and hence the specific role and nature of participation in explaining success is still somewhat unclear.

Societal acceptance of renewable energy is thus obviously a result of the interaction between project and context. In these terms, reviews of previous projects have attempted to identify features of successful projects and develop recommendations for project managers. The following section overviews some of these success factors and recommendations.

Influence of project management procedures

Some earlier review studies have identified project management factors contributing to the societal acceptance of specific renewable technologies. The focus has been on bioenergy (Khan, 2004; Upreti, 2004; Rohracher et al., 2005), wind energy (Devine-Wright, 2004; Khan, 2004; Sørensen et al., 2001) and local renewable energy projects (Predac, 2003). This section summarises some of the key lessons and recommendations of these reviews. The focus is on experiences of siting large or medium-size projects, and the lessons learned from successful and unsuccessful siting processes.

Factors contributing to failure: Local conflicts and acceptance issues are naturally only one set of aspects contributing to the failure of renewable energy projects. Failure may be due to 'objective' factors such as poor economics, unreliable technology, or real negative impacts on the local environment (e.g. increased air pollution and traffic, landscape degradation) or economy (farming, tourism, property prices). Yet poor project management and failed communications can also contribute to a negative 'cycle' that reflects poorly on the project's image. Social factors that have been shown to contribute to local conflicts include (Predac, 2003; Khan, 2004; Upreti, 2004; Rohracher et al., 2005):

- The development is involuntarily imposed on the locality from someone from 'outside'.
- The technology is not familiar.
- Local people's concerns are overlooked and they are not involved in the decision making.
- The development is for corporate profit rather than local benefit.
- The developer uses 'decide-announce-defend' -strategy (i.e., makes decisions before consulting local conditions, announces plan as *fait accompli*, further negotiations centre on defending decisions already made).

An interesting issue to note is that in some (not all) cases, environmental organisations have been in support of the project, and resistance has been organised quite independently by local residents and neighbours of the facility (Khan, 2004; Rohracher et al., 2005).

Factors contributing to success: Some common features of successful projects have also been identified (Predac, 2003; Devine-Wright, 2004; Uperti, 2004; Roracher et al., 2005; Khan, 2004). The factors identified in different studies can be categorised in terms of (1) local embeddedness, (2) local benefits (3) establishing continuity with existing structures and (4) good communication and participation. The following items illustrate these categories:

(1) Local embeddedness includes such issues as:

- Gaining support from key local organisations, finding a key local person propagating the scheme and/or involvement and backing of the local council.
- Local residents' trust in the developer, e.g., local presence and accessibility.
- Embeddedness in the local economy.
- Project manager's flexibility in the planning process and willingness to make changes in plans according to local circumstances.

(2) Local benefits include concrete issues such as:

- Economic benefits to the community: use of local contractors and provision of employment opportunities.
- Contribution to local energy needs, e.g., partnership with local utility.
- Local investment, community ownership.
- Improved environment for local people (e.g., less pollution, improved waste management).

(3) Continuity with existing (physical, social and cognitive) structures is represented by such issues as:

- Utilisation of existing infrastructure, e.g., use of existing industrialised sites.
- Familiarity with the technology, existing awareness of energy issues, earlier positive experiences.
- Links to other ongoing change processes (e.g. Local Agenda 21, regional economic development).

(4) Good communication and participation includes:

- Recognition of different interests and perceptions within the local community.
- Understanding and articulation of the local people's vision for their community.
- Good communications: targeting specific groups crucial to acceptance, existing information channels, using language that communicates with locals' needs.
- Ongoing dialogue with local groups, especially ones in opposition.

In terms of concrete recommendations for those planning a renewable energy project, Devine-Wright (2003), Upreti (2004), Khan (2004) and Roracher et al. (2005) have made the following recommendations pertaining to communications and participation:

- Clarify the purpose of the project.
- Involve every stakeholder in the process.
- Explore local people's concerns to make sure all issues are addressed in communications and consultation.
- Clarify expectations concerning the participation process (inclusiveness, influence and limitations).
- Promote horizontal communication within the community.
- Gain the support of local leaders and opinion leaders.
- Maintain flexibility: be prepared to change and adjust.
- The use of independent facilitators may help to build trust in the process.

Some authors argue that there is not much evidence on how different forms of participation actually influence societal acceptance for different technologies (Sørensen et al., 2001). Khan (2004) has made some comparisons of conventional public consultation as stipulated as part of the planning process and more early-stage and inclusive planning together with local residents. The findings are encouraging for early-stage involvement. Sørensen et al. (2001) and Khan (2004), however, point out that community-based projects and very inclusive planning projects can place special time demands on the project.

2.4 Summary and knowledge gaps

Most of the previous research on societal acceptance and resistance has been conducted in the context of wind and bioenergy applications. Less experience has accumulated on (project-level and contextual) factors influencing the acceptance (in concrete applications) of other technologies, such as hydrogen and CO_2 capture and storage. The research has also been largely concentrated in specific geographical regions - much more is known about societal acceptance in the UK and Netherlands, for example, than in Central and Eastern European countries.

While many studies focus on public acceptance, it is important to distinguish between different scales of application (Rohracher et al., 2005) and different types of societal acceptance (Khan, 2000): general public acceptance, acceptance by NGO's, local acceptance by neighboring people or local policy administrators, acceptance by consumers, etc. New energy technologies and solutions, even though they can be categorised as interrelated issues on the policy level and in public opinion surveys, are quite diverse phenomena on the everyday life level. Their deployment has different kinds of implications for members of the public - they are innovations that people can adopt, or they can be local siting conflicts, or sources of local pride. They are not merely energy or environmental issues, but also local political issues, housing issues, rural and economic development issues, and issues related to the adoption of new technologies.

Societal acceptance should also be investigated in local, institutional and historical context. For example, public perceptions appear to be more positive in countries with a longstanding tradition of community ownership and civic engagement in renewable energy. Through projects (and their media coverage), people learn about the social impacts of renewable energy. This would mean that projects start out in a world that is usually already populated by historical precedents, and in turn, contribute to the preconceptions that subsequent projects will encounter. Thus, societal acceptance is also a 'public good', and projects can influence the operating environment of other similar projects (see also Jolivet and Maurice, 2006).

A more specific definition of societal acceptance of new energy technologies is needed. This means that a) there should be a clearer understanding of what societal acceptance means to different stakeholders and what they need to do (or not do) in order to 'accept' the technologies;

b) societal acceptance should be investigated in local, institutional and historical context, and attention should be paid to how the energy projects are linked to other concerns of the stakeholders.

It is fairly easy to see that renewable energy projects involve a redistribution of global and local benefits. The inherent benefits of renewable energy are global (or national as they contribute to achievement of CO_2 reduction targets or energy independency). The impacts on local people, in contrast, can vary significantly. Impacts on the local environment can be positive (less air pollution, better waste management, etc.), but can also often be negative (more traffic, landscape impacts, etc.). Impacts on the local economy can also be positive (e.g., areas with limited economic opportunities can be revitalised), but can also be negative (impacts on local livelihoods such as farming, fishing and tourism, or property values). Especially larger projects also contribute to social change (e.g. labour mobility, redistribution of political power), which can be perceived of as positive by some and negative by others.

Many of the ‘lessons’ drawn and recommendations made on the basis of previous reviews are fairly straightforward. They are common features of ‘good land use planning’ or ‘socially responsible project management’ (e.g., Renn et al., 1995; Karlsen, 2002; Brody et al., 2003). Yet often, project managers have failed to anticipate these issues. This may be because they base their actions on preconceived notions of social costs and benefits, and fail to realise that others may see issues differently. They may believe that they have sufficient backing to override local concerns, or may simply not realise how dependent they are on having a place where to locate their project, because they are expending their organisational attention on other issues such as capital-raising and markets.

So it is important to not just analyse ‘stakeholders’ and their attitudes, but also develop recommendations for project managers in such a way that it fits their abilities to deal with the stakeholders in a constructive manner. Project managers need to be able to coordinate and integrate the interests of very different kinds of stakeholders within their project, and they often need to do so within the limited ‘time-window’ of the project. Thus, more research is needed on why project managers often fail to cooperate effectively with other stakeholders, and how they could learn to do so.

Following the progress of a range of different kinds of projects from inception to outcome is one way to explore these issues. The next chapter presents the theoretical and methodological framework that we have developed to analyse new energy projects and to identify the ways in which they have been more or less successful.

3. Researching societal acceptance: A five-step methodology

The purpose of this section is to present and justify the guide to undertaking empirical research as specified in Work Package 2. The key question this section reviews, in line with the focus of Work Package 2, is:

- How and why should we research: *relatively recent country specific controversies and successful deployments with respects to societal acceptance of renewable technologies, focusing on public communication, dialogue and participation efforts?*

The following section presents the theoretical approaches that we have adopted to analyse new energy initiatives, i.e., case studies on previously conducted projects. Section 3.2 explains how these approaches were translated into four steps for identifying common elements of these projects that are relevant to societal acceptance. Section 3.3 presents a fifth step in this analysis, which allows us to identify different dimensions of success, i.e., success in terms of outcomes and success in terms of processes.

3.1 Technological transitions and participation

The aim here is to reflect on why we are researching renewables controversies and deployments and the role of 'participatory' intervention in this. In doing this we draw on two bodies of literature to aid understanding of:

1. Transitions to 'new' and renewable energy economy initiatives.
2. In relation to and addressing debates around multi-stakeholder 'participation' in this, and what forms 'participation' and modes of communication can take.

In doing this we first address and develop ideas from the multi-level technological transitions literature. Thinking fruitfully about new and renewable energy technologies is about more than technical and economic 'characteristics' and 'possibilities' of individual new and renewables technologies or combinations of such technologies into 'systems' (Hodson and Marvin, 2006). We need to move beyond technologies at such levels of technical and economic abstraction and think about how the 'possibilities', 'promises' and 'expectations' of new and renewable energy technologies, and associated innovations, may be understood in relation to existing socio-technical infrastructures and broader social, cultural and political pressures for change in energy systems.

Technological transition approaches

A useful way of encompassing some of these issues is through the work of Dutch-based researchers (e.g. Rip and Kemp, 1998; Geels, 2004, 2002a, 2002b; Kemp, 1994) who have focused on the study of technological transitions (TT). TT are defined as 'major technological transformations in the ways societal functions such as transportation, communication, housing, feeding, are fulfilled' (Geels, 2002a, p.1257) and can be understood through interrelated, 'nested', concepts of landscape, regime and niche. The levels of landscape, niche and regime (Figure 3.1) are useful analytical concepts 'to understand the complex dynamics of socio-technical change' (Geels, 2002a, p.1259).

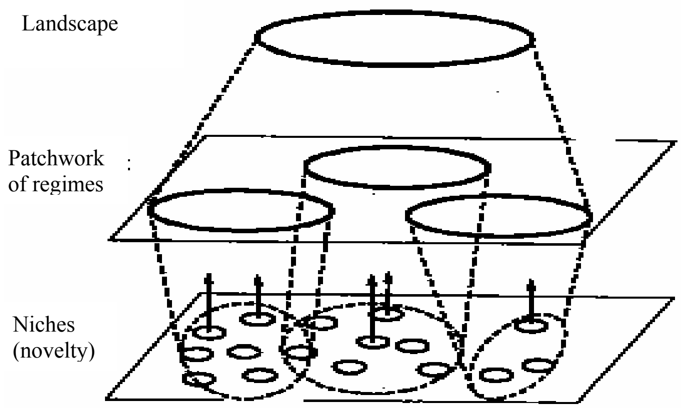

Figure 3.1 *Landscape, regime and niche levels in socio-technical change*
Source: Geels, 2002a.

This being the case the concept of *landscape* is important in seeking to understand the broader ‘conditions’, ‘environment’ and ‘pressures’ for technological change and transition to ‘new’ energy economies. The landscape includes ‘the large-scale material context of society’ such as ‘the material and spatial arrangement of cities’, political cultures, economic growth, macro economic trends, land use, utility infrastructures and so on (Geels, 2002b, p.369).

The concept of *regime* relates to incumbent technologies being intertwined within a configuration of institutions, practices, regulations and so on, where configurations impose a logic, regularity and varying degrees of path dependencies on technological change. Regime is defined as: ‘the whole complex of scientific knowledge, engineering practices, production process technologies, product characteristics, skills and procedures, established user needs, regulatory requirements, institutions and infrastructures’ (Hoogma et al., 2002, p.19). This focus on the embeddedness of transitions necessitates taking account of history. Path dependencies and logics of regimes are historically underpinned by circumstances which may have favoured a particular technology over another within specific local contexts.

The emphasis on regimes highlights the enablement and constraints on new technologies breaking through whereby incremental evolutionary change may be more likely than ‘revolutionary’ change:

> *“Such reconfiguration processes do not occur easily, because the elements in a socio-technical configuration are linked and aligned to each other. Radically new technologies have a hard time to break through, because regulations, infrastructure, user practices, maintenance networks are aligned to the existing technology” (Geels, 2002a, p.1258).*

The idea of socio-technical *niches* is of ‘protected’ spaces in which actors learn in various ways about new technologies and their uses’ (Geels, 2002b, p.365; Kemp, Schot and Hoogma, 1998), where innovation and processes of learning by trying keep alive novel technological developments which otherwise may be ‘unsustainable’. The concept of a niche provides a basis for addressing an appreciation of the circumstances within which we might understand the development of radical innovations where initially ‘commercial viability might well be absent’ (Hoogma et al., 2002, p.25). This requires ‘special conditions created through subsidies and an alignment between various actors’ (Geels, 2002b, p.367).

This necessitates a premise on highlighting the promise and expectations of hitherto ‘unproven’ technologies where to ‘get the new technology on the agenda, actors make promises and raise expectations about new technologies’ (Geels, 2002b, p.367) where these promises ‘are especially powerful if they are shared, credible (supported by facts and tests), specific (with respect to technological, economic and social aspects), and coupled to certain societal problems which the existing technology is generally not expected to be able to solve' (Geels, 2002b, p.367).

The constitution of networks and the expectations of a technology they present is important in creation of niches where a variety of possible radical innovations are generated. In seeking to go about generating activities in support of these developments niches may be seen as spaces for network development and learning (in some ways) 'protected' from the regime, where lock-in and path dependency assumptions are relaxed (Hoogma et al., 2002, p.26).

Technological transitions are premised not on radical regime shifts but through a 'stepwise process of reconfiguration' (Geels, 2002a, p.1272). Regime shifts may take place over a considerable period of time. Geels (2002a, p.1262) points out that TT involves the linking of 'multiple technologies' and that the use and development of innovations in different domains and contexts see a cumulation of niches - an important mechanism in gradual regime shift. Early linkages between niche and regime may rely on 'link up with established technologies, often to solve particular bottlenecks' (Geels, 2002a, p.1271).

Questions of 'who participates and in what ways' in technological developments are fundamental to TT and Create Acceptance. A key focus of TT is to 'explicitly incorporate the user side in the analysis' of technological change (Geels, 2004, p.897). Geels (2004, p.901) acknowledges that '[t]echno-scientific knowledge has become more distributed over a widening range of actors (universities, laboratories, consultancies, R&D units in firms)', that '[c]ultural appropriation of technologies is part of consumption' (2004, p.902), but that 'in many studies, markets and users are simply assumed to be 'out there'' (2004, p.902) and that we must pay more attention to *interactions between actors* (Geels, 2002a).

Technological Transitions and Participation

But how do we understand multi-stakeholder views and 'participation' in TT? The role of 'the public' in technological developments - at extremes characterised as docile recipients or active participants - has assumed contemporary interest underpinned by a number of issues. These include the seemingly increasing pace of technologically-informed change, particularly in many western societies, a view that the legitimacy of institutions and experts associated with technological forms of knowledge is being questioned, which in turn has raised questions of trust between experts and lay publics, and consequently has brought into focus the questions of relationships between experts and various stakeholders, 'publics' and their interactions.

At extremes, two positions are apparent: the 'deficit' model and 'participatory' and 'upstream' approaches to these relationships. The deficit position assumes a view of the relationship between technological expertise and 'the public' as one of 'the public' being acted upon through information provision and 'public education' and the winning over of public opinion through sharing with them unproblematic technological knowledge. A growing body of academic writings (see for e.g. Irwin and Wynne, 1996) have questioned this view of relationships between the production, communication and reception of technological forms of knowledge.

More 'participatory' views (see Wilsdon and Willis, 2004; Irwin and Michael, 2004) of the relationships between 'producers' and 'users' of technological forms of knowledge problematise not only the view of a reactive 'public' but also the cultural production of expert forms of technological knowledge. This view aims to open the 'black box' of technological forms of knowledge production asking: who is involved, with what assumptions and with what consequences? And in doing so seeking to broaden cultures of technological knowledge production to include experts but also lay publics and their 'representatives'. These complex processes of knowledge production assume a more 'upstream' role for what is characterised as 'publics'. In making this move the distinctions and boundaries between the production and reception or appropriation of knowledge blur. The key issue, with this in mind, is how we undertake case study research of multi-stakeholder 'participation'.

3.2 Four steps in researching ‘participation’ in specific renewable energy controversies and successful deployments

The issues raised in the literature above have been used by SURF as the basis to develop a four-step guide (Hodson et al., 2006; Hodson et al., forthcoming) to researching:

Relatively recent country specific controversies and successful deployments with respects to societal acceptance of renewable technologies, focusing on public communication, dialogue and participation efforts?

*STEP ONE***:** *Possible Futures?*

- *What was the vision in the case study that was produced? (including objectives, time, etc)*

Visions have been used in the Science and Technology Studies literature to offer prospective views on the *form, features, functions and benefits of technologies in relation to domains of application*. In this sense, visions articulated at an early stage of development can be viewed as highly aspirational and be seen largely in terms of their symbolic representational articulation of a future rather than a material one (although this is not to neglect the material production and media of communication of the vision). In this respect visions are ‘culturally anchored’ (Borup et al., 2006) and offer particular characterisations of the future from the present, often invoking particular attributions of the past. The purpose of these visions and the goals they outline provide a focus through which *networks can be built, gaining commitments to ‘participate’, orientating the actions of potential participants and constituencies, and in persuading potential participants of the desirability of transition*. Visions are important media in ***mobilising and shaping expectations*** and commitment around transitions (see Russell and Williams, 2002, pp.60-1). Although visions are not fixed and will change over time with the variety of social interests who become involved, the key point is that there is an issue of whether visions are initially articulated around narrow self-interests rather than in terms of a broader sense of societal purpose. There is, thus, a crucial issue of who, or which social interests, produce these early visions of the future and with what expectations?

STEP TWO: What were the various expectations of the case?

- *What types of interests/actors became involved in renewable energy initiatives at the level of the case?*
- *In what ways did they claim to speak for particular ‘publics’?*
- *What were their expectations of the renewable energy initiative?*

Under this step there is an acknowledgement that *visions of technological transitions are dynamic and involve multiple actors and multiple dimensions which encompass interests beyond the narrowly technological.* The issue this raises is who, or which social interests became involved in producing visions, with what expectations and with what views of particular ‘publics’? The literature in the sociology of expectations (see Borup et al., 2006; Van Lente, 1993) offers a fruitful focus here, although we are necessarily selective in drawing on this emerging literature. In the early stages of framing and producing a vision of the future in relation to technological change - *given the importance of visions in the subsequent mobilisation and shaping of expectations* - *the issue becomes one of articulating the variety (or otherwise) of expectations which inform the early stage production of a vision* and importantly the ways in which these are communicated.

In focusing on the social construction of visions, through the variety of expectations which inform this, we also acknowledge the differential capabilities and positioning of social interests to meaningfully engage in this process of framing the future. The degree of contestation and the breadth of expectations involved in producing a vision may be narrowly or broadly framed. The importance of whose expectations inform the early stages of a vision are that *expectations are 'constitutive', particularly at the early stages of innovation, in defining roles, attracting interest and building mutually binding obligations* (Borup et al., 2006).

STEP THREE: *Understanding 'participatory' decision-making: negotiating expectations*

- *How, when and on what basis were the different expectations negotiated?*
- *What (mix of) mechanisms (formal and informal) were used?*
- *Who controlled them? (Emanating from where? Top-down? Bottom-up? Technology provider? Government?)*
- *How were the interests of various actors aligned?*
- *What issues arose from these processes?*

Rather than a neutralised or depoliticised view of processes of 'participation' and 'engagement', the expectations of particular social interests and the ways in which they are embodied in a vision of the future frames unfolding processes of the negotiation and renegotiation of the future. What is crucial to this is not only *the construction of the vision and the expectations underpinning the vision but how these aspirations inform and translate materially*. This then requires a focus on understanding the ways in which these expectations were negotiated, or formed the basis for interactions in a process over time.

Important here are the formal and informal processes of 'participation' and the methods mobilised. The types of methods that are mobilised, the questions asked, by whom, the timing of their mobilisation in terms of a socio-technical transition and the alignment[6] of social interests and the concomitant resources they can draw upon highlights the politicised extent of 'participatory' methods which are often viewed as de-politicised and neutral. It also highlights *possibilities to 'open-up' or 'close-down'* (Stirling, 2005) processes of socio-technical innovation. In addition, with the upsurge of new 'participatory' methods, alongside the plethora of existing techniques and mechanisms, evaluating the role of participatory (engagement) methods becomes extremely confusing. Indeed what may or may not constitute participation has a long history (see Arnstein, 1969), with key concepts not particularly well-defined even taking into account the fruits of this long history (Rowe and Frewer, 2005; see also Leach et al., 2006). With this background in mind, views of what might constitute 'effective' public participation are not only unclear (Rowe and Frewer, 2004), but require a sensitivity but not a capitulation to the local context within which they are mobilised.

[6] Our use of 'alignment' is in a Latourian sense where the technology becomes part of the 'projects' of individual participants (i.e., an 'obligatory passage point'), redirecting their actions so as to make the project part of their purposes and interests. In this notion of alignment, various interests are actually included in the project and served by it (yet have changed in the process of their association with the project).

The key is how the variety of often heterogeneous expectations comes to be 'assembled' (Law, 1992). How are otherwise diverse sets of interest and actors 'aligned' around a technology development? This, in many ways, is linked to processes of 'translation' (Callon, 1986)[7] where various actors' interests are brought into line or accordance with those of 'key actors' in an ongoing process.

STEP FOUR: *From Visions to Actualities*

- *How was the vision translated into action?*
- *Did this result in adapting the initial objectives of the vision?*
- *How did this occur over time? (i.e. as an unfolding and adaptable process)*
- *What were the key lessons of the transition process at different points in time?*

From these negotiations and the 'vision' they produced of a new and renewable regional energy future, what, if any, were the 'gaps' between visions and attempts to territorially ground them? In the framework there is a strong, if often implicit, recognition on the importance of social learning. The steps from Vision to Actuality are about learning in terms of the 'gap' between Vision and Actuality and why? So, from the initial objectives of a Vision what were the adjustments (i.e. learning) that took place when project managers were faced with issues and problems, who did they engage with and enrol to address problems, how were these interests coordinated (aligned) and what were the consequences or the Actuality?

This section has developed a four-step framework through which researchers undertaking the case studies of Work Package 2 could analyse the interplay between processes of 'participation' in technological development in local context.

3.3 A fifth step in researching and analysing successful or unsuccessful projects

With a four-step framework in place for undertaking the case study research and an appreciation of the different types and contexts of case study projects, SURF have developed a fifth step to the framework (Hodson et al., 2006) which provides a basis for analysing the success of case study projects. The fifth step of the framework is detailed in this section. The question that arises in developing the fifth step is:

> *How would we know what the successful and unsuccessful features of the projects in the case studies were?*

This question needs to be set in the context of a shifting focus between Socrobust and Create Acceptance, from an emphasis on the technology developer to the relationships between the technology developer and multiple stakeholders. With this in mind, our collective meta-analysis

[7] The term 'translation' has been used in different ways by different authors (e.g. Serres, Callon, Latour). What we are interested in - and what informs the approach of our research framework - is the general approach of translation (rather than a literal and prescriptive following) as concerned with the *process* and stages or steps of socio-technical change and transformation. In our case we built an approach which focused on a process of four steps/stages which was also informed by a synthesis with other literatures. An approach informed by a concern with translation addresses how particular interests (in our case project managers/intermediaries) seek to shape processes of change through defining a new vision of the future. In our case, we focused, as a first step, on how project managers/intermediaries sought to define the change process (through a Vision). We also, as a second step, sought to follow how networks were developed around the process through various other interests with often different expectations. In the third step in the process of translation we looked at the participatory mechanisms through which these different interests became enrolled (or not) by project managers/intermediaries to this new identity. The fourth step examined the extent to which the process of translation had occurred by examining the 'gap' between the initial step of what change was envisaged by project managers/intermediaries, what actually occurred over time and what lessons could be learned.

of participation efforts aims to demonstrate not just indicators of outcome success, but the influence of process and context underpinning and shaping outcome success. Given the shift from the perspective of the technology developer to also analysing the roles of relevant stakeholders (e.g. NGOs, local authorities, etc.) and participating and non-participating members of the public, developing operational indicators of the success of communication and participation efforts has the potential to become extremely complex.

Success in Outcome, Process and Context

This is particularly so when we acknowledge that variety of projects represented by the case studies (as detailed in the previous section). The previous section turned the spotlight of the research on 27 different case studies, focusing on at least eight different core technologies, in 13 national contexts across the European Union and Iceland as well as in South Africa, encompassing 23 different local contexts. This illustrates that there is large potential to view processes of technological development from different contextual perspectives (technology developer, policy actors at different levels, user, etc.) and raises a series of questions which has consequences for how we define success:

- If we try to define success, we need to ask the question: the success of *what*?
- With a shifting focus from the technology developer to multiple stakeholders, there becomes an issue of success according to *whom*?
- With questions of context in mind, *where* is success? Can we only understand success in relation to the particular local contexts of the case studies or are indicators of success and lessons ‘transferable’ from different local case study contexts?
- At what point in the process in a project - *when* - do we judge if it is successful or not? Does this need to be consistent across all the projects or can projects be analysed within their own timeframes?

The consequences of success cannot be addressed without an understanding of the importance of these types of questions about what constitutes success rather than offering an a priori description of indicators of success. The relationship between initial objectives and their outcomes offers one focus, but in different contexts ‘success’ can be constituted by factors (indicators) that are *context-specific* and also, through comparison, *patterns* of indicators can be observed across different case study contexts. Given the potential variety of contextual factors, success is best seen not as definitive but in terms of the social shaping of success. Success is not seen here as a dichotomy - or as narrowly as success and failure - but in terms of the key issues which inform degrees of success.

Towards Defining Success: Shaping Success

Thinking about the cases in terms of outcomes, processes and context requires that we think not in terms of how we can impose criteria of success but what ‘emerges’ from the cases. Reflecting back to the four step research framework allows us to think about both (a) (un)successful outcomes and (b)(un)successful process in context (Figure 3.2).

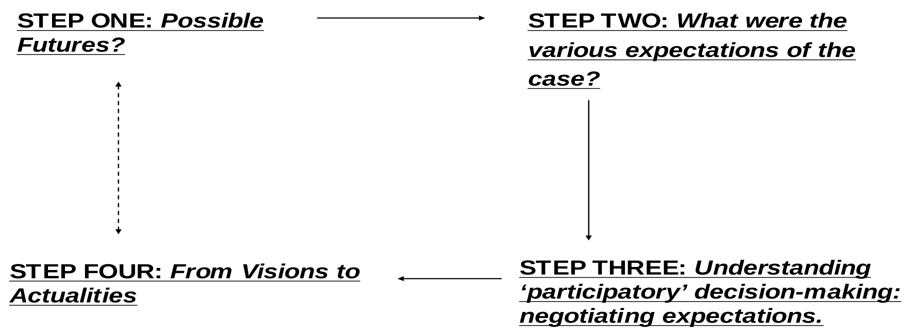

Figure 3.2 *The four step framework*

(Un)Successful Outcomes
Thinking about (un)successful outcomes acknowledges the importance of a focus on the technology developer (which may be more than just an individual) as an agent of change. In particular it requires addressing the degree of resonance or the 'gaps' between the initial Vision of Possible Futures (of the 'technology developer(s)' in Step 1) and Actuality (Step 4 - the extent to which initial objectives were met), in terms of:

1. The initial objectives encompassed and detailed in the Vision of Possible Futures and Actuality.

2. The proposed timescales for the project detailed in the Vision.

3. The proposed budget of the project detailed in the Vision.

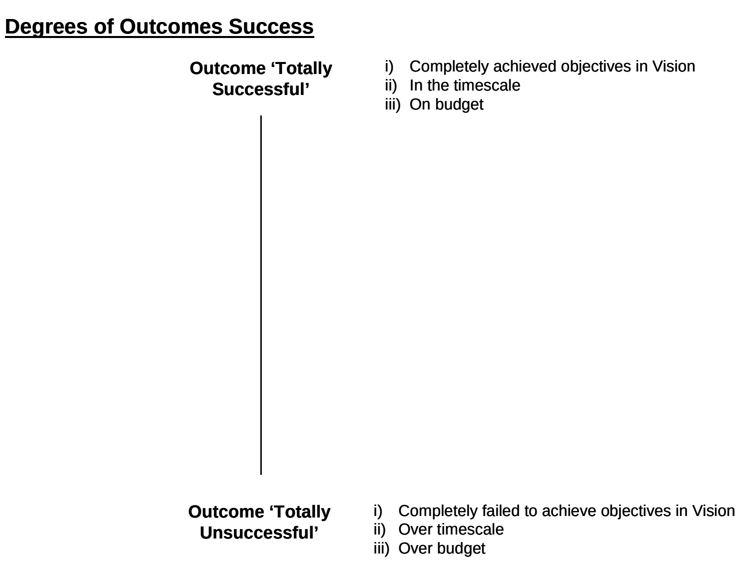

Figure 3.3 *Degrees of outcome success*

The extent of the resonances and/or gaps - between objectives proposed and their outcomes - informs the *degrees of outcome success*. Strong resonances between the objectives around the technology and its context of application, timescales and budgets would inform a high degree of outcome success (and would be plotted towards the top of the vertical degrees of outcome success axis) whilst gaps between the objectives outlined in the case study Vision and Actuality would inform a high degree of unsuccessfulness in outcomes. Total achievement of all objectives would be ‘totally successful’ whilst achievement of none would be ‘totally unsuccessful’ and the achievement of some objectives indicating a degree of success somewhere in between.

(Un)Successful Process in Context
The emphasis on outcome success allows us to retain a focus on the technology developer and their objectives in socio-technical innovation. It, however, tells us little about the processes through which technology development achieves or fails to achieve ‘acceptance’ amongst a wide variety of stakeholders and the role of the many different projects contexts which the case studies address. Reference to the research framework provides a basis to think about the processes and the contexts which *sit between* (Steps 2 and 3) the Vision and the Actuality (between Steps 1 and 4) and help us understand the processes through which ‘acceptance’ is socially shaped in context.

- Our starting point is again with the technology developer, and with their objectives and Vision of the Future. Either implicitly or explicitly captured within these Visions is a sense of *who technology developers ‘need’ to engage to deliver their Vision*. This may be broad-ranging or narrow in terms of the types of social interests (for e.g. funders, planners, users, residents, technology suppliers, local authorities, national governments, etc) technology developers anticipate they will need to engage with.

- What is of particular interest is that having engaged with the different social interests in the process, technology developers may still be confronted with *emerging issues, problems and controversies*. This might include, for example, controversies such as where a technology development is located, difficulties with funding stream, technical problems, lack of political support and so on.

- In addressing these emerging issues, problems and controversies: *who subsequently becomes involved and with what expectations?* This is important as it broadens the constituency of the process of technology development in context. A controversial location for technology development, for example, may involve technology developers engaging with local residents, funding difficulties may require dialogue with different funding bodies, a lack of political support may involve discussions with political interests at different levels. Each of these social interests potentially brings different sets of expectations to the process of technology development in context.

- The *coordination of these different social interests* in context is the key signifier of process in context success and ‘acceptance’. Co-ordination may occur between different social interests through a variety of methods and media. Addressing a controversial location for technology development may be through public meetings, via public information leaflets, through planning processes, etc. Likewise, a funding problem may be addressed through face-to-face meetings and bids for funding. A lack of political support could involve technology developers trying to build relationships through lobbying politicians, through a media offensive, etc.

A ‘totally successful’ process in context would have a fully coordinated constituency at the ‘end point’ of a technology development in context. Those who technology developers need to engage to realise their Vision would have been. Any issues, controversies or problems that arose would subsequently have been addressed through involvement the ‘necessary’ social interests and the ‘relevant’ resources and be coordinated - through various methods - with the initial objectives of the Vision.

Degrees of Process in Context Success

i) Fully coordinated constituency at ‘end point’ of technology development in context.
ii) Technology developers engaged with those needed to realise their Vision.
iii) Issues, controversies, problems subsequently addressed involving ‘necessary’ social interests and ‘relevant’ resources.
iv) Coordinated - through various methods - with the initial objectives of the Vision.

‘Totally Unsuccessful’ Process in Context —— **‘Totally Successful’ Process in Context**

i) Un-coordinated constituency at ‘end point’ of technology development in context.
ii) Technology developers not engaged with those needed to realise their Vision.
iii) Issues, controversies, problems not addressed.
iv) No coordination with the initial objectives of the Vision.

Figure 3.4 *Degrees of process in context success*

A ‘totally unsuccessful’ process in context would have failed to engage with those needed to realise a technology developer’s Vision. Any further issues, controversies or problems that arose would not have subsequently been addressed. The involvement of the ‘necessary’ social interests and the ‘relevant’ resources would not have been sought and there would, therefore be no coordination with the initial objectives of the Vision. Some engagement with those needed to realise a Vision, with issues, controversies and problems arising, and subsequently with ‘necessary’ social interests and ‘relevant’ resources would inform different degrees of process in context success dependent on the extent to which engagement around issues occurred.

Integrating Success: Outcome, Process and Context

Bringing the horizontal and vertical axes together allows us to integrate degrees of outcome and process in context success. It provides a framework within which we can locate each of the 21 case studies and their degrees of success in a comparative fashion, which permits the transferability and comparability of lessons, but which doesn’t reduce the lessons we take from the case studies to local context, instead it has a sensitivity to context.

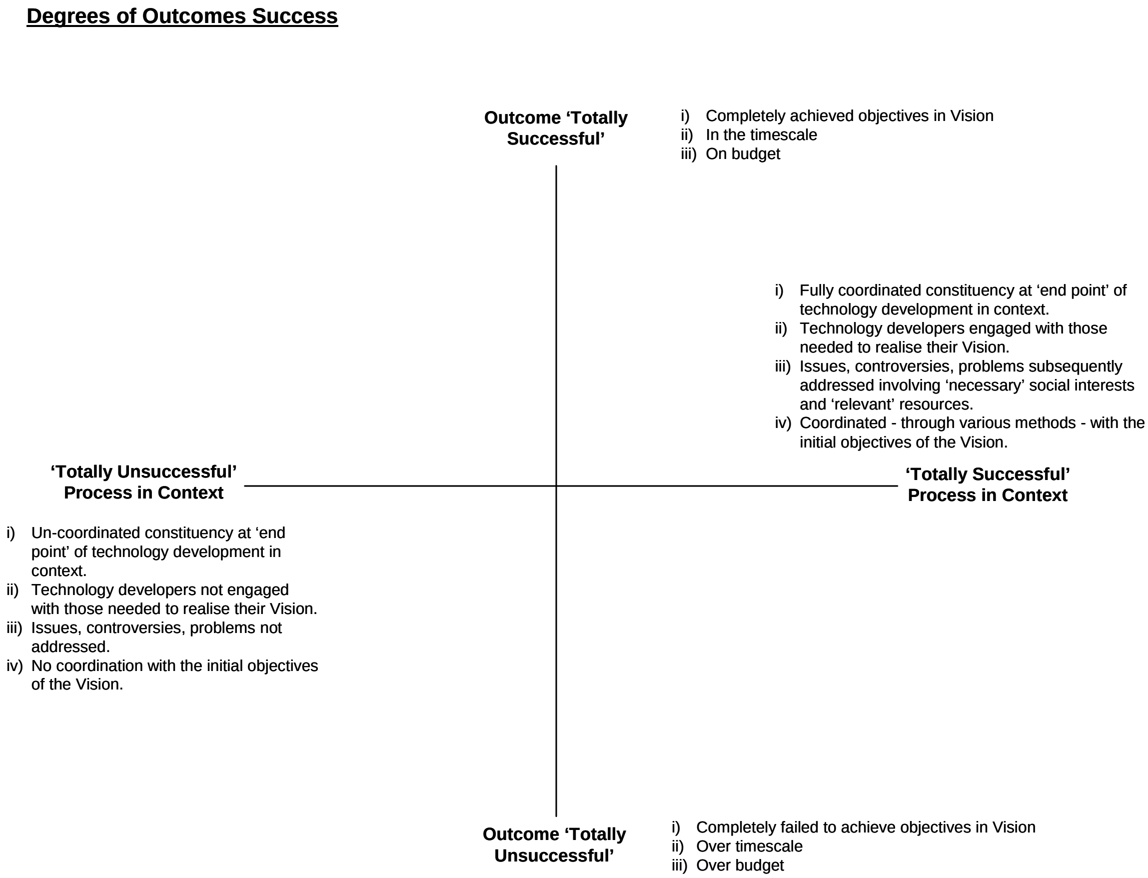

Figure 3.5 *Degrees and styles of success*

4. Meta-analysis 27 case studies of new energy projects

Using the framework presented in the previous chapter, we have compiled and analysed a set of case studies of controversial and successful projects. The case studies were selected to represent the diversity of contextual conditions in different parts of Europe, and a selection of new energy technologies that are important for Europe now and in the future.

This chapter begins with a background introduction to European regions and nations and presents some key data (§ 4.1). The final part of the background section introduces the non-European country included in our project, South Africa. The chapter continues with an overview of the case studies in terms of their regional and technological diversity and the different kinds of aims and initiators involved in the projects (§ 4.2). We then consider the types and degrees of societal acceptance, or lack of it, that the projects represent (§ 4.3). The final section of this chapter (§ 4.4) explains the meta-analytical framework adopted, which also structures the subsequent chapters of this report.

4.1 Background: challenges and conditions for new energy projects in different parts of Europe and beyond

European countries share common principles of energy policy, i.e., ensuring an efficient energy market, security of supply and sustainable development in the energy sector. Moreover, some common commitments support renewable energy, such as the commonly set targets to reduce greenhouse gas emissions and to increasing the share of renewable energy in electricity production. Nonetheless, European nations apply a range of different policy instruments to reach the commonly defined targets, as well as some nationally specific goals in the field of new energy. Moreover, European countries represent a wide range of geographic conditions and have different natural endowments of energy. Their energy systems, even though they are increasingly interlinked, still have their origins in different historical evolution patterns. Thus, the countries also have their own, unique perspectives on energy, both among policy makers and the general public.

In the following, some key figures are presented in order to provide a perspective on national commonalities and differences. They are organised by 'European region', i.e., West Europe, South Europe, Central and East Europe and North Europe, mainly for the practical purpose of providing a grouping for the 25 Member States. The 'macro-regions approach' also provides a backdrop for the case studies selected for this report, which aim to reflect the diversity of regional and national contexts in the following way:

- Representing the *West European region*, we have collected case studies from *Germany, France, the Netherlands and the United Kingdom,* which are the largest countries in this region. Other countries classified here as West Europe include Austria, Belgium, Ireland and Luxembourg. Almost 250 million people live in the region, and the economies of countries in this region account for more than 62% of the total GDP of the 25 EU member states.
- Representing *the South European region, case studies have been obtained from Italy and Spain. Other countries classified as belonging in this region* include Cyprus, Greece, Malta and Portugal. More than 120 million people live in the region.
- In the present report, *Poland and Hungary* represent the *Central and East Europe*an region, with a total population of approximately 73 million citizens. Other countries classified as belonging to this region include the Czech Republic, Estonia, Latvia, Lithuania, Slovak Republic and Slovenia.
- Case studies for the present report have been collected from *Sweden, Finland, Norway and Iceland*. They represent t*he North European region* consisting of Denmark, Finland, Iceland, Norway and Sweden, with a total population of about 25 million.

The key figures are based on existing literature and statistics. More details on each of these topics, as well as some other related ones, are provided in Annexes 2-5. Here, we focus on (a) energy consumption, energy dependency and current energy sources and (b) on policy features, public awareness and the growth rate of renewable energy.

Per capita energy consumption, energy dependency and energy profiles in European regions
In terms of per capita energy consumption in the different European regions, North European countries consume almost 3.5 times more energy per person than the countries of Central and Eastern Europe (Figure 4.1). Energy demand is naturally influenced by the level of economic welfare, which is reflected in the low per capita energy consumption in Central and Eastern European countries. It is also influenced by industrial structure, geography and policy measures. The countries considered here include ones that have low levels of per capita energy consumption and ongoing processes of improving energy efficiency, such as Hungary and Poland. They include ones with stabilizing energy consumption due to structural change in the economy, such as France, the UK and the Netherlands, and ones that have actually managed to reduce their energy intensity with efficiency measures, such as Germany. Spain represents a country with rapid GDP growth and rapidly expanding energy demand. The countries also include ones with energy-intensive economic structures, such as Iceland and Finland, which is visible in their high consumption levels compared to, e.g., Italy, with about the same per capita GDP as Finland. More details on energy demand, economic structure and energy policy are provided in Annexes 2 and 3.

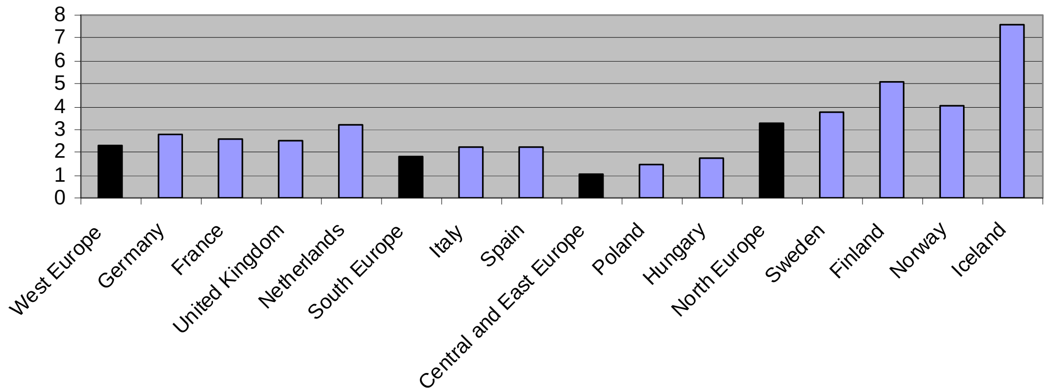

Figure 4.1 *Per capita final energy consumption in 2004, toe, (Eurostat)*

Figure 4.2 shows the *energy dependency* and Figure 4.3 shows the *share of main energy* sources in gross inland consumption of the four European regions and the countries selected for our study. In West Europe, the Netherlands and especially the UK are relatively energy independent due to domestic oil and gas production, accounting for a large share of their energy supplies (see Figure 4.3). France imports 50% of its energy, while relying largely on domestic nuclear power for electricity (see Figure 4.3). Germany imports more than 60% of the energy used in the country. South European countries rely heavily on imported oil and gas (see Figure 4.2) - Spain imports almost 80% and Italy more than 80% of its energy supply, which has been a stimulus for developing domestic renewable energy in these countries. Reducing energy dependency has been an especially important target for many Central European countries including Hungary, whereas Poland is relatively energy independent owing to domestic coal reserves (see Figure 4.2), only importing 15% of its energy supply. North Europe as a whole is a major exporter of energy, mainly due to oil and gas production in Norway. Finland, on the other hand, imports more than half of its energy supply.

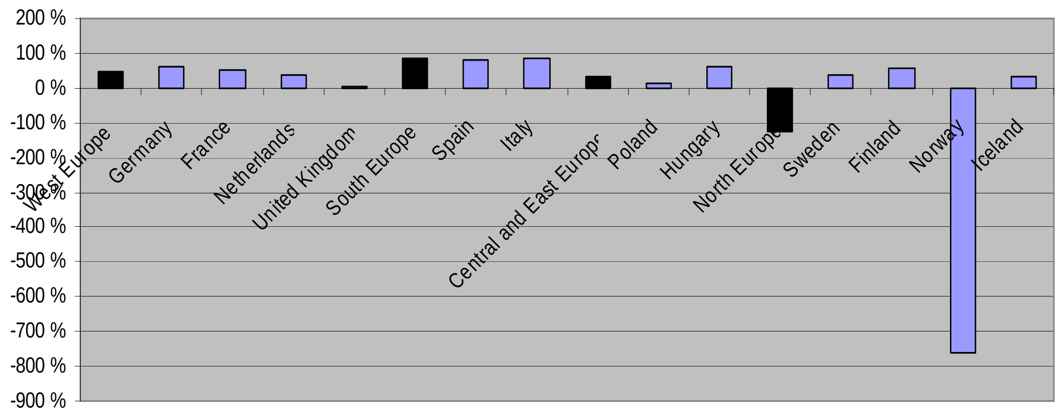

Figure 4.2 *Energy dependency, net energy imports per gross consumption in 2004, % (source Eurostat)*

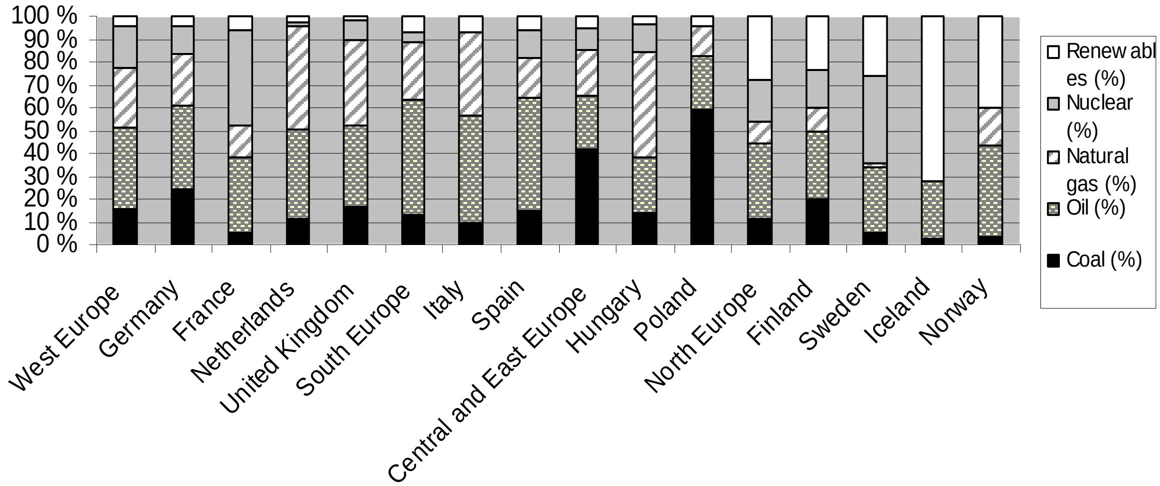

Figure 4.3 *Share of main energy sources in total primary energy supply in 2004, % (IEA Online data service)*

Figure 4.3 also indicates the share of renewable energy in the total primary energy supply (TPES) of the countries considered here in 2004 (for more details, see Annex 2). Among the West European countries, France has some hydropower capacity, which together with bioenergy account for most of its renewable energy (6.3% of TPES). Germany had a renewable energy share of 4% in 2004, mainly bioenergy and wind. The UK and the Netherlands still have low shares of renewable energy, 1.6% and 2.9%. The share of renewable energy in Italy was 6.8%, largely owing to hydropower and geothermal energy. Spain had a renewable energy share of 6.9%, mainly bioenergy, hydropower and wind energy. Hungary had a share of 3.7% and Poland 4.7%, mainly consisting of bioenergy. North Europe has a relative large share of renewable energy sources, with Iceland producing more than 70% from renewable sources, mainly hydropower and geothermal energy.

Policies, public support and growth rates of renewable energy in European regions
The countries have applied different combinations of policy instruments to promote renewable energy production, with variable results. Among the West European countries, Germany and the Netherlands have the longest policy traditions, whereas the UK and France have been rapidly catching up. Citizens in countries in this group also share a relatively high concern about climate change, especially in the Netherlands (Figure 4.4) (see Annexes 3 and 4).

- In Germany, a central policy to promote the production of electricity from renewables has been a feed-in tariff fixing a minimum price for electricity from renewable energy sources. Grants and loans to support renewables in the heating sector were also introduced early in the 1990s. Ensured grid access and premium prices for green electricity producers were introduced as additional instruments.
- The Netherlands applies feed-in tariffs for green electricity, tax exemptions and green certificates to promote investments on the supply side. On the demand side, exemptions for renewable energy from the fuel tax and investment subsidies for households purchasing renewable equipment have been applied. On the other hand, it has been noted that permit procedures and spatial planning of e.g. wind power projects involve complexities and local controversies.
- In the UK, the main support mechanism for renewables is based on green certificates. Electricity distributors are required to source a portion of their electricity supply from renewables. In addition, capital grants for biomass and offshore wind are offered. A tax is levied on commercial and industrial energy users for the use of carbon dioxide emitting energy sources, from which green energy is exempt. The UK has a well-documented history of lo-

cal controversies over renewable energy deployment, partly due to the top-down and large-scale nature of investments.

- In France, the main policy instruments include investment grants and incentives, feed-in tariffs for renewables, tax credits or reductions for purchase of renewable equipment are applied. Biofuels are promoted by an excise tax exemption, which makes them cost competitive. Incentives to promote wind energy are in place, but wind energy expansion has been hampered by small operators' problems in accessing the grid and by public acceptance difficulties.

The South European countries, Spain and Italy, have also stepped up their efforts to promote renewable energy production (for more details, see Annex 2):

- Italy applies a range of policies to promote renewables: favourable lending schemes, financing and capital grants, tax incentives, feed-in-tariffs based on avoided costs, green certificates and a tax on coal, natural gas and oil. Although the range of support mechanisms is wide, project planning has been somewhat complicated and some local controversies have been observed over renewable investments.
- In Spain, a fixed feed-in tariff that is differentiated by technology has been the primary tool to promote renewable electricity in the past, and has delivered impressive growth rates for wind generation. Low-interest rate loans and capital grants have also been available for renewable energy projects. In 2004, a new incentive was introduced, whereby renewable energy producers can directly sell their power to the market receiving the average market price plus differentiated premiums based on the market price. Spain has, in fact, become the most rapidly growing wind energy market in Europe during the past few years.
- Citizens in Spain and Italy are also relatively concerned about climate change (Figure 4.4), but overall awareness of the environmental impacts of energy use and the importance of renewables is somewhat lower than in the previous group of countries (see Annex 3).

Like other countries in Central Europe, Hungary and Poland have rapidly developed policies to stimulate the growth of renewable energy:

- In Poland, the most important instruments include a renewables obligation for energy distributors and fiscal exemptions for renewable investments.
- Hungary employs technology-specific feed-in-tariffs, as well as investment incentives and loans, and fossil fuel taxes.
- Both counties have significantly increased state funding for research and development of renewable energy in recent years.
- As in other New Member States, the local population's concern about climate change in comparison to other environmental problems is relatively lower than elsewhere in Europe (Figure 4.4); most likely, partly due to concerns about other local environmental problems.

The Nordic countries invested early in developing renewable energy due to the shock caused by the oil crises:

- Fossil fuel taxes and investment incentives or grants have been central instruments for promoting renewables; moreover, Sweden applies green certificates for electricity and Norway applies a feed-in-tariff for wind. Sweden has recently evolved into the most supportive of the countries in this group as Denmark has partly dismantled public support for renewables.
- Nordic citizens share a widespread concern for climate change (Figure 4.4). The countries, however, have quite varying track records in terms of societal acceptance of renewable energy projects, and some highlights from these experiences are presented in Annex 4.

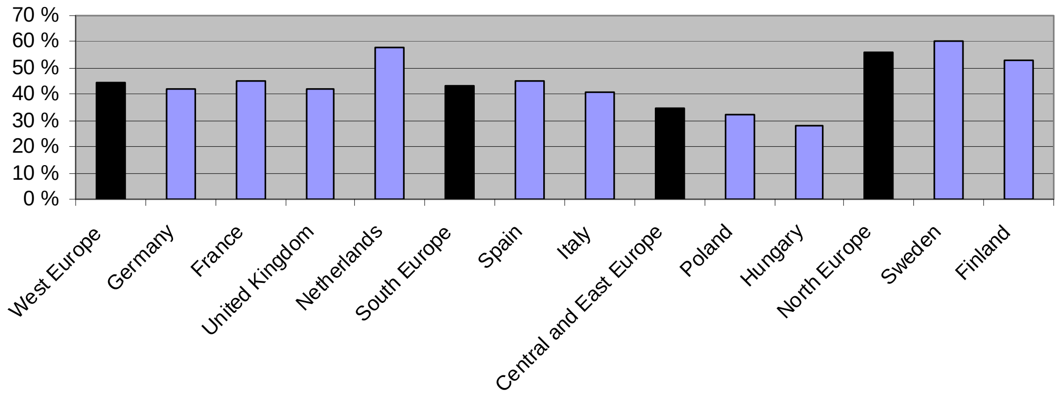

Figure 4.4 *Share of citizens mentioning climate change as one of five major environmental concerns (Eurobarometer, 2005)*

Partly as a result of intensified policy measures, the growth rates (1994-2004) of renewable energy sources in the energy supply have been fastest in the countries with lower initial levels (Figure 4.5): more than 185 % in the Netherlands, 122% in Germany and 86% in the UK. Iceland has also increased its renewable share by 84%. In contrast, many other countries with a large share of hydroenergy in their renewable supply (France, Norway and Sweden) have experienced lower (or even negative) growth rates due to annual variations in rainfall. Hungary (71%) and Spain (50%) have also increased their use of renewables rapidly over the past ten years.

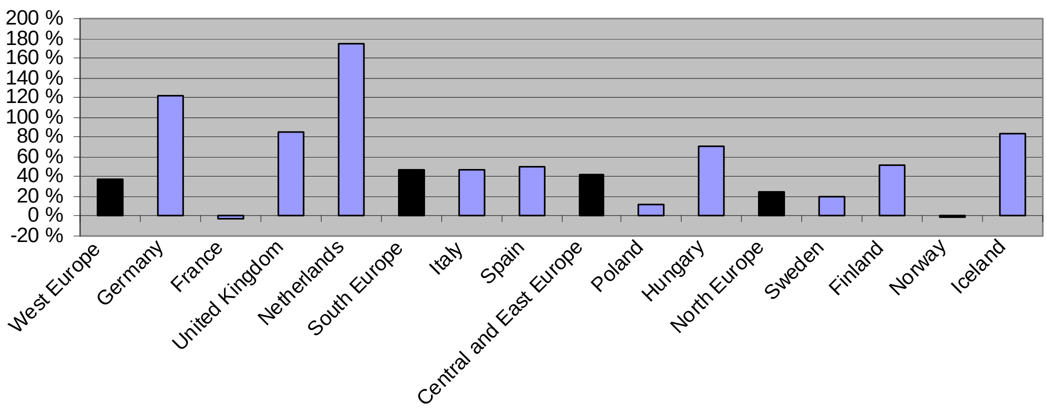

Figure 4.5 *Growth in renewables primary production 1994-2004, [%] (Eurostat)*

Beyond Europe: renewable energy and societal acceptance in South Africa

South Africa is in a very different situation from Europe. Like all transition countries, it faces the challenge of pursuing economic growth while at the same time trying to improve environmental sustainability. Per capita energy consumption (2.51Toe/capita) is much lower than anywhere in Europe. South Africa has cheap and abundant coal reserves and 92 % of electricity is generated from coal. The country imports most of its oil requirements. Its own reserves are limited and are supplemented by liquid fuel production from coal. The share of energy demand is given in Table 1.

Table 4.1 *South Africa: Share of final energy demand (DME, 2002)*

Liquid fuel and gas	35%
Coal	30%
Electricity	26%
Biomass	9%

South Africa has an energy intensive industry based on mineral extraction and by international standards the energy intensity is high (3.51 total energy consumption/GDP; PJ/Rbillion).Renewable energy has increased very little over the years. The sugar industry generates electricity from bagasse for its own use and the paper industry burns waste wood to generate electricity for internal use. In rural areas wood is used for cooking largely by the poor.

The country is not bound by any international agreements to mitigate climate change, even though South Africa has focused on climate mitigation more than most other African countries, and is currently exploring the opportunities provided by the Clean Development Mechanism linked to the United Nations Framework Convention on Climate Change. Nonetheless, there are not many incentives for grid-based renewable energy initiatives. Yet there are some relatively powerful reasons to develop off-grid renewable energy. These relate to the pressure to increase rural electrification, on the one hand, and to reduce peak loads leading to power blackouts, on the other because the country can no longer meet its peak demand.

South African energy policies have always been linked to the prevailing political situation. Before 1994, energy policy was characterised by energy security concerns and racial inequity in the provision of energy. After the apartheid era, electrification of previously disadvantaged populations became one of the priority areas in the national development programme, which has been pursued by the National Electrification programme, resulting in over 70% electrification by 2002. Yet the electricity consumption rate among the poor has remained low because many are not able to afford the monthly bills.

Renewable energy is one of the government's means to reduce environmental impacts, diversify energy supplies, and promote economic development. The Government White Paper on Renewable Energy (2003) has set a voluntary target to provide 4 % of energy to be supplied from renewable sources by 2013. Solar energy is considered one of the most promising renewable energy sources, and the two cases from South Africa (Solar Home Systems and Solar Water Heaters (Case studies 18 and 19) analyse projects and programmes to promote the use of solar energy, with a special emphasis on the poor.

4.2 Overview of the case studies: regions, technologies, aims and initiators

The previous overview summarises one of the starting points of the present study - there appear to be differences in the adoption and acceptance of new energy technologies in different parts of Europe. Yet the nature of these differences is not fully understood. Moreover, there are obviously some differences in what societal acceptance can mean for different technologies and applications in different regions, countries and local contexts. Thus, an important task was to identify major differences, as well as find out whether there are some common features influencing societal acceptance allowing us to develop a common toolbox for project managers dealing with different kinds of new energy projects.

The research design hence attempted to encompass both the regional and technological diversity of European new energy initiatives and projects. The technologies in focus in this report include energy efficiency, bioenergy, wind energy, solar energy, hydrogen and CO_2 capture and storage as well as geothermal energy and ocean energy. For some of these technologies, the existing knowledge gaps are larger than for others. Hydrogen and CO_2 capture and storage (CCS) are still largely at the research, development and demonstration stage, so concrete experiences of the societal acceptance of early deployment projects are scarce. On the other hand, bioenergy is widely used and even traditional in some forms, yet there are indications that the societal acceptance of bioenergy applications varies considerably in different geographical contexts (Rohracher, 2004).

In designing the case study portfolio, an attempt was made to collect information concerning each technology from different parts of Europe. Nonetheless, there are - quite naturally - more relevant experiences of solar energy from South Europe, whereas experiences of the 'new' technologies, hydrogen and CO_2 capture and storage, are more readily found in West and North Europe. We included bioenergy projects from different parts of Europe, however, as well as comparable projects from similar contexts in order to gain a closer understanding of the potential reasons for the large observed variations in societal acceptance. Table 4.2 presents an overview of the cases in terms of technology and regional coverage.

This report is interested in factors influencing success and failure. For this reason, we attempted to include more and less successful examples of the application of specific technologies. For example, two of the biomass cases are examples of projects that have been aborted due to local resistance, whereas some of the other cases can be termed 'success stories' (more details in Section 4.3). A very brief description of each case is given in Table 4.3.

The most important criterion for selecting case studies, however, was their theoretical contribution. It was important to find examples of projects that allow the research team to investigate key factors influencing the successfulness of new and renewable energy projects. Due to time and resource constraints, it was also important to focus on examples that have been documented - at least to some extent - in previous research in terms of features important for our case analysis framework. Nonetheless, a large amount of original research had to be conducted (see case studies in Annex 1).

Table 4.2 *Overview of the cases in terms of technology and regional coverage*

	Energy conservation	Biomass	Wind	Solar	Hydrogen	CO_2 capture and storage (CCS)	Other
WEST EUROPE	Hannover social marketing for energy efficiency (Germany)	• Crickdale Bioenergy Power Station (UK) • Bracknell Biomass CHP Energy Centre (UK)	• EOLE 2005 wind energy programme (France) • Cap Eole wind project in Albi (France)		London CUTE hydrogen fuelling station (UK)	CRUST CO_2 capture & storage project (Netherlands)	Blue Energy (salinity power) (Netherlands)
		Bioenergy Village Jühnde (Germany)			Berlin H2ACCEPT bus trials (Germany)	Schwarze Pumpe CO_2 capture and storage project (Germany)	
NORTH EUROPE	Low energy housing (Finland)	• Västerås Biogas Plant (Sweden) • Lund Biogas Plant (Sweden)			ECTOS hydrogen project (Iceland)	Snohvit CO_2 capture & storage project (Norway)	
EAST & CENTRAL EUROPE		Pannon Power biomass conversion (Hungary)	• Suwalki region wind project (Poland) • Szelero Vep wind project (Hungary)	Pommerania region solar energy project (Poland)			Podhale region geothermal project (Poland)
SOUTH EUROPE	Trinitat Nova Ecocity energy efficiency project (Spain)	Umbria local biomass projects (Italy)		Barcelona Solar Ordinance (Spain)			
				PV Accept solar project (Italy)			
BEYOND EUROPE				• Solar home systems (South Africa) • Solar water heaters (South Africa)			

Table 4.3 *Overview of case studies in terms of aims and outcomes*

	Case project	Aims	Outcome
efficiency	1. Hannover social marketing for energy efficiency, Germany	Promote energy modernisation through social marketing, reduce CO_2 emissions	CO_2 reduction targets achieved, wide awareness + new businesses
	2. Low energy housing (LEH), Finland	Stimulate prefabricated LEH market by procurement competition and labelling	Awareness raised, but low market penetration
	3. Trintat Nova Ecocity energy efficiency project, Spain	Improve building quality + energy efficiency	Some, not all, energy improvements reached
bioenergy	4. Crickdale Bioenergy Power Station, UK	Build wood-fuelled power station	Project aborted due to local reistance
	5. Bracknell Biomass CHP Energy Centre, UK	Redevelop town centre + build biomass CHP plant in new development	Project delayed due to local resistance
	6. Bioenergy Village Jühnde, Germany	Shift entire village to renewable (mainly biogas), improve participation & quality of life	Wide support, 70% residents have contract
	7. Västerås Biogas Plant, Sweden	Build co-digestion plant for biogas	Plant started operation 2005, wide support
	8. Lund Biogas Plant, Sweden	Build co-digestion plant for biogas	Project aborted due to local resistance
	9. Pannon Power biomass conversion, Hungary	Convert one unit of the plant to biomass fuel, later: start new unit with non-wood biomass	Unit opened successfully 2004 without resistance (some doubts about further plans)
	10. Umbria local bioenergy projects, Italy	Start biomass plants making use of local resources	Early projects failed due to local resistance, current ones focus on acceptance
wind	11. EOLE 2005 wind energy programme, France	Increase installed wind capacity, improve competitiveness, shape value chains	Targets met after reorientation, multi-local and national resistance radicalised
	12. Cap Eole wind project, France	Install 5-turbine wind farm as part of local redevelopment project	On track until now, permits approved, but cases submitted to administrative court
	13. Suwalki region wind project, Poland	Support local governments in attracting wind energy investments	Overall societal acceptance reached, investors active, stalled due to policy uncertainty
	14. Szelero Vep wind project, Hungary	Build 20 turbines in 3 phases through experimental community-involvement business model	First phase successful, development stalled due to authorisation and grid access problems
solar	15. Pommerania region solar energy project, Poland	Raise overall awareness of solar energy + promote use at camping sites	On track with targets (until now)
	16. Barcelona Solar Ordinance, Spain	Introduce solar thermal installations as mandatory in new buildings in Barcelona	Not quite met solar installment targets, but broad impacts beyond Barcelona
	17. PV Accept solar project, Italy	Promote PV implementation through design + tourist attraction monuments	3 solar panels installed, learning & co-operation with designers
	18. Solar home systems (SHS), South Africa	Supply PV solar home systems & services to poor rural households in order to increase electrification	Feasible business model developed after difficulties, targets only partially met yet
	19. Solar water heaters (SWH) South Africa	Provide sustainable energy for Cape Town, reduce peak loads, promote SWH adoption	Project still ongoing, by-law in the process of being adopted mandating SWHs for certain constructions
hydrogen	20. London CUTE hydrogen fuelling station, UK	Test and demonstrate operation of hydrogen fuel cell buses + learn from it	Positive reaction to buses, fuelling station debate caused delays and reputation crisis
	21. Berlin H2Accept hydrogen bus trials, Germany	Experiment with hydrogen-fuelled bus	Met unambitious expectations, gained little attention
	22. ECTOS hydrogen project, Iceland	Demonstrate hydrogen and fuel cell based transportation system + learn from it	Demonstration successful, wide support, positive attention
CO_2 capture	23. CRUST CO_2 capture & storage project, Netherlands	Assess conditions for underground CO_2 storage ‘buffer’	Clarification of positions, societal acceptance did not grow
	24. Snohvit CO_2 capture & storage project, Norway	Build LNG plant with CO_2 capture & storage (for excess CO_2 in gas)	Plan due to start 2007 after delays and cost overruns, but local support

	Case project	Aims	Outcome
	25. Schwarze Pumpe CO_2 capture and storage project, Germany	Build 30 MW pilot plant for CO_2 capture from brown coal combustion > gradually expand to 1000 MW	Project just started, support by most locals & national government, NGOs oppose
other	26. Podhale region geothermal project, Poland	Serve as large area as possible with geothermal heat, gain realistic view of demand	Geothermal network grew, but not all ambitions met
	27. Blue Energy (salinity power) in the Netherlands	Set up small pilot plant for demonstrating Blue Energy	Not yet achieved, research ongoing but funding difficulties due to lack of confidence

Renewable energy projects can also involve different kinds of initiators. As was noted in Chapter 2, the role of local communities and ordinary citizens in initiating energy projects has an impact on societal acceptance. The possibility of governmental bodies - at different levels - to promote renewable energy through concrete projects and programmes was also considered when selecting the cases. Thus, most cases in our study (Table 4.4) pertain to projects initiated by companies, usually energy companies, or public-private partnerships, but there are also case studies about projects initiated by government and by the local community. In some of the cases, the initiative was also taken by 'intermediary organisations', i.e., consultancies or universities that set up partnership projects with other actors.

Table 4.4 *Case projects with different kinds of initiators*

Company or public-private partnership	Government (national, regional or local)	Intermediary organisations	Citizens
• Crickdale Bioenergy Power Station • Västerås Biogas project • Lund Biogas project • Pannon Power biomass conversion project • Umbria local bioenergy projects • Podhale region geothermal project (municipal ownership) • London CUTEhydrogen fuelling station • Berlin H2Accept hydrogen bus trials • ECTOS hydrogen project • Snohvit CO_2 capture & storage project • Schwarze Pumpe CO_2 capture and storage project • Cap Eole wind project • Szelero Vep wind project	• Low-energy housing, Finland • Hannover social marketing for energy-efficiency • CRUST CO_2 capture & storage project • EOLE 2005 wind energy programme, France • Suwalki region wind project • Solar home systems project (together with companies) • Solar water heaters project (together with companies and NGOs)	• Bioenergy Village Jühnde (university + citizens) • Pommerania region solar project (energy consultancy) • Bracknell Biomass CHP Energy Centre (energy consultancy) • PV Accept solar project (university) • Barcelona Solar Ordinance (together with local government) • Blue Energy (research organisation together with companies)	• Trintat Nova Ecocity energy-efficiency project

This report is interested in the step from demonstration and promotion to early-stage technology deployment. The case studies examined include projects located at different points on this continuum - with some projects including both deployment and promotion aims (Figure 4.6). For example, many of the bioenergy cases are 'ordinary' deployment projects of technologies that are novel to the local context. The primary aim of the projects was to set up an installation and start operating it. At the other end of the spectrum, there are projects that primarily aim to promote or experiment with a new technology, or to organise a demonstration with the aim to learn about it. Such projects have broader aims, and their successfulness cannot be evaluated merely in terms of the successfulness of a specific investment.

Deployment				**Promotion, experimentation, demonstration or learning**
	Crickdale Bioenergy Power Station	Hannover social marketing for energy-efficiency	Low-energy housing, Finland	
	Bracknell Biomass CHP Energy Centre	Trintat Nova Ecocity energy-efficiency project	EOLE 2005 wind energy programme, France	
	Västerås biogas project	Bioenergy Village Jühnde	Pommerania region solar project	
	Lund biogas project	Umbria local bioenergy <(early projects) (current projects)>	PV Accept solar project	
	Pannonpower biomass conversion	Suwalki region wind project	London CUTEhydrogen fuelling station	
	Szelero Vep wind project	Barcelona Solar Ordinance	Berlin H2Accept hydrogen bus trials	
	Cap Eole wind project	Solar home systems project	ECTOS hydrogen project	
	Snohvit CO_2 capture & storage project	Solar water heater project	CRUST CO_2 capture & storage project	
		Schwarze Pumpe CO_2 capture and storage project	Blue Energy Project	
		Podhale region geothermal project		

Figure 4.6 *Primary aims of the case projects on a continuum between early-stage deployment and promotion, experimentation, demonstration or learning*

4.3 Types of project successfulness: process and outcome

The case studies were also selected to include ones that have been more or less successful in terms of outcomes and in terms of process. Success and failure are always relative, there are many different ways of defining project success, and different parties will naturally each have their own perception of success. We simplify project successfulness indicatively into two dimensions, *outcome* and *process*, as explained in Section 3.3:

- Outcome successfulness relates to the vision and aims of the project as defined by the project manager.
- Process success relates to how the project managed to integrate the interests of different stakeholders. Thus, process successfulness represents our ‘local’ operationalisation of societal acceptance within the spatial and temporal context of the project.

It is also important to stress that we consider successfulness within the timeframe examined in the case study. Ten years later, for example, the outcomes of the project and its influence on societal acceptance may appear in a very different light. This is an important issue from the perspective of the overall development of the technology, but we limit our discussion of success here to the immediate sphere of influence of the project manager.

As explained in Chapter 3.3, a fully successful *outcome* here refers to a project that has completely achieved the objectives in the project manager's vision. Successful outcomes are also reached largely within the timescale and budget originally planned, yet in some cases a project manager might still perceive a project successful even if it exceeded its original budget or timeframe. In terms of outcomes, unsuccessful projects are here defined as ones that failed to achieve their original objectives - in the cases examined here, usually ones that have been terminated before reaching completion. This does not mean that the outcome might not have been quite successful for some other party - e.g., in the case of a project exceeding its budget significantly, there is likely some other party that has benefited from the excess spending.

Projects that have a successful *process* are here defined as ones that have managed to coordinate the various interests of the actors related to the project at the 'end point' of technology development. In such cases, technology developers engaged with those needed to realise their vision, and addressed issues, controversies and problems by involving the necessary stakeholders, and achieved alignment among their interests and the original vision. Unsuccessful projects are ones that failed to accomplish these tasks within the time-period of the project implementation. This does not mean that unsuccessful projects may not have provided useful lessons to the organisations involved, leading to better projects at a later time, as was the case, for example, in the French Wind EOLE 2005 case (see Annex 1).

Table 4.5 presents our categorisation of the projects based on these axes. These evaluations are based on the opinions of the actors involved in the cases, previous researchers' comments on the case projects, as well as the case study authors' judgments. More details are provided in the cases themselves (Annex 1). The recently started Schwarze Pumpe case is not categorised at all because the project is still at a very early stage.

Table 4.5 *Overview of case study projects: successfulness in terms of outcome and process in context*

Other stakeholders' perspectives / Project manager's perspective	Process largely successful	Process mixed or uncertain	Process largely unsuccessful
Outcome largely successful	• Bioenergy Village Jühnde • Västerås Biogas project • Pannon Power biomass conversion • Pommerania solar project • Barcelona Solar Ordinance • PV Accept solar project • ECTOS hydrogen project • CRUST CO_2 capture & storage project	• Hannover social marketing for energy efficiency • Berlin H2Accept hydrogen bus trials • EOLE 2005 wind energy programme • London CUTE hydrogen fuelling station	
Outcome mixed or uncertain	• Suwalki wind energy • Szelero Vep • Solar Water Heaters	• Low-energy housing, Finland • Trinitat Nova Ecocity energy-efficiency project • Snohvit CO_2 capture & storage project • Podhale region geothermal project • Solar Home Systems	• Cap Eole
Outcome largely unsuccessful		• Bracknell Biomass CHP Energy Centre • Blue Energy	• Lund Biogas project • Umbria local bioenergy (early projects) • Crickdale Bioenergy Power Station

Outcome successful and process successful

- The Bioenergy Village Jühnde model aimed to shift an entire village from conventional energy supply to a renewable energy system. While the outcome meets the initiators' expectations, the process itself had to face a lack of continuity.
- The Västerås biogas project aimed to establish a co-digestion plant producing biogas. The planning process was explorative, and by-and-large met the expected outcomes in spite of changes in plans during the project. The project also managed to establish local synergies and gain the stakeholders' support, even though not all locals were equally convinced.
- Pannon Power biomass conversion project, Hungary, can be termed largely successful in terms of both outcomes and process. The aim of the biomass project was the conversion of a coal boiler to biomass (woodchips) combustion so as to secure both economic survival of the plant and compliance with the emission limits of the EU Large Combustion Directive. Main steps of the project were carried out as planned, without any significant change or delay. Most of the objectives have been achieved. Only a few problems arose while realising the project, resulting in some delays. As concerns success of the process, the coordination and the communication in connection with the realization of the project were effective. Most of the issues, controversies and problems were addressed, but there were some exceptions. For example, forestries worried about insufficient microelements recycling in the forests due to increased exploitation of wood residues.
- The aim of the Pomerania region solar energy project was to raise overall awareness of solar energy and promote its use at camping sites ('outcome'), as well as establish a network of actors supporting solar energy ('process'). The project is rated largely successful both in terms of process and in terms of outcomes, because the (still ongoing) project is largely on track in terms of both types of aims.
- The Barcelona Solar Ordinance aimed to create legal standards to introduce solar thermal installations as mandatory in new buildings in Barcelona. The outcome can be defined as largely successful as since 2006 solar thermal installations are mandatory not only in the city, but all over Spain (new building code). In terms of process it can also be defined as largely successful, as there was no major conflict during the process, and technical knowledge of all involved actors was improved.
- The PV Accept solar project can be termed as largely successful in terms of both outcome and process. The aim of this project was to develop PV systems and modules whose design enables a low striking integration into old buildings, historical sites, and (protected) landscapes. In terms of outcome, the final products met the aesthetic and technical expectations. Regarding the process, the involvement was well structured in two step: ex ante and ex post. This procedure helped to spread information and communication about several stakeholders involved in the project.
- The ECTOS hydrogen project is termed successful in terms of both outcome and process. The goal of ECTOS was to learn about the feasibility of running a hydrogen-fuelled public bus system. The project managed to engage people on many levels at the municipality, the government, the education system and it raised the public awareness of the possibilities for adding hydrogen usage into the local renewable energy systems. The international media also showed great interest and support. The learning spread among the industry, operators, maintenance team, politicians and public as a whole. ECTOS marked the first step in the continuous integration of using hydrogen as a clean fuel.
- The CRUST CO_2 capture and storage project can be termed as largely successful, both in terms of process and outcome. CRUST was initiated as a participatory process and included all major stakeholders for CO_2 capture and storage in the Netherlands, although one environmental organisation withdrew from participation during the process. The outcome of the project was largely as envisioned by the initiator: a project on CO_2 capture and storage was initiated (although not as innovative as desired) and much was learned about societal acceptance (which actually was a clear project goal).

Outcome successful but process mixed or uncertain

- The Hannover energy efficiency campaign and programme aimed to raise the public awareness for efficiency and reduce CO_2 emissions through retrofitting residential buildings. While the growth in awareness was largely successful at the regional level, more investors could have spent money for building insulation and modern heating technologies. As the campaign's focus and subject matter changed, the process has to be described as 'mixed'.
- The Berlin H2Accept hydrogen bus trials were successful in terms of the unambitious aim of test-running one hydrogen bus. No local resistance was invoked, but the process is termed 'uncertain' because few local people were aware of the trial, and hence little can be concluded about societal acceptance.
- The aims of the EOLE 2005 wind energy programme were to increase the installed base of wind power capacity to 250-500 MW by 2005, to demonstrate and improve the techno-economical competitiveness of wind energy and to shape an industrial value chain in the country. In spite of a slow start, these targets were reached, or at least successfully initiated, through an important reconsideration of the project - hence, it is classified as largely successful in terms of outcome. In terms of process, the project created significant local controversies, but also initiated a process of policy learning towards the end of the project timeframe - hence, the project is classified as 'mixed' in terms of process.
- The London CUTE hydrogen project can be seen as largely outcome successful in that it met most of the initial objectives documented by the CUTE initiative but that in encountering significant discontent in the earlier stages of engagement the process was mixed or uncertain.

Outcome mixed or uncertain but process largely successful

- The aim of the Suwalki region wind energy project was to attract new wind energy investments to the region, and in order to support this purpose, conduct research and consultation with stakeholders. The project can be considered highly successful in terms of process: sophisticated methods were used to articulate stakeholders' concerns and create local support for wind energy. In terms of outcomes, the project is rated 'uncertain' because the investments were stalled due to national-level policy uncertainties.
- The aim of the The Szelero Vep wind project in Hungary has been to build 20 turbines in 3 phases through an experimental business model that involves significant local benefits and community participation. The project has been highly successful in gaining the support of other stakeholders except for the energy regulating authority (hence, the process is termed largely successful). The first phase of the project was successfully implemented, but due to problems in authorization and grid access, later stages of the project have been stalled; hence, the outcome can be considered mixed or uncertain.
- The Solar Water Heater project is an ongoing project launched by the City of Cape Town to provide sustainable energy, together with Eskom, which aims to reduce peak loads and the related blackouts. So far, a demonstration project has been set up, government grants have been applied for, and a by-law has been adopted mandating solar water heater installation for new constructions above a certain size. The outcomes are obviously still uncertain, but due to success so far in gaining public acceptance for supportive measures, we could term the process largely successful.

Outcome mixed or uncertain and process mixed or uncertain

- The aim of the low-energy housing project in Finland was to introduce into the market a concept of design-based low-energy housing. The project managed to engage the market players in experimentation and learning, but did not result in many new products that followed the specific concept. Even though no major controversies arose, a diversity of interests persisted even after the project. The project is thus classified as mixed both in terms of outcome (the project managers' viewpoint) and process (the stakeholders' viewpoints).

- The Trinitat Nova Ecocity Energy Efficiency case did not achieve the expected results, either in terms of outcomes or in term of process: high efforts were made in the organisation of the participatory process, but the improvement of energy-efficiency is lower than expected, also due to a lack a formalised decision-making structures.
- The Snohvit CO_2 capture and storage project can be termed mixed both in terms of outcomes and in terms of process. It seems likely that the plant will be started; yet the schedule has involved many delays and large cost overruns. Some stakeholders, including local people, have been enthusiastic about the plan, whereas others (e.g., NGOs) have been highly critical.
- The aim of Podhale region geothermal energy project was to serve as large an area as possible with geothermal heat, on the one hand, and reduce the CO_2 emissions as musch as possible. As a result of the project, the geothermal heating network grew, but not as much as expected: hence, the outcomes is judged as being 'mixed'. One of the reasons for that was that the project did not assume intensive energy efficiency measures in private households, nor did it predict the competition on the side of the natural gas network. During the process of the project, improvements in co-operation with municipalities and communication with households were achieved, but not as much as might have been the case, and not totally without controversies. Hence, the process is also rated 'mixed'.
- The Solar Home Systems project in South Africa aimed to support rural electrification through the creation of a new business model to provide solar PV systems as a utility service for poor rural households. After initial difficulties, a viable business model has emerged, and installations have been made amounting to about one-tenth of the target population. But the poorest rural population has not been able to afford even this heavily subsidized system, and a communication gap remains between users and service providers. Thus, it could be termed mixed in terms of outcomes (installation targets), and also mixed in terms of process (communication and user outreach problems).

Outcome mixed or uncertain and process largely unsuccessful

- The aim of the Cap Eole project was to support a local redevelopment project in the old mining region of Albi-Carmaux by setting up 5 wind turbines. So far, the project has managed to avoid some of the nation-wide controversies related to wind energy development, but has encountered resistance by organisations in the neighbouring city of Albi due to visual effects and potential impacts on cultural heritage and tourism interests. An unsatisfying concentration process led to the radicalisation of the opposition to the project. On the outcome side, it is mixed: all the permission have been granted by the State but radicalised local opposition has now blocked the realisation of the wind farm by a recourse to the administrative court.

Outcome largely unsuccessful and process mixed or uncertain

- The Bracknell Biomass CHP Energy Centre project was largely outcome unsuccessful in that the initial outcomes of the project were not met due to attempts to fuse elements of urban regeneration with a biomass CHP scheme becoming disconnected. The process was mixed or uncertain in that it engaged a wide number of social interests but failed to overcome many of the problems that were raised for the project manager.
- The aim of the Blue Energy (salinity power) project in the Netherlands has been to develop this novel technology to a point at which a small-scale pilot plant could be installed. The project has been successful in combining the available scientific expertise and spurring experts' enthusiasm to work on the technology. However, it has failed to create overall confidence in the operation of the technology and its ability to produce electricity. We could thus term the process mixed. Because no pilot plant has been established and difficulties in obtaining funding have been recurrent, the outcome of the project can be seen as largely unsuccessful.

Outcome largely unsuccessful and process largely unsuccessful

- The Lund Biogas plant can be termed a failure in terms of outcomes, as the planning was terminated due to local resistance. In spite of some sincere attempts to find local synergies, the fact that the local resistance also spread into the municipal administration suggests that the process was also largely unsuccessful.
- The Umbria local bioenergy experiences (biodiesel plant, small-scale biomass gasification) can be considered, in the early projects, as largely unsuccessful in terms of both outcome and process. The past initiatives failed due to a strong public resistance, lack of well-structured information, and lack of support from public authorities. Recently, however, a Plan for Renewable Energy was established, with a coordination between eight Umbrian municipalities, which signed an agreement in support of this project and planned well-defined actions of information.
- The Cricklade Bioenergy Power Station scheme was unsuccessful in terms of both outcomes and process. The scheme never translated into a tangible project and engagement was primarily on the basis of local residents successfully objecting to the initiative.

Taken together, the cases present a quite diverse pattern of success or lack of it on the two different dimensions. We can see that there appears to be some connection between success in terms of process and success in terms of context, but the connection is not straightforward or deterministic, and requires a closer examination of underlying factors.

Examining the factors contributing to these outcomes and processes enabled us to identify features of the technologies and their applications, the national and local context and the patterns of stakeholder involvement that contributed to this diversity of outcomes and processes. This was the main focus of out meta-analysis. The following section presents a brief overview of how the meta-analysis was undertaken.

4.4 Analytical framework: technology, context and alignment

The case studies described above presented a somewhat exceptional dataset for a meta-analysis owing to their diversity. Thus, the relevant factors explaining success or lack of success could not be easily reduced to a narrow set of variables, according to which variation among cases could have been examined. Nonetheless, the cases are reported in a consistent fashion, allowing us to consider the following questions for each case:

- Project context and background.
- Project aims and visions.
- Actors involved and their expectations.
- Stakeholder participation and negotiation of expectations (who participates, at what stage, and in what kinds of participation and negotiation processes).
- Outcomes and their relations to original expectations.
- Key lessons learned within the case study.

The case study projects vary according to two key dimensions: the different technologies considered and the different national and local conditions in which they were conducted. These are the main *a priori* factors contributing to variation in the projects, and they are examined in Chapter 5 and 6. We have established key differences among the cases according to these factors by conducting cross-case analysis, searching for differences and similarities between technologies and between projects employing similar technologies, as well as differences between specific national and local contexts and within them. Chapter 5 presents our analysis of the differences and similarities between success factors for the different technologies. Chapter 6 identifies key features of the national and local context that influenced project success.

Within this range of variation, we then turned to consider the fundamental issues of how and why different projects encountered different expectations. In Chapter 7, we present our analysis of how projects attempted to create alignment among the different expectations of the stakeholders involved, and how and why they were more or less successful in such attempts. We describe the roles that different kinds of stakeholders played in the projects. We also identify four modes of communication and four patterns of interaction that differentiate the projects. Central issues arising in stakeholder participation are analysed, and the ways in which projects managed to align different interests are identified.

5. Technological characteristics as factors shaping societal acceptance

The various technologies for renewable energy and energy efficiency have different profiles in terms of overall public image and acceptance in society. Some are quite familiar to the general public while others are more novel and unfamiliar. Different kinds of players (e.g., large or small companies, government or citizens) have also been visible prominent in promoting these different technologies.

Even more importantly, the deployment of different new energy technologies has different kinds of social impacts. In the following, we will first discuss the new energy technologies first separately, presenting findings from previous studies as a 'background' and then highlighting new observations from our case studies. The final section of this chapter draws comparisons across the different technologies on the basis of a meta-analysis of the case studies.

5.1 Energy efficiency

Findings from previous studies: There is widespread agreement among policy makers, experts and ordinary citizens on the prime importance of energy efficiency in meeting future energy challenges. For example, the *Green Paper on Energy Efficiency* points to the fact that the EU could save at least 20 % of its present energy consumption in a cost-effective manner. The Eurobarometer (2007) survey indicates that 54% of EU citizens consider reducing energy consumption 'very important'. In a large-scale survey (EurEnDel, 2004) European energy experts selected energy demand reduction as a top priority for satisfying future energy needs.

Public acceptance and recognition of energy efficiency is extremely high. The Eurobarometer (2002) survey found that 80% of Europeans are convinced that "we could save, simply and cheaply, much of the energy used in our homes and offices". Yet studies have found that people do not know a lot about household energy use (Eurobarometer, 2002; 2006). Energy efficiency is 'invisible', and thus very difficult to communicate in a way that integrates both experts' and ordinary citizens' perspectives (Chappels et al., 2000; Parnell and Larsen, 2005). Moreover, there is a large gap between public attitudes and the actual implementation of energy efficiency measures.

Energy efficiency pertains to a large number of technologies, sectors and activities such as industry, transport, appliances and the built environment. We decided to focus our case studies on energy efficiency in buildings, because they offer the single largest potential for energy efficiency in the EU (COM, 2005). According to the EU *Green Paper on Energy Efficiency*, the buildings sector accounts for 40% of the EU's energy requirements. Research shows that more than one-fifth of the present energy consumption and up to 30-45 MT of CO_2 per year could be saved by 2010 by applying more ambitious standards to new buildings and when refurbishing existing ones. Increasing the energy efficiency of existing buildings is especially important because the building stock has a slow turnover, and most of efficiency potential is hence in existing buildings. Moreover, the EurEnDel energy expert survey (2004) identified the need to increase public involvement an important challenge for promoting energy efficiency in buildings.

Evidence from our case studies: Due to resource constraints, we have focused on energy efficiency in household space heating. Two case studies, Hannover social marketing for energy efficiency from Germany and the Trintat Nova Ecocity project from Spain focus on promoting energy retrofits, the former as a project by local government, the latter as a project initiated by residents themselves. The case study on low-energy housing in Finland focuses on a project aiming to integrate energy-efficiency in the design of new houses.

When compared with renewable energy technologies, the societal acceptance issues in energy efficiency are quite different. This is also shown in the case studies:

- Customer acceptance is the key component of societal acceptance for this technology. Energy efficiency is well-known and widely-endorsed in principle, and it has limited negative external affects. Thus, public acceptance and local acceptance in the sense of siting issues are not problems for energy efficiency. But there can be conflicting views about other external impacts of the technology, such as concerns about impacts on indoor air quality.
- Yet creating local acceptance in the sense of adapting the technology and the project design to the local context is extremely important. Energy-efficiency, especially in the case of housing, is very close to the user and implies changes in the users' immediate living environment. Thus, projects need to be designed on the basis of a good understanding of local housing conditions and local residents' needs. The Hannover social marketing case presents a project that has made every effort in this respect.
- Customers themselves are usually required to make an investment in residential energy efficiency, even though financial assistance can be provided by government, as in the Hannover and Trinitat Nova cases. Thus, the central conflict in this energy technology revolves around the distribution of costs and benefits - over time, and among different actors involved.
- Even though energy efficiency is primarily an issue of customer acceptance, it is well known that ordinary households rarely apply a strict investment calculus when making decisions. The energy efficiency cases show that knowledge about household energy efficiency involves social processes of sensemaking and peer-to-peer negotiation. People tend to rely on information from social sources - neighbours and other people in the same situation are important sources of knowledge and models for action. Thus, neighbourhood-wide projects seem to help to overcome the 'cost barrier' in energy efficiency investments. Also, local 'role models' and 'multipliers' (i.e., local champions who promote the project in their own social circles) can help to overcome the problems created by the invisibility and uncertainties inherent in energy efficiency.
- Risk perception issues were not very prominent in the energy efficiency case studies, but the case study on new low-energy houses shows that the technology can carry the stigma of early unsuccessful applications, and there can be some concerns about the health effects of high insulation levels. Nonetheless, public understanding is very important. The Finnish low-energy housing case shows how diverse interpretations can be made of what residential energy efficiency means: even though the project initiator tried to promote a distinct definition, ordinary consumers tended to include a range of alternative energy sources (geothermal, wood) within the definition of 'low energy housing'.

The cases also highlight some of the synergies and competitive relations that are typical to these technologies. Even though energy efficiency is the cheapest 'alternative energy source', energy efficiency investments compete with other cheap sources of energy, and are more difficult to introduce in contexts where such energy sources are believed to be available in the future. They can also compete with other kinds of building improvements that the residents might like to make. Here, the Trintat Nova case shows how this competitive relation can be turned into a complementarity, as energy efficiency in that case was directly linked to overall refurbishing and building improvement in a low-income neighbourhood. While some early beliefs that energy efficiency decreases comfort and convenience may persist, the case studies also show how comfort and convenience can be build into residential energy efficiency projects. Thus, one successful feature of the projects has been their ability to turn potential conflicts into synergistic factors through an in-depth understanding of local conditions and concerns.

5.2 Bioenergy

Findings from previous research: Bioenergy consists of a very versatile and diverse group of technologies to convert organic matter into fuels, heat or electricity. Applications and technologies include, among others, direct industrial and residential biomass use, biomass-based energy production plants (heat and electricity) as well as biomass-based transportation fuels. Bioenergy can be based on agricultural residues, forest products, energy crops or organic waste and it can be produced as solid, liquid or gaseous fuels. In fact, in terms of applications, bioenergy shares many features in common with fossil fuels (McKormick, 2005). Common 'new' uses of bioenergy in Europe today include biomass-based district heating and combined heat and power production, the production of automotive biofuels, and the co-digestion of different organic waste streams to produce biogas.

The public perception of bioenergy does not seem to be quite as favourable as that of energy efficiency, or that of other renewables such as wind and solar energy (Eurobarometer, 2007). In contrast to the views of European energy experts (EurEnDel, 2004), ordinary European citizens do not necessarily perceive of biomass as an environmentally benign energy source. There also appear to be wide variations in the support for bioenergy between different countries and respondents groups (Roracher, 2004; Rowlands et al., 2002)[8]:

- In the Netherlands, a small survey (N=100) found that only 8% of the respondents associate biomass with green electricity (Rohrracher, 2004).
- In the UK, in Reading, a survey (N=569) found that 16% support an increase in bioenergy use, while 79% 'don't know' (Støer & Yang, 2002).
- A German survey of energy attitudes found that 28 % would like to increase the use of biomass-based energy (fewer than those who would increase hydropower) (Allensbach, 2004).
- In Sweden, a study on attitudes to green electricity (N=528) found that 55% of the respondents believed that electricity from biomass has low impacts on the environment - the same share of respondents perceiving nuclear energy to have low impacts (Ek, 2005). In another Swedish survey (N=797), the attitude to bioenergy was slightly more positive than to natural gas, but clearly poorer than to solar, wind and hydro energy (Viklund, 2004).
- In Finland, an annual survey of energy attitudes (N=1189) reported that 78% would like to increase the use of wood or other bioenergy (second only to wind energy) (Kiljunen, 2005).
- A recent Eurobarometer survey (2007), the first to include questions concerning bioenergy, reported that support of biomass energy ranged from 21-75% in the different Member States, indicating a larger variation than in the case of solar or wind energy, for example.

Some of the differences among countries may be partly (but not entirely[9]) due to the amount of accumulated experience in bioenergy use and to existing natural endowments. Partly, the differences in attitudes may be due to the heterogeneity of fuels and applications (Roracher et al., 2004). The few existing detailed studies have identified very different perceptions of different types of fuels and applications (Richards and Deveson, 2001; Midden et al., 2003). Roracher et al. (2004) also differentiate between different scales of applications[10]. Social acceptability issues for large-scale plants usually include local residents' potential opposition due to controversies over siting, emissions and health hazards, traffic movements, landscape and ecological effects as well as economic concerns - and most importantly, perceived level of control of by and benefits to local people (Upreti, 2004). These findings derive mainly from the UK - a study by Mei-

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[8] Unfortunately, bioenergy is not included in the Eurobarometer (2006) survey of Europeans' attitudes to energy, and thus comparable data are not easy to find.

[9] One might assume that the difference between e.g. the UK and the Netherlands, on the one hand, and Finland and Sweden on the other, are related to very different forest biomass resources and levels of bioenergy use. This is not, however, necessarily the case. Studies from Canada (Rowlands et al. 2002) and Croatia (Segon et al. 2002), with significant biomass resources, also show limited public acceptance of biomass as a sustainable energy source.

[10] The focus in the present study is on large- and medium-scale bioenergy applications. Small-scale bioenergy use, such as the use of wood or wood pellets for heating, involves very different social acceptance issues, which are discussed in more detail in Rohracher et al. (2004).

jinders (2005) from the Netherlands shows a more moderate and mixed reception among neighbours.

Evidence from our case studies: A total of seven different projects in different parts of Europe were included in our case studies on bioenergy. Two of them deal with the establishment of biomass-fired heat and power stations, both in the UK, in Crickdale and Bracknell. Another case study dealing with a fairly similar technology concerns the conversion of one unit of the Pannon Power district heating plant to biofuels in Pecs, Hungary. Three projects deal with biogas - two from Sweden (Västerås and Lund) and one from Germany (Bioenergy Village Jühnde). A case study from Italy considers the lessons learned from diverse early attempts to establish biomass-fired plants for industrial or municipal use in Umbria, as well as later attempts to create a wider support network for bioenergy.

Interestingly, the case studies include both more and less successful applications of similar technologies. This is especially clear in the case of biogas. One of the Swedish projects, an attempt to set up a co-digestion plant for agricultural and household waste in Lund, was terminated due to local resistance by prospective neighbours of the plant. The other Swedish case, with a similar technology design, was successfully implemented. Finally, the Bioenergy Village Jühnde case shows widespread local support for a biogas district heating co-operative, which has been largely implemented by local farmers and has managed to gain the majority of local households as customers.

The case studies illustrate the specific kinds of societal acceptance issues linked to bioenergy:
- Local siting issues were pronounced in all but two of the cases, which were located on existing industrial sites. Mismanagement of the public consultation and siting process contributed significantly to failure in the Crickdale, Bracknell and Lund cases.
- The cases also show an inherent inequity in the distribution of global and local costs and benefits. Increased use of bioenergy involves local and national benefits in the form of reduced carbon dioxide emissions. Yet it may imply an increase in local emissions, disturbance, noise and landscape degradation. These concerns, if not appropriately addressed, can give rise to local conflicts. Yet when well managed, as in the Bioenergy Village Jühnde case, such projects may also bring significant benefits to local people.
- Customer acceptance in most cases is not an issue, as the ‘products’ of bioenergy plants (heat and electricity) are usually fully compatible with existing customer practices. The Bioenergy Village Jühnde case is an exception here, as it involved a new local district heating system, and the case study illustrates how local customers were successfully linked to the project. The cases, however, do not deal in depth with transport applications, where customer acceptance issues may arise.
- Different and even conflicting views of the technology are clearly present in many of the cases. One reason for the failure of the Bracknell and Crickdale cases was the lack of precedents: local people were uncertain about what to expect, and were reluctant to serve as a ‘test bed’. The Pannon Power case also shows conflicting views of how forest resources should be used, with intrinsic and amenity values of the forest conflicting with a more instrumental view of the forest as a resource. The Umbria case illustrates an even more prominent conflict: locals linked bioenergy with waste incineration (even when this was not the case), which formed the basis of their strong and effective opposition to the projects.

The case studies also show that bioenergy is very strongly linked to the local and regional economy - probably more so than any other new energy technology. Thus, issues of competition and synergies with other activities and industries are very prominent. There can be competition over alternative uses of land and landscapes, with energy production competing with recreational and preservation values (e.g., the Pannon Power, Crickdale and Biogas Lund cases) or with existing agricultural use, as in the case of the Umbria local bioenergy projects. Bioenergy projects can also run into conflicts with competing uses for biomass sources - such as competition for wood with the wood chip industry in the Pannon Power case.

The synergies between bioenergy and other activities or local development initiatives are even more pronounced: bioenergy can make common cause with agriculture, local energy systems and local renewal projects. For example, all three biogas projects involved the active participation of local farmers. Local energy systems and local or national energy independence have played an important role in the Bioenergy Village Jühnde case and in the Swedish biogas cases. In some cases, there were also strong links to rural (Umbria) or urban (Bracknell) renewal. Bioenergy projects can thus gain support from many different interests and can be linked to different kinds of ongoing change projects. However, some of the cases, especially the Bracknell and Lund projects, highlight the complexities involved in making effective use of the range of potential synergies (e.g., involvement of many different interests and different planning timeframes). Such projects may be organisationally very challenging, requiring a lot of attention to ensuring a clear division of responsibilities and to making sure that all relevant stakeholders are represented.

A further challenge is the management of local supply chains in an economically efficient, environmentally sustainable and socially responsible manner. This can mean solving conflicts with industries competing for the same resources and ensuring sustainable practices in fuel sourcing. It can also imply efforts into developing new local competencies and facilitating changes in agricultural and forestry practices. The Pannon Power and Umbria case studies in Annex 1 provide more detailed examples.

5.3 Wind energy

Findings from previous research: Wind energy is one of the most comprehensively surveyed renewable energy sources in the EU. A summary of large opinion surveys conducted in different European countries (Wind focus, 2003) indicated strong, or at least moderate, public acceptance of wind energy in many European countries:

- Austria: 50 % support promotion of wind energy.
- Greece: a survey by Kaldellis (2005) found that about half of the respondents supported existing wind energy turbines, slightly fewer the establishment of new wind parks.
- Poland: 41% reported willingness to pay more for electricity from renewable sources such as wind turbines.
- Germany: 66 % in favour of construction of more wind farms.
- Sweden: 64 % would increase wind energy.
- Denmark: 68% support continued construction of wind turbines.
- Belgium: 78 % positive or neutral toward offshore wind farms.
- Spain: about 80% of residents in different regions support wind energy.
- UK: 77 % in favour of wind energy.
- France: 92 % in favour of further developing wind energy.

The wordings and types of questions presented in the surveys differ somewhat, as does the purpose of the surveys, but the overall picture appears to be highly positive (see also Hohmeyer et al., 2004). Yet this overall positive attitude has not always been reflected in local responses to wind turbine installations or wind farm projects (Wolsink, 2000; Devine-Wright, 2005). Devine-Wright (2004a) has published a review of factors influencing the acceptance of wind energy on a local level:

- Physical characteristics and proximity: There is some evidence that residents prefer smaller or mid-sized wind farms (about 10 turbines), but there is significant local variance, and the factors influencing people's perceptions of physical characteristics are not well understood. Evidence on the impact of physical proximity to the wind farms is also inconclusive (some studies find those living closest to be the most negative, while others find those living closest as being most positive).

- There is some evidence that time and experience lead to more positive perceptions of wind farms, but once again the evidence is not clear and there is also evidence of a non-linear relationship between experience and acceptance.
- The NIMBY (not-in-my-backyard) phenomenon has often been evoked in studies as an explanation for local opposition, but the assumption that people would prefer wind farms to be located somewhere else in not clearly supported by evidence (e.g. Ek, 2005) - rather, resistance seems to be related to inappropriate physical characteristics of the wind farm and local politics (Wolsink, 2000).
- Economic and political involvement of the local community in wind farms (i.e., local control, share ownership) appears to be closely linked to acceptance of and attitudes toward wind farm development. Social influence also appears to have a significant impact on people's attitudes - in one study (Devine-Wright, 2003), friends' opinions were found to be the most significant predictor of a person's attitude to wind farm projects.

Evidence from our case studies: The case studies provide interesting evidence of the relation between public acceptance and local acceptance. They also show how different settings and organisational designs can contribute to success or failure of similar technological solutions.

The case study on the French Government's large-scale wind energy promotion programme, EOLE 2005, follows the programme from inception to implementation. It shows how local concerns were ignored in the programme design, which resulted in the emergence of highly radicalised resistance movements in different parts of the country. Moreover, due to the lack of existing, well-defined guidelines for project management, the wind farm projects and administrative procedures often reinforced the feeling of top-down, mandatory and unsafe projects.

The Cap Eole case, also from France, represents are more recent project, which indicates that administrative procedures have evolved in past few years. This has alleviated some of the earlier problems, but not resolved all potential conflicts. This case points to the need to go beyond generalities about participation to understand the specific role and nature of participation as was indicated in the introductory part of this report. In particular, the case highlights the role of not only the immediate local community, but also *neighbouring* communities that are potentially influenced by wind projects.

The Sulwaki region wind project from Poland and the Szelero Vep project from Hungary illustrate how local concerns can be managed in a responsible and highly participatory manner. The Szelero Vep project also demonstrates an innovative approach to explicitly building local benefits into the design of the project. The better design of the newer projects also suggests that some learning has occurred, and that project managers and experts providing them with advice are becoming more sensitive to the social issues surrounding wind energy.

The case studies also highlight some of the specific features of societal acceptance of wind energy:
- Local acceptance can be very different from public acceptance as measured by public opinion surveys. Siting issues are of utmost importance. The national and global benefits of wind energy may come at a cost to local people. Wind energy may also bring local benefits, but here also care should be taken to make sure that they are distributed equitably (i.e., fairly), as the Sulwaki project shows. Consumer acceptance is usually not a concern (apart from willingness to pay for 'green electricity'). Yet there is a concern due to intermittency and the lower price to be paid in the free market by an average customer. Such concerns are neutralised by mandatory feed-in, and offset by the balancing market and the extra charge in the system operation fees.
- Conflicts centre around land use and different understandings of space. A place that on a wind map appears to the project manager as a site with suitable wind characteristics can have very different meanings and value for local people. There are also conflicting views about the environmental and health impacts of the technology, e.g., the impacts on wildlife. These

need to be dealt with in a constructive manner, which may also be time-consuming, as the Suwalki case illustrates.

The competitive and synergistic relations of wind energy projects are fairly straightforward. The case of the French EOLE 2005 programme shows how other forms of electricity production, in that case especially the nuclear-based national policy, can crowd alternatives out of the market, but also out of the institutional structure available for managing and promoting energy projects. As an intermittent source of energy, wind power also can encounter problems in grid access and compete with other energy sources for the services of grid operators, as the Szelero Vep case indicates. Synergies can exist with the local economy, especially that of rural land owners, as is evident in the Suwalki and Szelero Vep cases.

5.4 Solar energy

Findings from previous research: There are different types and scales of solar energy technologies. Photovoltaic panels and solar thermal panels are usually implemented on a small scale directly in connection with residential, public or industrial facilities. Large-scale solar power plants are still uncommon in Europe, although a few such plants have quite recently been commissioned (Quasching and Muriel, 2001).

Solar energy has an extremely good public image - it was, for example, the most popular solution among EU citizens to reducing dependency on imported fuels (Eurobarometer, 2006). In the past decades, it has also been emblematic of 'alternative energy' and the anti-nuclear movement. Solar energy has not raised significant concerns about social acceptability. A review of solar thermal energy markets by European OPET members (EC BREC, 2002) and a report for the IEA by Haas (2002) have identified some key characteristics influencing the societal acceptance of solar energy technologies:

- Different kinds of intermediaries: Architects, construction companies, building materials and equipment suppliers are important intermediaries for both solar thermal and photovoltaic technologies.
- Public information: It is noted that there is a lack of reliable public information on appropriate technologies and their costs. Surveys have also found that private consumers would be more willing to deal with NGOs or 'green companies' than with large established energy companies when investing in solar technologies.
- Costs, willingness to pay and financial incentives: The costs of using solar technologies vary in different parts of Europe for obvious reasons. Yet both studies identify affordability as a more important feature than total investment price or payback periods.

Much of the social research on solar energy has focused on consumer applications and examined people's willingness to invest in solar heating or electricity-producing technology (e.g., Haas et al., 1999; Sidiras and Koukios, 2004; Faiers & Neame, 2006). As the knowledge base for such marketing issues is fairly well-established, we focused our case studies on more complex multistakeholder projects for the promotion of solar energy. The Pommerania region solar energy case study deals with promoting solar energy in the TriCity region of Gdansk, Gdynia and Sopot, focusing especially on camping sites. The PV Accept case examines a project to promote solar energy by experimenting with its use on public monuments in popular tourist destinations, and by organizing workshops for architects and designers. The Barcelona Solar Ordinance case study describes a unique project in which the City of Barcelona adopted a regulation that makes the installation of solar thermal energy systems mandatory for most new buildings and those undergoing major renovation. Moreover, the cases include two early attempts to promote the diffusion of solar energy (PV and solar water heaters) in South Africa, where they can have an important role in rural electrification for the poor and for managing strains on the electric grid. All case study projects involved a large network of stakeholders, including local government, equipment and service providers, experts and ordinary citizens.

Evidence from our case studies: Our case studies confirm the benign public image of solar energy technologies, and show that it also extends to the local level:

- No notable local conflicts were observed in the case studies. Solar energy applications involve few negative external effects - apart from visual ones - and the PV Accept case shows that the visual effect can also be a positive feature. They also highlight the simplicity of the technology, which made it possible for example in the Barcelona case for local government to mandate the technology.
- Customer acceptance was naturally the most prominent form of societal acceptance. Costs, and the issue of who should pay for them, were the main type of controversy observed in the solar energy projects.
- Conflicting views of the technology are not strongly in evidence in the case studies. Where present, such contrasting views mainly pertain to the economics of solar applications and to their significance as a source of energy, as was indicated in the Pommerania region solar energy case. As customers deal directly with the technology, some uncertainty is also created by the novelty of the technology for its potential users, evidenced for example by some municipalities' hesitancy to join the PV Accept project. Uncertainties can also be created by poor early experiences concerning incompetent service providers, as exemplified by the Pommerania case. Moreover, the Barcelona Solar Ordinance case exemplified the role of gaps in grid connection rules and bureaucratic procedures as obstacles to the diffusion of solar energy (see also Reiche, 2002).

The case studies also provide examples of synergies and competition of solar energy with other sectors and activities. Solar energy involves obvious synergies with energy efficiency, and in fact, the Barcelona project started out with a focus on energy conservation. Another very specific synergy is the link to tourism, which is highlighted by the Pommerania and PV Accept cases. An obvious competition exists with cheap energy sources, creating uncertainty for investors. The cases also highlight the need for new competencies - for a period of time, there may be competition between 'old' and 'new' competencies in the design and installation of building and energy systems.

The case studies are more complex projects than merely marketing campaigns for solar energy. Yet they still highlight the importance of customer acceptance, i.e., acceptance by organisational customers or private consumers. They also, however, highlight the role of various 'gatekeepers' such as designers, service providers and policy makers. The cases also provide some evidence about public acceptance; even though these applications might have some impact on non-customer public, no siting problems or 'neighbour acceptance' problems were observed, even on 'sensitive' sites such as historically valuable monuments. Yet it remains to be seen how fully this situation will persist if and when new large-scale solar power plants enter the scene. It is also interesting to see, then, whether the potential emergence of local siting issues has any impact on the public image of the technology.

The case studies from South Africa, moreover, illustrate the growing importance of solar energy in many countries of the South. They also drive home the specific nature of off-grid, consumer applications of solar energy. Private consumers, often with very little knowledge, need to gain a working understanding of the technology and adapt their behaviour to its possibilities and requirements, while service providers need considerable knowledge of different local contexts of household energy use. The Solar Home Systems case, which deals with PV panels for electricity also highlights the extent of consumer acceptance issues, which relate to the relatively small amounts of electricity provided by small PV panels. Consumer concerns about quality and reliability are not confined to South Africa, but have also been observed also in Europe.

5.5 Hydrogen

Findings from previous studies: Interest in practical energy applications of hydrogen date back almost 200 years, but environmental and resource depletion issues have raised hydrogen research and development to the fore in recent years. There are still many uncertainties on what will be the dominant production fuels and methods, storage technologies and technologies to convert hydrogen into heat and power (Solomon and Banerjee, 2006). For example, in the EurEnDel (2004) survey, the dominant view among European energy experts was that large-scale production of hydrogen is still decades away. In their view, the main problem associated with the use of hydrogen is the need to invest in new infrastructure for production, transportation and storage as well as the long-term impact of the hydrogen fuel cycle on the environment. The kind of fuel used is one of the most widely debated topics in the field, and one that will most likely influence societal acceptance in the long term (Solomon and Banerjee, 2006). The EurEnDel experts were strongly in favour of the production of hydrogen from renewable energy sources. Other problems to be solved relate to safety and to the efficiency of the fuel cycle (EurEnDel, 2004). In October 2006 the German Hydrogen and Fuel Cell Association published a report (Schindler et al., 2006) stating that the hydrogen needed to feed the European transport sector could be produced with renewable electricity mostly made from wind energy. Then transport of hydrogen would occur via the electric grid and be produced with electrolysis near the market. The most critical issues raised in the EurEnDel survey are still in dynamic discourse.

Studies on the public acceptance of hydrogen concern the use of hydrogen as an automotive fuel, but also views on having hydrogen stations as a neighbor and which criteria should apply before people would dare to use hydrogen vehicles. A benchmarking survey, AcceptH2, which included an analysis of the impact of eventual demonstration projects on public perceptions and willingness to pay for hydrogen-fuelled transport in Berlin, London, Luxembourg and Perth (Neves and Mourato, 2004). An ex-ante survey (N=1385) on public attitudes to hydrogen as a fuel conducted in the study found that neutral associations (fuel, energy) dominated, but negative associations (explosive, bomb) were also visible (20%), as well as positive ones (clean energy). About half of the respondents would support large-scale introduction, but many would need more information. The majority would support hydrogen storage at local petrol station, and about half stated a willingness to pay a slight increase in fare for hydrogen buses. Similar surveys were carried out in 10 European cities and Perth during actual demonstrations of Hydrogen Fuel cell buses in 2005 only to reveal that public acceptance had been raised and neutral and positive connections had increased (Hy-FLEET: CUTE, 2006).

In addition to environmental benefits, hydrogen technology makes some notable contributions to the comfort of public transport use. Positive aspects identified by respondents in previous studies include lower noise, fumeless emissions, etc. However, the IEA Hydrogen Energy Program has compiled a set of case studies on ongoing demonstration projects (mainly in the US and Germany), also including stationary applications such as air compressor powering for a laboratory, or in the context of electricity utilities (IEAHA, 2006). According to the project managers' experiences, public acceptance has not proved to be a problem: in contrast, local residents have in some cases been enthusiastic about the projects.

As case studies, we selected three recent projects demonstrating the use of hydrogen as a fuel for public transportation. An initial survey (H2ACCEPT) was carried out in London, Berlin and Luxemburg before the CUTE hydrogen FC transportation demonstration began. The actual acceptance is then followed up in the case of CUTE in London and in comparison the public acceptance is also outlined in a similar exercise, the ECTOS in Reykjavik. All projects have involved the commissioning of hydrogen-fuelled buses, the establishment of a fuel distribution network, communication efforts and surveys of responses by the local public. Two of these projects, the London CUTE demonstration and ECTOS in Reykjavik, Iceland, also involved broader strategic visions of a transition to a hydrogen-fuelled economy.

Evidence from our case studies: The case studies show an interesting variation in the societal acceptance of projects with quite similar designs and employing quite similar technologies. The London CUTE project ran into a difficult local controversy when trying to establish a fuelling station. The Berlin H2Accept bus trial did not raise a lot of attention locally[11], and was met with tolerant indifference by the Berliners surveyed. The ECTOS project in Reykjavik, in turn, was received very enthusiastically by the local public.

In spite of their differences, the projects share one similarity. They are early introductions of hydrogen-based technology in their contexts, and were thus not able to draw on precedents. Within this context, the projects highlight some of the issues related to the societal acceptance of hydrogen fuels:

- Local siting issues can be important for fuelling stations. In the London CUTE project, this came as a surprise for the project managers, as they had not paid a lot of attention to such 'peripheral' issues as fuelling stations, which are not linked to the technology as such.
- Customer acceptance could be an issue, but seems to be fairly well in hand in the public transport applications considered here. They required some adaptation by the bus companies, but the users of the service did not necessarily notice any difference, or where a difference was noticed, it was a positive one.
- Public transport applications do not seem to raise a lot of attention to the technology itself; the projects mainly gained attention as a result of communication activities by the project managers. An extreme case is the Berlin H2Accept bus trial, which received very little media coverage. This is probably due to the limited visible changes ensuing from the projects in an urban context, as well as to the timing of the projects, which coincided with a variety of experiments with alternative public transport fuels.
- Risk management and risk perception play an important role, especially in the first applications, which set precedents and shape the public image of the technology. The projects considered here were small-scale and devoted significant resources to ensure a tight control over potential risks.
- Local adaptation and engagement with local people seem to be extremely important on the basis of the variation found in the case studies. In the highly successful ECTOS case, the hydrogen demonstration appeared to support a positive local identity and was probably applied in the most appropriate of all possible contexts: a country with huge renewable energy resources and momentum to become the world's first hydrogen economy. Yet, in addition to these positive boundary conditions, the project also applied an extensive set of communication methods and engaged a wide range of local stakeholders.

The type of players involved in implementing the new energy system also seems to be significant in the case of hydrogen. Hydrogen projects usually involve large oil companies, which may not enjoy a good reputation among local people. This was visible in both the London CUTE and the ECTOS cases, although it did not turn into a problem in the latter case, owing to the collaborative and communicative efforts of the project.

Public understanding of hydrogen is still just emerging, but the case studies mainly reflect a tolerant or positive attitude among the general public towards the technology. As yet, there has not been much public discussion about the type of energy used to produce hydrogen fuels. Yet the way in which hydrogen is produced can have a large impact on the public image of the technology. In Iceland, where hydrogen is produced with renewable energy sources, it enjoys a very 'clean' and 'fresh' image. Elsewhere, social representations of hydrogen seem to be still vague,

[11] "The continuation of the Berlin bus trial started again in 2006 (project title: Hy-FLEET:CUTE). 11 cities on three continents, including Berlin use a common test strategy this time and an approach based on former experience from Acceptance H and the studies from CUTE to communicate with the public. A common survey on public acceptance was carried out simultaneously in September - October 2006 in all the cities of the Hy-FLEET:CUTE." The results of these surveys will partially be comparable with AcceptH.

and the local discussion has focused on visible and immediate aspects of the demonstrations such as the buses, local air quality and the siting of fuelling stations.

Expectations toward a transition to a hydrogen economy are currently extremely high (McDowall and Eames, 2006). The case studies analysed for the present report show that demonstration projects require significant technical, operational, financial and communicative efforts. The ECTOS case study also shows that intensive efforts are needed to keep up momentum even after a very successful demonstration project.

5.6 CO_2 capture and storage

Findings from previous studies: CO_2 capture and storage (CCS) refers to an emerging set of technologies to remove carbon from fossil fuels and to store it. There are a variety of technologies to remove carbon from fuels or during or after the combustion process, and there is also intensive research ongoing on storage solutions in different locations. Existing storage projects have been offshore in connection with oil and gas production, but there is intensive research ongoing concerning onshore underground storage. Yet members of the scientific community are intensely engaged in researching and developing the technology, and have gained increased policy support in the wake of the IPCC Special Report on CCS (2005), which announced that many of the components of CCS are mature enough for deployment. Many countries have recently stepped up their efforts to research and develop the technology - in Europe, especially Norway, the UK and Germany.

The expert debate over the technology has been turbulent in recent years. In the EurEnDel (2004) survey of energy experts, most experts were quite sceptical. None of them selected CCS as the preferred option for climate change abatement, and many were concerned about the high costs and storage safety problems involved. More generally, the prospect of using this technology has provoked intensive debates over storage capacity, storage safety, costs, impacts on fuel efficiency, regulatory issues and competition with investments in renewable energy sources.

The existing studies of ordinary citizens' opinions paint an overall picture of very limited public awareness and understanding: respondents rate their knowledge level as low, and find it difficult to form an opinion. Research from other, non-EU countries provides relatively similar findings (Curry, 2004; Sharp, 2005; Itaoka et al., 2004). For example:

- A survey (N=112) by Huits (2003) of residents of a town located in a gas storage area in the Netherlands reported a low subjective knowledge level, slight concern and a slightly higher rating of risks and drawbacks vs. benefits to self and society.
- A citizen's panel organised in the UK by Shackley et al. (2004) showed a general consensus on CCS as one option to be included with others (lifestyle change etc.), but with strongly polarised minority positions.
- A survey reported by Shackley et al. (2004) conducted at Liverpool airport (N=212) showed as the most prevalent initial reaction 'don't know' (25%). Leakage was the most frequently mentioned problem, climate change abatement the most frequently mentioned benefit.
- A recent Eurobarometer survey (2007) indicates that 21% of the respondents say that they have heard of CCS, but the report also stresses that this does not imply that the respondents know what the term means.
- Where support for CO_2 capture and storage has been compared to other climate mitigation options, it rates lower than renewable energy and energy conservation, but higher than, e.g., nuclear energy.

One of the large problems with existing studies of public opinion about CO_2 capture and storage is that people know very little about the technology, and thus do not have strongly held opinions. A study by Best-Waldhober and Daamen (2006) showed that respondents' 'informed preferences' were very different from those gained by a traditional questionnaire survey. According to the authors, the low stability of attitudes in traditional survey questionnaires leads to a very low validity of the findings. A recent report on the legal, regulatory, economic and social aspects of CO_2 capture and storage (Coninck et al., 2006) also stresses the generally low level of public awareness of the technology, but summarises the limited public opinion research as providing a neutral rather than negative opinion on CO_2 capture and storage. Coninck et al. (2006) also highlight the potential importance of NGOs' positions, which however is quite variable, depending on context and application, as well as broader issues such as competition for funding with renewable energy and the investment of public funds in the technology.

It is obvious that applications of CO_2 capture and storage need to be examined in historical and local context in order for us to gain a more reliable understanding of what societal acceptance means with respect to this technology. As there are few projects running yet in Europe, there were not many alternatives to select from. As a local project highlighting the societal acceptance issues of CO_2 capture and storage, we selected the CRUST project in the Netherlands, which aimed to clarify the social issues involved and assess conditions for establishing an underground CO_2 storage 'buffer'. Another interesting project identified is the Snohvit project by the Norwegian company Statoil to build a liquid natural gas plant with CO_2 capture and storage for the excess CO_2 in the gas. Finally, we investigated a recently started project by Vattenfall Europe to build a 30 MW pilot plant for CO_2 capture from brown coal combustion in the industrial district of Schwarze Pumpe in Germany, with the aim to gradually expand it to a commercial-scale 1000 MW power plant.

Evidence from our case studies: The case studies reflect the emerging nature of CO_2 capture and storage as a social phenomenon. Even though there is a lot of scientific activity in the field, actual applications are rare, unique and novel in their contexts. The case study projects highlight some of the specific societal acceptance issues for CO_2 capture and storage at its present stage of maturity:

- The largest controversies in these cases played out on the national level and in the context of public acceptance. They usually involved NGOs and other groups critical of the further expansion of fossil-fuel based energy industries as opponents, and scientists and industry groups as proponents. On the other hand, the NGO position is not clear-cut, as in the CRUST and Snohvit cases there were also calls by NGOs to make the technology mandatory, and also in the Schwarze Pumpe case, citizen groups questioned why the company was not also applying the technology at other sites.
- Companies operating in this field are proceeding cautiously from demonstration to deployment, largely due to the large costs involved. Such costs are at present acceptable for R&D projects, but do not fit into industry investment calculation rules for normal deployment projects. Moreover, existing uncertainties about the costs and benefits of CO_2 capture and storage make the market very complex for first-mover companies. On the one hand, the companies feel the need to gain positive attention for the project, but on the other, they have problems in communicating why they are not willing to invest more at the present time. In the Snohvit case, for example, an initiative by a local company to develop an additional project created a quandary for the project managers.
- Significant local acceptance issues have not yet emerged, partly due to the fact that onshore storage options are still only being studied. In the Snohvit and Schwarze Pumpe cases, the projects were located in an economically declining region. The potential economic opportunities and future-oriented image provided by the project were met with great (Snohvit) or mild (Schwarze Pumpe) enthusiasm by some locals. In these two cases, there were also perceptions that the project would bring local environmental benefits. But it is important to underline that in neither of these cases were there plans to store the carbon dioxide near the production site. Yet one type of 'siting issue' was evident in the Snohvit case, however, i.e., the controversy over the location of the new gas field in the Barents Sea.
- The cases show that there is a clear need for those involved to gain a forum to articulate the concerns related to CCS and to explore the dimensions of the problem. The CRUST case

provides an example of how this kind of articulation can be accomplished on the national level in a multi-stakeholder context.

There are obvious competitive relations between CO_2 capture and storage and other solutions, such as renewable energy and energy efficiency. The cases also show that continued fossil fuel use can also compete with other values, such as the preservation values of pristine areas that are opened up for fossil fuel extraction. The potential synergies - e.g., with the production of hydrogen fuels from carbon-rich feedstocks - are still on the horizon (e.g. Herzog and Golomb, 2004). But a very particular, if diffuse, synergy found was the novelty and high-tech image of the technology. This feature was viewed positively by some people living in 'old economy' regions, who expected that the 'advanced' nature of the technology would also give the region a more 'modern' and 'forward-looking' atmosphere.

5.7 Other new energy technologies

As other new energy sources, we have examined a geothermal heating case study from Podhale, Poland. Moreover, a case study on 'blue energy' will be later added in this section.

The geothermal heating case study from Podhale, Poland, is in some ways similar to the energy efficiency cases, as it deals with a renewable source of home heating. It shows some similarities, but also some differences to the energy efficiency cases. A difference between energy efficiency and geothermal heating is the sense of autonomy created by energy efficiency - those investing in energy efficiency can expect to be less dependent on the energy market in the future. In contrast, customers of geothermal heating make a large investment in connecting to the heating network, and in the Podhale project, they were concerned whether the price of the service would rise in the future. Also, the Podhale geothermal project involved a complex organisational infrastructure, which highlighted the need for co-operation among different actors in the network.

Geothermal energy is sometimes linked to safety concerns (e.g, Popowski, 2003), but this was not the case in the Podhale project. In Podhale, the wastewater is reinjected to the geothermal reservoir, which is a costly solution but protects the environment. This solution is not very widespread in the world; usually the waters are treated as effluent. Thus, safety can be a concern when the waters or gases from geothermal water pollute the environment.

The Blue Energy case represents a very novel form of renewable energy, which is even more immature than CO_2 capture and storage. Blue Energy is a sustainable energy source that is based on the difference in salinity between fresh (river) water and salt (sea) water. When fresh and salt water join, the concentration will diffuse until the salinity is equal in the total fluid (fundamental law). When a selective membrane is placed between sweet and salt water, the diffusion can be controlled and potential energy gained.

The technology has attracted extensive interest in the Netherlands, but it is still in the research and scale model development stage. At such an early stage, problems of societal acceptability revolve around the confidence of experts and government in the technology, and our case study on Blue Energy illustrates the challenges that the development of such a novel concept encounters in these field. It shows how decades of research, development, networking and communication with interested parties can still result in a failure to obtain funding for even a small-scale pilot plant. Because the technology is so new, it is also difficult to determine what societal concerns will emerge in the future. As the technology has strong links to water management, it is likely that future acceptance issues - but also synergies - will relate to the management of water resources.

5.8 Comparison across technologies

It is clear that the different technologies have different types of market and external effects, and thus different 'modes' of societal acceptance seem to be critical in the case studies (Table 5.1). The patterns for different technologies are indicated in coloured shading in the tables. Bioenergy and wind are most clearly issues of local acceptance, but in many cases, the products (electricity, heat) are compatible with existing market expectations (if suitable policies are in place to ensure competitive prices). Energy efficiency and solar energy are often cases of customer acceptance, but have few (negative) external effects - apart from some concerns about impacts on indoor air quality in the case of energy efficiency improvements through improved insulation. Local (neighbour) acceptance is not so critical, apart from visual effect. Hydrogen fuels involve both kinds of acceptance (with neighbours most interested in the fuelling stations), and CO_2 capture and storage is still evolving, with public and NGO acceptance most evident at present. These patterns of different 'critical' modes of societal acceptance imply that for the less mature technologies, the debate focuses on a more general level of public and NGO acceptance, whereas for more mature technologies, the debate focuses more on the concrete function of the technology in a sector and on the local impacts (see van Lente, 1993). Nonetheless, as indicated in the right-hand column of Table 5.1, acceptance by policy makers was relevant in practically all of the case study projects.

Table 5.1 *Types of societal acceptance highlighted in the cases*

Technology and country	Public and NGO acceptance	Local (neighbour) acceptance	Customer acceptance	Policy maker acceptance
Energy efficiency: Hannover social marketing, Germany		(•)	•	•
Energy efficiency: Low energy housing (LEH) Finland			•	•
Energy efficiency: Trintat Nova Ecocity		(•)	•	•
Biomass PowerStation, Crickdale, UK		•		•
Biomass CHP Energy Centre, Bracknell, UK		•		•
Bioenergy Village Jühnde, Germany		•	•	•
Biogas Västerås, Sweden		•		•
Biogas, Lund, Sweden		•		•
Biomass: Pannon Power, Hungary	•	•		•
Bioenergy local projects Umbria, Italy		•		•
Wind EOLE 2005, France	•	•		•
Wind Sulwaki region, Poland	(•)	•		•
Wind, Szelero Vep, Hungary		•	• (grid operator)	•
Wind Cap Eole, France	(•)	•		
Solar Pommerania, Poland		•	•	•
Solar Barcelona, Spain	•		•	•
Solar PV Accept, Italy		•	•	•
Solar Home Systems, South Africa			•	•
Solar Water Heaters, South Africa			•	•
Hydrogen CUTE London		•	(•)	•
Hydrogen Berlin H2Accept		(•)	•	•
Hydrogen ECTOS Reykjavik		•	•	•
CO_2 capture & storage CRUST	•			•
CO_2 capture & storage Snohvit	•	•		•
CO_2 & storage Schwarze Pumpe	•	•		•
Geothermal: Podhale region			•	•
Blue Energy, Netherlands				•

Also the conflicts arising in the promotion or deployment of the different technologies have somewhat divergent profiles (Table 5.2). The bioenergy cases seem to involve the largest number of different types of conflicts; including conflicting views about the technology itself, but also siting issues revolving around divergent interests in land use. Very often, there is conflict over the distribution of costs and benefits, including environmental and economic costs and benefits to the community. A potential source of conflict is also the governance and management profile of these projects (see Chapter 7). The problems are similar, although more focused on issues of land use and local costs and benefits, in the case of wind energy.

Energy efficiency and the solar energy applications considered here have quite similar profiles, with potential conflicts revolving around the distribution of costs and benefits (among different players, and over time). Land-use conflicts are rare, because the current applications of these technologies are usually small-scale and distributed, having the largest impact on the users themselves. Yet the successful case studies such as the Hannover social marketing campaign and the Barcelona Solar Ordinance exemplify that local adaptation of the technology and embeddedness into the local social fabric are important for these technologies as well, and the need for local adaptation (and the problems resulting from a lack of it) are emphasized in the Solar Home Systems case from South Africa.

Hydrogen and especially CO_2 capture and storage have more diffuse profiles. Hydrogen has not raised a lot of public debate in the cases, most probably because it has been introduced as an alternative transport fuel at a time when there is much experimentation with alternative transport fuels. On a more general level, the debate about the hydrogen economy has met with enthusiasm or scepticism, but rarely forceful opposition (McDowall and Eames, 2006). CO_2 capture and storage, on the other hand, is closely linked with the continued use of fossil fuels. Potential conflicts pertain especially to different views of the technology. Thus, the focus of the debate on acceptance of the technology itself, as well as on acceptance of the closely related fossil fuel technologies. This may also be due to the early stage of development - when more applications materialise and storage issues are actualised, most probably land use issues and the distribution of costs and benefits will emerge more forcefully.

In this respect, the case studies also qualify the ‘risk perception’ and ‘conflict management’ literature to some extent. Some of the cases do involve conflicts that relate to different views of the technology applied, and different understandings of its risks and benefits. Some also involve organisational failure (escalation of the conflict, lack of adaptation to local circumstances, etc.). But there are also genuine interest conflicts about the use of a scarce resource (e.g., land and personal space) and about who benefits from the project. The bioenergy cases also show that local acceptance is not merely an issue of risk management and solving safety problems. Concerns about new technologies are not merely a result of biased risk perception, but rather, legitimate concerns about more mundane issues such as nuisance, disruption and loss of amenity, or overall poor adaptation of the project design to the local context.

Table 5.2 *Types of conflicts arising in the cases*

Technology and country	Differing views of the technology	Land and natural resource use	Distribution of costs and benefits	Management failure	Few conflicts evident
Energy efficiency: Hannover social marketing, Germany			(•)		•
Energy efficiency: Low energy housing (LEH) Finland	•		•		
Energy efficiency: Trintat Nova			•		
Biomass PowerStation, Crickdale, UK	•	•	•	•	
Biomass CHP Energy Centre, Bracknell, UK	•	•		•	
Bioenergy Village Jühnde, Germany					•
Biomass Västerås, Sweden			•		
Biomass, Lund, Sweden	(•)	•	•	•	
Biomass: Pannon Power, Hungary	•	• (forests)	(•) (forestry)		
Bioenergy local projects, Umbria, Italy	•	•	•	•?	
Wind EOLE 2005, France	•	•		•	
Wind Sulwaki region Poland	•	•	•		
Wind, Szelero Vep, Hungary			• (grid access)		
Wind Cap Eole, France	•	•			
Solar Pommerania, Poland			•		
Solar Barcelona, Spain			(•)		•
Solar PV Accept, Italy	(•)				
Solar Home Systems, South Africa	•		•		
Solar Water Heaters, South Africa			•		
Hydrogen CUTE London	(•)	•	•	•	
Hydrogen H2Accept Berlin					•
Hydrogen ECTOS Reykjavik					•
CO_2 capture & storage CRUST	•				
CO_2 capture & storage Snohvit	•	• (Barents Sea)	•		
CO_2 capture & storage Schwarze Pumpe	•				
Geothermal: Podhale region		•			
Blue Energy, Netherlands	•				

In summary, we can conclude that even though new energy technologies are a separate category of technologies in some respects - i.e., in a policy context, and in terms of market competition - their applications on the project and local level are quite different: physically, historically, economically and socially. Thus, the kinds of activities that should or could create 'societal acceptance' are quite different for the technologies. Table 5.3 presents a summary of factors shaping societal acceptance for the different new energy technologies (with a focus on those represented by multiple cases). The first row indicates specific features of the technologies that influence the nature of their societal acceptance. The second row lists key problems and uncertainties that projects need to deal with. The final row suggests a set of factors that are likely to promote success in projects dealing with these technologies.

Table 5.3 *Factors shaping societal acceptance for the different new energy technologies*

	(Household) Energy efficiency	Bioenergy	Wind	Solar	Hydrogen	CO_2 capture and storage
Special features of the technology	• Invisible technology • Located in the users' immediate environment	• Strong links to local economy and supply chains • Variable level of experience and initial acceptance in different contexts	• Impact on immediate environment • Local acceptance can be very different from public acceptance	• Visibility and implementability on a small scale • Technological integration • Has negligible external effects	• The concept is different depending on local energy conditions	• Link to fossil fuel industry • Discussion on the national and expert level: lack of local vision
Key problems and uncertainties related to the technology	• High public awareness and participation needed • High transaction & transition costs & spread ownership • Common benefits but individual investment • Different powers of different social & economic players • Competing technologies	• Input logistics: managing economics and social and environmental impacts • Siting issues • Reputation of operator/initiator	• Siting issues • Local costs and benefits and their equitable distribution • Land-use intensity • Diverging views on landscape preservation • Concerns about health and environmental impacts • System operation concerns because of intermittency	• Costs • Difficulty of developing economies of scale • Small-scale applications require significant user involvement • Mistrust in the technology as a reliable energy source • Small scale photovoltaics: gaps in grid connection rules and bureaucratic procedures • Installation firms have difficulties adapting to local context	• Siting for infrastructure in accordance with site planning • Reputation of the operator/initiator • Keeping expectations in proportion to the scale of the project • Management of perceived risks	• Common problem, but first-mover risks • Extra cost • NGO resistance • Exposure to legislative requirements • Immature technology • High investment, low income • Market complexity • Controversial interests
Factors likely to promote success	• Financial incentives • Information campaigns • Social pressure • Ability to enhance autonomy from suppliers	• Respecting existing (regional) networks • Integrating local information into project design • Management of local benefits and drawbacks • Ability to enhance local energy independence	• Adaptation to local context • Managing local benefits and drawbacks • Involving citizens in the process	• Bundling decision making • Demonstration investments at public institutions • Simple technologies like solar water heater can be mandated • Investment relevant to scale • Prosperous and fresh image • Ability to enhance personal/local energy independence	• Roots in fresh/clean technology • Risk tolerance in society • Shared investment • Sense of shared benefits	• Can improve image of the operator • Shared investment, common ownership • Strong research network

6. The role of national and local context in the societal acceptance of new energy projects

The application of renewable energy technologies occurs in a specific context or region (e.g. local, national, supra-national), which is likely to differ for each project. Moreover, recent insights from innovation studies show that characteristics of and dynamics in the context have an important influence on project success (e.g. Blomquist and Packendorff, 1998; Geyer and Davies, 2000; Engwall, 2003; Grabher, 2004; Raven, forthcoming). Blomquest and Packenhoff (1998), for example argue that “traditional project management theory still suffers from the rationalistic dreams of the early 20th century. It is based upon a perception of the project as a distinct manageable activity system that, once having been designed using the proper scheduling techniques, can be isolated from the environment and implemented. The environment only exists before and after the project, providing goals and resources and receiving the final results.” Engwall (2003) sees projects as open systems that are “history dependent and organisationally embedded” and argues that every individual project “only constitutes one of many different projects, activities, ventures, undertakings, problems, issues, decisions, and solutions that gradually pass through the history of its organisational context.”

Such findings imply that projects and context are inherently intertwined. In each project a project manager needs to address the question how the project fits or does not fit its specific context. What ‘works’ in one context does not necessarily work in another. In this section we therefore discuss how we define project context. We then focus on the definition of region and discuss how stakeholders networks can cross regional boundaries, which is relevant in order to understand that different ‘levels’ of context are interconnected. This serves as an introduction for our discussion on the role of the national and regional context (Section 6.3) in renewable energy projects in the cases we studied.

6.1 Defining context: what is a region?

Defining the regional context is a challenge for renewable energy projects. In many energy projects like a biomass CHP plant or wind turbine, for example, a region covers the surroundings of a local community or city, where local stakeholders form the social context for the project. Stakeholders, citizens and interest groups play an important part. The region is among others defined through the stakeholders of the setting. In case of the energy use of biomass, the group of stakeholders consist at least of those related to the ‘sources’ (farmers, forest owners, waste producers etc.), those concerned with the conversion (e.g. heat plant operators), and those who are to be supplied (e.g., private households, public administration).

The region can profit from the interaction and concentration of economic stakeholders. Factors of production, conditions of demand, and up- and downstream markets interact. The regional (and local) economic and social structure supports the flow of information and communication between stakeholders. Through the use of biomass for energy for example, regional economic interaction may be strengthened, so that the cooperation between producers and customers might be stimulated, and the ‘social capital’ of a region might be activated. Therefore, the regional approach might also help to increase competitiveness of the region (Porter, 1991).

A region in this meaning is local and stays below the size of a national state. A region is associated with a small area, with ‘the surroundings of home’. Through common characteristic features, regional awareness arises from it. Customs and way of life as well as a lively regional dialect are in particular factors for regional awareness. Although the definition of a particular region often follows political or administrative borders, there are also cases in which natural or cultural features decide on the region's geographical coverage.

More generally, a region can also be defined in terms of a specific problem (e.g. emissions, limited economic growth, security of energy supply). There may be administrative, cultural, ecological or economic reasons for its scope. In this particular meaning a region does not necessarily represent the scale of a city or local community, but rather an area where people want to cooperate to solve common perceived problems. This is usually because they have enough in common such as a similar problem definition, similar economic systems or commercial transaction systems, enough understanding about each others culture and respect for each others values. Also allowing cross border competition can be a way of defining regions, as is the case in the European Union (as a region of the world), but also within the European Union (e.g. the Nordic countries who have a regional energy market within the wider European market).

Different disciplines deal with what a region or a regional context is and what the main functions of a defined regional context are. The following list shows a small selection of different socio-political perspectives:

Region from the European perspective:
- A region is an aggregate of human communities, connected to the landscape through history, geography and economy. The inhabitants share interests and aims (European Council, 1978).

Region from the political science perspective:
- The nation state is bound up with political systems (Pokol, 2001). Regional political integration is a process, where states develop common institutions. This will lead to more decision-making authorities and indicates the degree of integration (Zimmerling, 1991).

Region from the social science perspective:
- A region is a welfare and diversified functional system. The role of a region is to be a communicative and functional substrate.

Region from a social network perspective:
- A region is the near environment of subsystems of the society. Through cooperative action, networking takes place and supports the different actors in their social (and economic) exchange (Brohmann, 2003). In sharing socio-cultural experiences, citizens can develop a kind of regional identity (Ipsen, 1993). A region sets up new possibilities of information and communication between actors.

In sum, there is no 'universal' definition for 'region'. The concept of a 'region' is very much an 'actor category': project partners and project stakeholders give meaning to what the region is in a specific renewable energy project. The concept of region can even be contested, when project partners and stakeholders disagree on the meaning of region. Also through globalisation (or Europeanisation), the meaning of region is subject to change.

In this report 'region' will therefore be defined as a multi-level concept which can exists on the following levels:
- Local, place-based notion of region.
- Subsystem/administrative notion of region.
- Country notion of region.
- European region (Central & Eastern, Western, Northern, Southern).
- Stakeholder network that can cross levels.

Stakeholder networks are a way to bring the external environment into the decision-making process of organisations, or in this case, (energy) projects (Maessen et al., forthcoming). Stakeholder networks can cross the regional boundaries as defined above. In other words, any actor relevant to an energy project such as a local citizen group, but also a European research network, or a national legislator, can be a stakeholder for an energy project. Stakeholder networks are discussed in more detail in Section 7.2. Figure 6.1 indicates the interrelations between the different concepts.

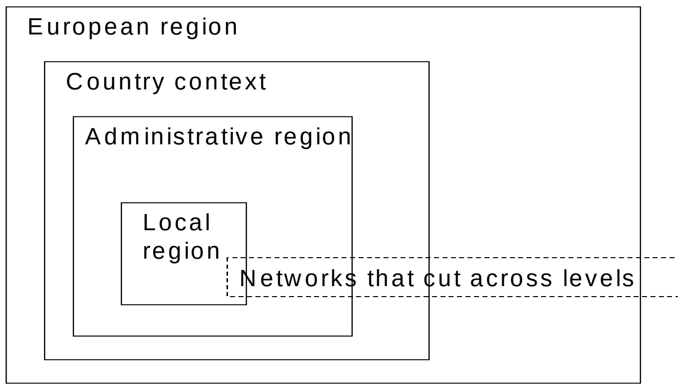

Figure 6.1 *A multilevel perspective on region*

In Section 4.1, we presented a brief overview of European regions, and identified that there are great variances with each region. 'Region' on this macroscopic level did thus not turn out to be a relevant explanatory factor for the observed differences in societal acceptance. In our analysis, the national context was revealed as a more important locus for factors shaping societal acceptance. Even more importantly, factors influencing societal acceptance were found to derive from the local context, which forms the project environment in which stakeholder networks materialise. The following sections identify the influence of national (§ 6.2.1) and local (§ 6.2.2.) regional factors on societal acceptance. The aim is to develop lessons from the case studies on how different types of context can influence societal acceptance of an energy project.

6.2 Influence of national and local context on the new energy projects

Each country in Europe carries out projects on renewable energy. Apart from the influence of stakeholders, and of technical and financial factors, the outcome of the projects is also influenced by the context of the project. This section focuses on the national and local factors that influenced the societal acceptance of the projects analysed in the case studies of the second work package of CreateAcceptance. The set of factors outlined here has been derived inductively from the case studies, and is backed with data from surveys and previous studies. Annexes 4, 5 and 6 provide a complete overview of the relevant statistical and other data utilised for this chapter. Annex 5 presents the main conclusions concerning the influence of national-level factors in the case study projects. Nonetheless, it is important to note that the list of factors is non-exhaustive, especially in terms of sub-factors; further case studies would most likely identify other factors that are relevant. Thus, readers are encouraged to treat the set of contextual factors as indicative.

The contextual factors range from current policies to historical experiences and attitudes, from environmental awareness to a trusted local mayor. In order to come to conclusions that are useful for the following work packages, we have put the wide range of factors in a logical order. This classification resulted firstly in the distinction between national (§ 6.2.1) and local factors

(§ 6.2.2). These national and local factors have been sub-divided into four categories: political, socio-economic, geographical and cultural factors.

A necessary remark for this section is that although the national and local factors are addressed separately from each other and from other factors, the success or failure of a project is always the result of a unique combination of factors at a specific time, place and environment.

6.2.1 Influence of national factors

The case studies of this work package show us the many variations in national[12] driving forces and barriers for societal acceptance of the projects on renewable energy. Table 6.1 at the end of this section provides a list of these factors along with a brief characterisation of their relevance for renewable energy projects. Below, more detailed definitions and examples are given for how they influenced the conditions for the projects described in the case studies presented in Annex 1.

It is important to note in this section that there are large variations in the overall importance of the *national* context. Partly, this depends on how homogeneous the countries are in terms of policy, economy, social and cultural factors. There are many federalist Member States in which independent states, provinces, other autonomous regions or even ‘free cities’ have significant legislative powers. Regional gross domestic product within some countries, like the UK and Belgium, can vary more than between the countries and their neighbours (Eurostat, 2006f). Moreover, there are many countries in Europe in which different languages are spoken in different regions, which is merely one reflection of the local cultural variations that can exist with a single nation state.

Government policies

Government policies are shaped in a process that has historical roots, but also evolves continually in response to a range of factors including new research, international agreements, as well as citizens’ preferences. Hence, government policies are influenced by the societal acceptance of policies and technologies, while they also influence and shape the societal acceptance of projects.

Policy on renewable energy/technology or related topics: Governmental policies on renewable energy influence new, current and future projects. Policies can influence the geographical location, the used technology, the size, the partners involved, the duration, etc. of the project by creating (financial) opportunities or (financial) barriers. In the case studies, the effect of national policies on the societal acceptance of projects varied. Sometimes projects were completely initiated or blocked by policy. In other cases, the national policy only influenced some stakeholders of the project.

In Germany, for example, the federal government promotes renewable energy sources in general with fixed feed-in tariffs (minimum rates) for electricity grid operators when buying from renewable energy sources (EEG). This has resulted in a wide range of successful projects of different sizes, locations and technologies. Since 2000 the contribution of biomass has more than trebled, wind power has increased almost five times, and solar energy ten times. To promote the diffusion of biomass heating, the government has introduced a Market Stimulation Programme with investment incentives, which is further supported by an energy tax exemption for biomass fuels. Many successful projects, for example the biomass plant in Jühnde, which supplies the energy of the village (see Annex 1, Case 6), have become economically feasible owing to the governmental support. In this case, the government policy was able to support a project that also

[12] We base our concepts of nation and national context on the political boundaries and definitions as used for states in for example the European Union.

had a strong resonance with local needs and aspirations, such as the desire for local energy autonomy.

In other cases the national policy points out a concrete direction for a certain energy technology. An example is the Dutch CRUST project, initiated by the national government to learn more about the storage of CO_2 (as a buffer for future use) (see Annex 1, Case 23). An impulse for projects on renewable energy can also be given by the governmental decision to phase out a specific technology, for instance nuclear power. This was the case in such countries as Sweden and Italy (see Annex 1, Cases 7, 8, and 10).

There are also examples in which the national governmental policy has been an obstacle to the local adaptation of the project. In the Crickdale bioenergy base (Annex 1, Case 4), the project was initiated in the context of the UK national system of Non-Fossil Fuel Obligation (NFFO) contracts, which required energy suppliers to source a specified amount of energy from non-fossil fuels. NFFO contracts required the applicant to specify the site of the location, and this could not be changed later. Applicants were also required to keep the site confidential; thus, local residents could not be engaged in the project before the site was selected. This raised local concern about the transparency of the project in Crickdale, and directly contributed to the subsequent controversy and failure of the project. A similar problematic government policy is exemplified in the way the French EOLE 2005 wind energy programme was executed, which is discussed in the paragraphs on national policy culture.

The policies underlying the above-mentioned two negative examples have since been revised. The NFFO system has been abandoned (see Szarka, 2006), and the French EOLE 2005 wind energy Programme shows that the government learned an important lesson about public engagement as a result of the controversies raised by the EOLE 2005 programme. More and more countries are recognizing that citizens need to be involved in the introduction of renewable energy and are starting to understand the importance of societal acceptance (Szarka, 2006). Yet project managers need to understand that previous experiences of insensitive policies can influence the conditions for future projects for years. For example, in the UK and France, national-level organisations have been institutionalised that critically monitor, and are prepared to resist, new energy projects (see Szarka, 2006).

Apart from energy policies, national regulations on spatial planning procedures were found to influence the acceptance of different projects. This was the case, for example, in the EOLE 2005 Wind Energy Programme. More generally, for example the Predac (2003) report has attributed the controversies encountered by renewable energy projects in France, the UK and Greece to a lack of socially responsive spatial planning regulations.

National policy culture and administrative procedures: The existing culture in which policy is defined can influence the societal acceptance of projects on renewable energy by influencing how projects are governed and executed. Moreover, the quality of administrative procedures for land use planning and facility permitting influence the kinds of possibilities or problems that new projects encounter in their planning and permitting stage (e.g., Predac, 2003; Reiche and Bechberger, 2004).

Lijphart (1999) has investigated the overall performance record of consensus democracies versus majoritarian democracies. According to him, negotiational cultures that strive for consensus often delay the progress but still come to more successful outcomes. The case study on the EOLE 2005 wind programme in France illustrates Lijphart's supposition on confrontational culture in a majoritarian democracy. Moreover, it illustrates a more specific culture in energy policy that had evolved from the commitment to nuclear energy and the centralised and technocratic policy style ensuing from the commitment to this technology (cf. e.g., Winner, 1986). This culture of policy making served the development of nuclear energy well, but turned out to be very ill-adapted and badly equipped to deal with wind farm projects, a technology elaborated in a more community and participatory tradition. Thus, the French government confronted rural areas with the EOLE 2005 programme, which consisted of large wind turbines farms to produce 250 - 500 MW (Annex 1, Case 11). This sudden confrontation with the new project had a critical impact on the societal acceptance of the project by local stakeholders. The following radicalisation of the opponents led to the blocking of a large part of the project and only 55.7 MW of wind turbines were installed.

In addition, the EOLE 2005 programme and the Szelero Vep wind project, as well as many of the others, illustrate the way in which the quality of administrative procedures for planning and permitting influences the successfulness of projects. Complex bureaucratic structures, lack of clear responsibilities and competences for different authorities and lack of transparency are some of the administrative features that have created difficulties for the case study projects.

(De)centralised national government: The case study projects illustrate national contexts with a varying degree of centralisation or decentralisation. They show that both centralisation and decentralisation can block or carry the project. Whether the influence of a *decentralised government* (with relatively more power at local level) leads to societal acceptance is mainly dependent on the degree of autonomy of the governmental departments and the possibility to align the visions of the different authorities.

The municipality of Barcelona for example implemented the ‘Solar Ordinance’ in 2000 (see Annex 1, Case 16). This regulation obliges the installation of solar thermal energy systems for most new buildings and those undergoing major renovations. Because of the societal acceptance of the new legislation, many municipalities followed Barcelona’s initiative and in 2006 the obligation to install solar thermal panels in new buildings has been introduced in the Catalonian and national legislation. Although the visions of the local and national government contradicted initially, the autonomy of the municipality of Barcelona got the project started. Due to the later alignment with the national government the project became wider socially accepted.

Also the influence of a *centralised government* on projects on renewable energy varies and is mainly dependent on the trust in the national government. According to the Standard Eurobarometer Survey of the European Commission (EB, 2005c), the trust in the national government in France, for example, is relatively low. Our case study on the French EOLE 2005 wind energy programme shows indeed the conflict between local and national actors. Because local actors were only consulted at the end of the planning phase when the national institutions already had made detailed decisions on the project, they radically opposed the project.

Stability of national policy: The stability of policy is also crucial for the development and continuity of projects on renewable energy. If policies concerning renewable projects change often, then investors’ and other stakeholders confidence in the projects is likely to decline (Verbong and Geels, *in press*). This is illustrated by the Wind Suwalki project (Annex 1, Case 13). Regional government, with the help of international funding agencies and an expert consultancy, devoted significant efforts to create favourable social and technical conditions for new wind energy investments. Project sites were well researched in advance, and local consultation processes were conducted. Yet investments were stalled because of uncertainties relating to pending changes in national government support for wind energy.

Socio-economic factors

Availability of natural resources: The availability of a specific resource leads often to societal acceptance of local fuel producers and suppliers to start a project for energy production based on the use of that resource. Many examples can be given of biomass plants close to biomass production lots, solar projects in the sunny parts of Europe, CO_2 capture and storage in nearby gasfields, etc. The Norwegian case (Annex 1, case no 21) on CO_2 capture and storage in the Snohvit plant also shows that the availability of fossil fuels does not stimulate the development of renewable energy technologies in an early phase. But in a later phase, the existing oil and gas refineries and consequential CO_2 emissions have been the impulse for the development of CCS technology in Norway.

Perceived availability of natural resources: The availability of a natural resource, does not however imply the societal acceptance of a certain technology. The Polish case on solar energy in Pommerania (Annex 1, Case 15) shows that the perception of the abundance of different natural resources also influences the societal acceptance of the general public in the country. Although the conditions for solar energy in the Poland (average 1,000 kWh/m^2 a year) are good, the opinion "we haven't got enough sun" was predominant at the start of the project. Significant efforts had to be devoted to creating confidence in the local potential for solar energy.

Energy prices: The traditional market system of demand and supply based on prices, of course influences the acceptance of the renewable energy market as well. Many of our cases show that the higher the current energy prices based on fossil fuels, the higher the demand for renewable energy. Due to the relatively higher costs for renewable energy production, financial support from authorities or other investors is often needed for the introduction and possible competition on the (regulated or liberalised) energy market. An example is the earlier mentioned German Renewable Energy Sources Act that in combination with other support and research programmes and the rising prices for fossil energy, has pushed the societal acceptance of renewables (see Annex 1, Case 6).

National perception of foreign investment: If the investors or initiators of a project on renewable energy are foreign, the success of the project will also be influenced by the attitude of the country towards foreign investors. In the Wind Suwalki case, the investments of the US Trade and Development Agency were welcomed in Poland (see Annex 1, Case 13), where the policy makers and local people have a favourable attitude toward foreign investment (see Annex 6). Although there are no consistent surveys of national attitudes to foreign investment in different European countries, the data collected in Annex 6 show that there can be some variances, which project managers should take into account when planning projects.

Importance of national energy independence and security of supply: The will to become energy independent and to ensure security of supply are important driving forces for acceptance of renewable energy projects in many European countries. A prime example of this can be found in the ECTOS project in Reykjavik (see Annex 1, Case 22). The government and other stakeholders in Iceland strive towards full energy independency. The country does not have any fossil fuels and the economy (mainly fishery) is therefore highly depending on oil imports (and oil prices). In order to diversify the economy and lay foundations for higher living standards, local renewable energy production is supported. The cases show that also in other European countries such as Poland, Hungary and Sweden, the will to become energy independent is a driving force in the societal acceptance of new energy projects (see Annex 1, Cases 26, 13, 15, 7, 8, and 9).

National competing technologies and industries: Competition between technologies, companies or industries can also influence the societal acceptance by industries and other investors of projects on renewable energy. This competition can take place within the country or in relation with other countries. The Snohvit CO_2 capture and storage project, for example, illustrates the influence of Norwegian government's desire to make the country a forerunner in CO_2 capture and storage. This aim gained further momentum from the opportunity to gain financial benefits by extending the lifetime of existing oilfields through enhanced oil recovery (see Annex 1, Case 24).

Employment and regional development: Many countries struggle with unemployment, and most also have special problems with economically less-developed regions. The importance of these kinds of concerns for individual projects is illustrated in the Snohvit CO_2 capture and storage case (Annex 1, Case 24). Here, government support - in the form of shorter depreciation periods - was largely justified in terms of the ability to create employment in the North. Concern about employment in a declining region also played a role in the Schwarze Pumpe case (Annex 1, Case 25), and unemployment on a national level is an underlying factor promoting societal acceptance of new energy projects, for example, in the Polish (Annex 1, Cases 13, 15 and 26) and South African case studies (Cases 18 and 19).

Cultural factors

National trust in institutions: From the perspective of a new energy project, trust or distrust in the initiators of the project can influence the possibilities of the project to gain societal acceptance. The studies referenced in Annex 6 indicate that there are some differences in the trust of inhabitants of different European countries in, for example, the press, the government, large companies, religious institutions, charitable and voluntary organisations and in other people (i.e., 'generalised trust'). For example, the successful projects reported from Poland indicate the importance of the involvement of local government (see Annex 1, Cases 13, 15 and 26), as trust in the national government is relatively low.

National bottom-up movements versus top-down: The start-up of projects on renewable energy can be divided into bottom-up and top-down movements. Both have different effects on the acceptance of the project, depending on national traditions. For example, the cases from Spain reflect a tradition of cooperation among non-governmental organisations, which enabled them to gain momentum and civic support (Annex 1, Cases 3 and 16). The Netherlands have a tradition for searching for consensus on a national level, leading to more top-down, but well-debated projects, such as the Dutch CRUST project where the national government initiated the research on CCS (Annex 1, Case 23). Both kinds of movements can lead to successful projects when supported by the appropriate kinds of traditions.

Certain project designs may also expect that 'grassroots' actors take responsibility and adopt an active, 'bottom-up' role in the project. The Finnish low-energy housing case shows that in some national contexts, this is not very likely. The project targeted small enterprises and private households, neither of which have as yet had very active roles in energy policy in Finland, where energy policy has focused on large companies that dominate the energy demand. Thus, the project encountered some inertia, for example finding it difficult to mobilise households to participate in the project.

National environmental awareness: The existence of (strong) environmental awareness within a country can influence the importance of environmental arguments in the project's vision and expectations. Environmental benefits, and especially climate change mitigation, can be important arguments in countries where there is a longstanding tradition of environmental awareness, but may be less important arguments elsewhere. This is visible, for example, in the German projects, in which the general public was clearly responsive to environmental arguments to support the projects.

National historical experiences: Having good or bad experiences with certain technologies in the past influences the acceptance by stakeholders of new projects. Many examples can be given. The Norwegian and Dutch development of CCS, for example, was nationally accepted because of the longstanding tradition of co-existence with gas- and oilfields (see Annex 1, Cases 23 and 24). And the expansion of the hydrogen projects in Iceland is accepted due to positive experiences in the recent past (Annex 1, Case 22).

National attitude towards new technology: There can be national differences in overall attitudes to novelty and in the propensity to adopt new technologies (see Annex 6). The Icelandic ECTOS case shows that the entrepreneurial national spirit and interest in new things, including technologies, greatly facilitated the introduction of the hydrogen project, which was extremely novel and quite risky at the time it was launched. The case study shows that the novelty and 'fresh' image of the technology actually served as an attractor for the project, whereas it might be a cause for suspicion in another context.

Geographical factors

Climate: The climate in a country influences the demand and supply of energy and therefore also the acceptance of new energy suppliers that adapt to this variable. In the Northern colder climates, the demand for heat and light increases the energy demand. Therefore, energy efficiency and insulation projects are well-suited to this context (see Annex 1, Cases 1 and 2). The potential supply of renewable energy from for example wind and sunlight is also influenced by the climate. Climate is therefore one of the causes of the diversity in renewable energy projects in Europe.

Availability of suitable locations: The availability of suitable locations can have a large influence on the acceptance of the project. Projects may enter the context of national debates over what kinds of uses are suitable for specific regions in the country, for example. This was the case in the Snohvit project, which was located in the Barents Sea. This location of the project - quite unrelated to the CO_2 capture and storage technology deployed - contributed significantly to the controversies that arose around the project. Similar conflicts can arise concerning the potential use of land for food crops or energy crops.

Table 6.1 *National factors influencing new energy projects*

Factors pertaining to the national context	Examples of relevance for new energy projects
Government policies	
Types of policies on new energy technologies and related topics	Sensitivity and adaptability of policy to needs from stakeholders (investors, scientists, inhabitants, etc.).
National policy culture (consensus, negotiation, confrontation)	Influence of policy culture on societal acceptance of stakeholders before and during project.
Centralization of national government	Autonomy of national and local government to decide upon projects.
Stability of national policy	Investor and stakeholder confidence in projects due to (in)stable policies in the past.
Socio-economic factors	
Availability of natural resources	Stakeholder confidence in feasibility of project due to availability of resources.
Perception of availability natural resources	Stakeholder confidence in feasibility of projects due to perception on the availability of (enough) natural resources essential for project.
Energy prices	Acceptance of project because of good competitive conditions for new energy projects based on existing energy prices (taxes) in country.
Perception of foreign investment	Stakeholder confidence in external project partners influences their acceptance of the whole project.
Importance of energy independence	Usefulness of arguments supporting project visions based on willingness to become energy independent and to insure security of supply
National competing technologies and industries	Existing technologies and industries may form competitive conditions for new energy projects
Employment and regional development policies	Social and economic support available for projects from stakeholders that support development of employability
Cultural factors	
Trust in institutions	Stakeholder confidence and trust in different types of project partners
Tradition of top-down vs. bottom-up initiatives	Project partners’ ability to mobilize resources from the top down or from the bottom up.
Environmental awareness	Environmental awareness influences the usefulness of environmental arguments in communicating the project vision
Historical experiences	Historical experiences with certain technologies, stakeholders and projects influences the support for new but comparable technologies, stakeholders and projects.
Attitudes to new technology	Acceptance project based on attitude from stakeholders to innovation or new technology in general.
Geographic factors	
Climate	Natural endowments and demands for energy due to temperature, wind, etc.
Availability of suitable locations	Possibilities and problems encountered in finding good locations for the project

6.2.2 Influence of local factors

Most projects on renewable energy are concentrated in a specific geographical area. Apart from the national context, these projects are consequently also influenced by local[13] factors. These local factors can be categorised similarly as the national ones (Table 6.2 at the end of this section). Some of the factors pertaining to the local context have a direct impact on the societal acceptance of specific new energy technologies. Other local factors are related to specific kinds of project designs that are more likely to promote acceptance in certain local contexts.

Political factors

Local policies can block or push the acceptance of a project in many ways. The cases include numerous examples in which local government influenced the project by allocating of building permissions or by providing financial support for the project. Also the stability of the local policy plays a role in the start and development of projects. The policy culture on the local level is not consequently a copy of the culture on national level. The effects on societal acceptance of a (de)centralised government are mainly dependent on the level of autonomous power and responsibilities that local governments have (see e.g., the Barcelona Solar Ordinance, Annex 1, Case 16). Annex 3 provides some information from each European country on the legal competences of local authorities. Apart from their legal power to make decisions, local governments can be very important for projects by providing access and contacts to local residents, as was exemplified in the Podhale geothermal case.

More than on the national level, individual policy makers can have a large influence on the local level. For example, the attitude of the mayor towards the project in his/her community can influence the attitude of other local stakeholders and thereby influence the project itself, depending on the trust attributed to this person by the local residents. The enthusiasm of the mayor of the village of Jühnde and his personal work in promoting the projects, for example, convinced many citizens to participate in the project (see Annex 1, Case 6). Similarly, individual influential figures played important roles, for example, in the Snohvit case (Annex 1, Case 24).

Socio-economic factors

The *local availability of natural resources* can influence the acceptance of projects. Although the possibility of transporting resources to a local plant (e.g. biomass, hydrogen) is sometimes an option, other resources (wind, solar) must be available locally. *The perceived of the abundance of natural resources* can also be an influential factor. For example, in the Schwarze Pumpe case, local people perceived their economy as being dependent on the continued use of brown coal, which is abundant in the region, and were thus largely supportive of plans to ensure its future use by applying CO_2 capture and storage.

The perception of foreign investment can, in terms of local context, be interpreted as the acceptance of (large) investors from outside the local area. The inhabitants of Hornchurch, nearby London, for example, did not accept the plans from BP to install a hydrogen refuelling station in their town (see Annex 1, case no 3). They raised concerns about the fuelling station and were especially disappointed that the 'big BP' did not give information to them and that they never saw a representative of the company to whom they could address their concerns. The opposition of the neighbours affected the progress of the project, and BP had to make many efforts to regain the trust of the inhabitants of Hornchurch.

Energy independence can also locally be an important driving force for the acceptability of a project on renewable energy. Being energy independent can be a psychological impulse for members of a community to join the project and for the community feeling in general. The bio-

[13] The concept 'local' refers in this report mostly to the level of the community and sometimes to the level of the province.

mass plant in the village of Jühnde provides a good example (Annex 1, Case 6). The village aims to become the first village in Germany to completely replace its fossil energy use for heating and electricity through bioenergy.

The availability of local competence and infrastructures can influence the project in a operational sense by shaping the possibilities of the project to rely on local contractors. In many of the case studies, training programmes for local contractors were needed to complement the service network around the project. The ability to make use of local competences and industries can also have a positive influence on the societal acceptance of the project; as was the case, for example, in the Hannover social marketing campaign (Annex 1, Case 1).

Local unemployment is often a reason for local institutions to accept new projects in the area. Both existing unemployment as (foreseen) future unemployment can be a reason for investors and authorities to stimulate projects in the specific area. Examples in the case studies include the Umbria projects in Italy, where the local tobacco plantations were expected to disappear in the coming years due to the phase-out of subsidies (see Annex 1, Case 10). Expectations of employment opportunities also played an important role in a number of other cases (e.g., Cases 23 and 24).

Many of the cases show that *regional and local economic development* policies and programmes can create significant opportunities for new energy projects. Some of them also indicate that regional and local redevelopment programmes, in themselves, can embody significant controversies in which new energy projects can become embroiled (e.g., the Bracknell bioenergy case, number 5, the Cap Eole case, number 12, and the Snohvit case, number 24). Thus, the consistency of the public support for regional development policies can reflect onto the societal acceptance of new energy projects linked to them.

Cultural factors
As on the national level, the *trust in local institutions* can influence the acceptance of their initiatives and policy by other local stakeholders. Other cultural aspects as environmental awareness also influence acceptance on the local level. Especially when the project has positive effects on the local environment, local parties will easily be more positive towards the initiative. In the Podhale region, a popular health resort in Poland, the improvement of air quality in the region was an important aspect that led to acceptance of the local actors (see Annex 1, Case 26).

Bottom up and top down movements also exist on the local level and influence societal acceptance. For example, in many of the case studies, existing residents' associations were able to mobilise quickly to question or counter project plans when they felt their local environment was being threatened (Annex 1, Cases 5, 6, 9 and 17). Existing bottom-up movements with good local networks can also mobilise to support a project, as was the case in the Trinitat Nova energy efficiency project (Annex 1, Case 4). When local acceptance is lacking, local players can also self-organise to create the necessary support for their projects, as was the case in the Umbria bioenergy projects. Individual projects did not have sufficient resources to create societal acceptance, but a regional forum was mobilised, with better financial resources and abilities to create competence in promoting renewable energy projects (Annex 1, Case 10).

Local historical experiences with a specific technology or plant can have a large influence on the attitude of local stakeholders towards the project. The different outcomes of the biogas projects in Sweden are a good example of the effect of historical experiences (see Annex 1, Cases 7 and 8). The success of the biomass plant in Vasteras (Sweden) was largely dependent on the acceptance of the local actors, who had good experiences with the project managers and waste plant in the past. In contrast, the plans for the biomass plant in Lund were cancelled due to high resistance from local groups, who were not as familiar with the project manager and were suspicious of the company's motives.

Geographical factors
The *climate* in countries can vary and the local climate can therefore influence which project is initiated at which location; for example the sunny north of Poland has better potential for solar energy. Yet the *availability of suitable locations* turned out to be one of the most important factors influencing the societal acceptance of new energy projects.

Many projects slowed down or were even cancelled due to siting controversies. The problems also seem to be somewhat different in urban and rural contexts. These problems can have a judicial origin but can also be initiated by opposing local neighbours or have security reasons. An example are the problems BP had with creating local acceptance for opening a hydrogen station nearby London for the CUTE project (see Annex 1, Case 20). In Sweden the success of the biomass project in Vasteras was influenced by the easy acceptance of the new biomass plant by the neighbours who were already used to living near a waste plant. (Annex 1, Case 7). In quite a few of the case studies, locating the project on an existing industrial site was a successful way to avoid disruption of the local environment.

These examples show that features of the local context often become influential in terms of how they are experienced by relevant stakeholders. As discussed in Section 6.1, context can also be understood in terms stakeholder networks, which are local, yet cross the boundaries of the local context to extend to national and even international levels. The stakeholder networks that emerged in local contexts are discussed in more detail in the following chapter.

Table 6.2 *Local factors influencing new energy projects*

Factors pertaining to the local context	Examples of relevance for new energy projects
Political factors	
Power of local government	Influence of decisions of local government on the project.
Policies for urban planning and financial involvement in new energy	Influence of local policies concerning urban planning and financial involvement in new energy on the project.
Impacts on the local environment	Impact of the project on local environment influencing the societal acceptance.
Influence of individual local public figures	Personal influence of public figures on the (acceptance) of the project.
Socio-economic factors	
Availability and perception of natural resources	Stakeholder confidence in feasibility of project due to (perception of) availability of sufficient resources on the location.
Attitude to ‘foreign’ (non-local) investors	Stakeholder confidence in external (non-local) project partners influences their acceptance of the whole project.
Importance of local energy independence	Usefulness of arguments supporting project visions based on willingness to become locally energy independent and to insure local security of supply.
Interest in employment opportunities and presence of local economic development policies and programmes	Social and economic support available for projects from stakeholders that support development of employability locally.
Availability of local competence and infrastructures	Existence of local competence and infrastructures influences the support of stakeholders for the project.
Cultural factors	
Trust in local institutions	Stakeholders’ trust in local project partners and institutions.
Tradition of top-down vs. bottom-up movements	Project partners’ ability to mobilize resources locally from the top down or from the bottom up.
Historical experiences	Local experiences with the location/technology/initiator or other aspects of the project.
Geographic factors	
Climate	Natural endowments and demands for energy due to temperature, wind, etc.
Availability of suitable locations	Possibilities and problems encountered in the location of the project.

7. Stakeholder involvement and societal acceptance of new energy technologies

This chapter focuses on how the case study projects engaged with stakeholders in order to achieve alignment between the technologies and their local and national contexts, including the interests of various parties influenced by and capable of influencing the projects. Even though the issues arising in connection with different technologies and contexts are different, it is possible to identify some common elements, interaction patterns, types of issues and factors in stakeholder management that promote societal acceptance.

The first part of this chapter focuses on describing “who participates and in what ways?” in the case study projects: first, by elaborating on the concept of stakeholders and then by identifying the roles that stakeholders had in the different projects. The role of project partners as a specific category of stakeholders is discussed in Section 7.2. Section 7.3 identifies different patterns of stakeholder involvement, Section 7.4 explores the issues that arise in this process and Section 7.5 examines how projects attempted to align different interests. Finally, the role of the project manager is considered in Section 7.6, and we identify factors that characterise the management of successful processes.

7.1 New energy projects as social networks

In the following section, we describe the kinds of social networks that evolved around the case study projects. We overview the kinds of actors involved in the case study projects and the kinds of expectations and resources that they brought to the project. Let us first discuss how we define ‘stakeholders’.

From the perspective of organisations, stakeholders can be defined as ‘any group or individual who can affect or is affected by the achievement of the organisation’s objectives’ (Freeman, 1984) or ‘people who affect, and are affected by, the company’ (Post et al., 2002). There are many ways of defining who is a stakeholder, and which stakeholders are important. Table 7.1 shows a (non-exhaustive) overview of what different authors perceive as stakeholders.

Table 7.1 *Different definitions of stakeholders. Source: Maessen et al. (forthcoming).*

	Preston (1990) GE Co. early 1930s	Preston (1990) Sear's 1950	Freeman (1984)	Clarkson (1995)	EU Green paper (2001)	Kaptein & Wempe (2002)	Van Empel et al. (2003)	Beloe et al. (2004)
Employees	X	X	X	X	X	X	X	X
Company				X				
Shareholders/owners	X	X	X	X	X	X	X	X
Investers					X			
Customers	X	X	X	X		X		X
Suppliers			X	X				
Business partners						X		
Competitors			X			X		
Unions/trade associations							X	X
NGO's					X	X	X	X
Special interest groups			X	X				
(Local) communities		X	X	X				X
Society						X		
The general public	X							
Future generations								X
Citizens							X	
Media			X	X				
Consumer (advocates)			X		X			
Environmentalists			X			X		X
Governments/public authorities/regulators			X	X	X		X	X

In the Create Acceptance project it was agreed that a simple notion of stakeholders as those individuals or groups influenced by the project, or ones that can influence the project, would suffice. The degree to which stakeholders can have an influence on a project can differ, for example in terms of their power to influence, their basis of legitimacy or the urgency of their claim (Mitchell et al., 1997). However, we decided that no *a priori* measures of the importance of different stakeholders are called for, because such issues can change during the project and are dependent on the characteristics of the project. We thus adopted an empirical, rather than a normative or instrumental approach to stakeholder analysis (see, e.g., Donaldson and Preston, 1995). Nonetheless, a general distinction was made between three sets of actors:

1. *Partners/shareholders* surround the project and constitute its core, they are linked to the project through formal arrangements that institutionalise their resource commitment, and they have relatively clear principal-agent relations[14]. They have a direct influence on the project.
2. *Stakeholders* can influence and are influenced by the project, but do not have a formal commitment or relationship with it. Compared to partners, they have less direct means to convey their influence.
3. *General actors* can enter or exit stakeholder status at different points of time (e.g., the media); their relation to the project changes over time. Their influence on the project is usually more diffuse.

This is illustrated in Figure 7.1 showing a 'circle of stakeholders' (Maessen et al., forthcoming).

[14] Principal-agent relations refer to relations in which one party, the principal (e.g., an investor), entrusts another party, the agent (e.g., a manager), to make contracts and manage resources on his or her behalf (see *Palgrave Dictionary of Economics,* 1987).

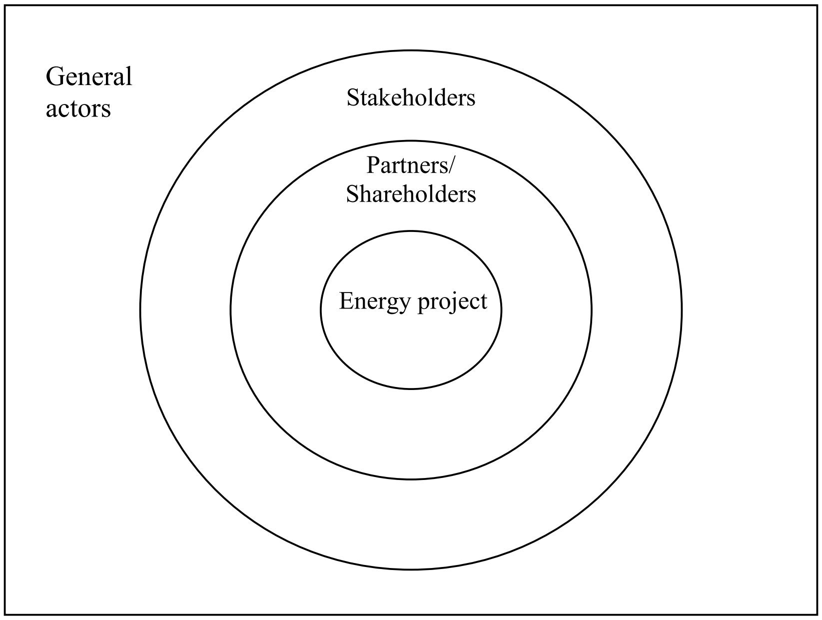

Figure 7.1 *The circle of stakeholders*

Table 7.2 presents an overview of different parties involved in the projects studied. As 'partners', we have listed those parties that are linked to the project through formal arrangements: for example, they are represented in the project management group or some other groups involved in the governance of the project, or they have committed funds to the project. The 'stakeholder' column presents the parties that are influenced by the project or exert an influence on it, but do not have formal agreements with the project. The 'general actors' column presents parties that do not sustain long-term relations with the project, but can become stakeholders to the project at some time during its course.

In order to highlight the relevant parties, the lists in the table are *limited to parties that actually had some involvement in the project* over the period studied and in the issues considered. Other parties have most certainly been influenced by the project in one way or another, and vice-versa, but have not perceived of themselves as having any relation to this specific project. It is also important to note that the depiction of the parties involved in the project is constructed in hindsight - it was not always obvious to the project initiators at the start who their stakeholders would be.

We can see that the projects involve quite different kinds of networks of actors, and thus partners and stakeholders have different roles in the project. Stakeholders are often on different levels: local, national and even international. In the following, a brief overview is given of the different types of parties involved in the cases.

Partners: Many of the projects involved some sort of public-private partnership. For example, a number of the projects were managed by a company, but in close co-operation with some local government actors. Some of the projects involved a consortium of companies as partners (e.g., London CUTE, Lund and Västerås Biogas, ECTOS). Very often, national or EU funding agencies were involved in the projects; they are considered partners here because of their financial contribution and the ensuing power to influence the project. Some projects chose to involve representatives of the local municipality as partners, while community-initiated projects often involved partners providing funding or expertise to the project.

Stakeholders: Some projects had selected, in advance, some key stakeholders - important 'gatekeepers' or customers that the initiators aimed to enrol in the project. This was the case, for example, in the PV Accept project focusing on the installation of PV panels on public buildings. Architects, designers, museum authorities were important gatekeepers making decisions on building exteriors, and the organisations owning and managing the buildings were natural key stakeholders.

Users and local residents most commonly appear as stakeholders in the project. In the energy efficiency projects, they usually were a specific target group, such as homeowners in the cases considered here. In the other projects, they usually were the local people living in the vicinity of the project - sometimes also with more specific roles such as members of the local council, neighbours of the plant, landowner, potential subcontractors for the project, or current or future employees. They can often be potential customers of the plant at the same time. Other stakeholders can include regional authorities, companies providing services related to the project and companies with some sort of competitive relation with the project.

NGOs are indicated in Table 7.2 as 'stakeholders' or 'other actors' (or in one case, 'partners') depending on the project. In some projects, environmental NGOs had a clear stand and influence, whereas in other projects they have remained more in the background, only participating at some specific point. It is also important to note that NGOs may have somewhat different positions from the local residents or 'the general public' on specific new energy projects - being more supportive in some cases, and less in others. Their positions cannot therefore be taken as a 'proxy measure' of the general or local opinion.

Other 'general actors' that became stakeholders of the project at some stage include the media, as well as other organisations or institutions that participated in the project at some stage in a way that shaped its course. Some of the projects have had an impact beyond their immediate sphere of action in the sense that other municipalities have adopted the practice developed in the project. Sometimes the resources of specific actors have been needed: for example, in the Umbria bioenergy case, after initial failures, a number of new local actors were enrolled in the project.

Table 7.2 *Overview of partners, stakeholders and other actors in the cases*

Project	Project initiator	'Partners'	Stakeholders	General actors
Hannover social marketing, Germany	Municipal-funded agency (Hanover Climate Agency)	Funding agency; Advisory council; Public Services of Hannover	House owners; Local companies; The region of Hannover	Media
Low energy housing (LEH) Finland	Gvmt-funded agency	R&D institutes; Authorities; User representatives; Housing manufacturers	Potential customers; Initial buyer group	Ecological housing experts; Housing Fair organisation; Consumers and citizens
Geothermal: Podhale region	World Bank>PEC Geothermia (public-private company)	Gvmt fund; World Bank; Municiapities; Investors, Clients, Consultants	Existing and potential customers; Local companies	Local residents
Trintat Nova energy efficiency, Spain	Residents' association	Regional Government (different functions); Barcelona City Council; Expert team	Local residents	
Crickdale Biomass Power Station, UK	New energy venture company	Government agency administering renewable supply contracts	Local residents; Local farmers	NGOs
Bracknell Bioenergy, CHP Energy Centre, UK	Local council + real estate developers + renewable energy company	Developers; Energy company; Gvmt & EU funding; Regional gvmt	Local businesses; Local residents	NGOs
Bioenergy Village Jühnde, Germany	University; Government; Local residents & farmers	Government; Local mayor; Bioenergy co-operative; Companies; Committee of extnl experts	Local residents/potential customers	Other municipalities
Västerås Biogas, Sweden	Waste mgmt company (together with local farmers & municipality)	Municipality (different functions); Local farmers; Local energy company; State (funding)	Local residents; Local politicians; Regional permit authorities	NGOs
Lund Biogas, Sweden	Waste mgmt company local municipality	Municipality(different functions); Local farmers; Local energy company; State (funding)	Local politicians; Local residents; Regional permit authorities	NGOs
Pannon Power Biomass, Hungary	Energy company (district heat + electricity)	Forestry companies; Contractor; World Bank (carbon financing)	NGOs; Authorities; Competitors (chipboard comp.); Local residents	
Umbria local bioenergy projects, Italy	Several projects, mainly by local businesses	Local companies; Fuel suppliers (farmers, forest owners, saw mills); Local authorities	Local residents	Regional co-operation forum; Expert consultancy; Agritourism entrepreneurs

Project	Project initiator	'Partners'	Stakeholders	General actors
EOLE 2005 Wind France	Government ministries	Energy agency; EdF; Other companies	NGOs; Local actors	Media, Internet
Cap Eole Wind France	Local Member of Parliament	Local subsidiary of German wind energy firm, Local redevelopment project operator	Local residents, residents and Mayor of neighbouring towns, interest groups for cultural preservation, local authorities and administration	Media
Sulwaki region Wind Poland	Regional government	Municipalities; Donors; Consultants; Grid operator; Project group	Potential (foreign) investors; Local farmers; Other local residents; NGOs	
Szelero Vep Wind Hungary	Special non-profit local company	Austrian wind company, local government, citizens and companies of Vep	Local authority, local landowners, local residents, various state authorities, national grid operator, regional electricity supplier	Other wind energy companies, Renewables associations, Media
Pommerania region Solar, Poland	Research institute (EC Brec)	Cities; National federations; Camping site operators	PV Installers; Tourists	Media; Local residents
Barcelona Solar Ordinance	Local NGOs; Barcelona City (Councillor for Sustainable City)	Barcelona City (different functions); Regional Energy Agency	Local residents; Professional & trade associations	Other municipalities and the national government
PV Accept Solar Italy	Universities	Tech companies; Municipalities & local partners; EU funding	Non-participating municipalities; Architects and designers; SMEs; Tourists	Local residents
Solar Home Systems, South Africa	Government	Special companies created to provide rural PV as a utility	Rural residents	?
Solar Water Heaters, South Africa	City of Cape Town	National electricity company, government (funding), NGOs and service providers	Residents and potential customers (high- and middle income + low income)	NGOs, UN (CDM)
London CUTE Hydrogen	Public-private partnership	Daimler-Chrysler; BP; City; Gas company; EU+national funding; Bus companies	Local residents; Local councillors; Residents' association; Local Planning Committee	Media
Berlin H2Accept Hydrogen	Berlin bus company	Business partners; Research institutes; EU	Local residents/customers of the bus service	Media
ECTOS Hydrogen Reykjavik	Venture company: Icelandic New Energy (INE)	Consortium of energy companies; Daimler-Chrystler; Shell; EU	Local residents/customers of the bus service; Iceland Energy Authority	Media
CRUST $C0_2$ capture and storage	Dutch Government	Gaz de France, Shell/NAM	Other companies; NGOs; Scientists	Dutch citizens; Media; EU & IPCC
Snohvit $C0_2$ capture and storage	Large energy company: Statoil	Other investors; Customers (with long-term contracts); Government (as large owner of Statoil)	NGOs; Local municipality; Local residents & businesses; Other petroleum companies	Parliament; Media; EC Court; IPCC
Schwarze Pumpe $C0_2$ capture and storage	Large energy company: Vattenfall,	Research Institutes; Federal Government	City Council & administration; Local residents; NGOs	Media

Project	Project initiator	'Partners'	Stakeholders	General actors
Blue Energy, Netherlands	Research institutes, companies	Research institutes, companies	Experts, potential funding providers (government and private)	Public figures, General public

It is interesting to note that few of the projects engaged in systematic stakeholder identification at early stages of the project. Thus, there are few examples in which the project managers had tried to consider whom the project influences and who can exert an influence on it, and what the expectations of those parties might be. Thus, the stakeholder network has unfolded in the course of the project, sometimes resulting in surprises for the project initiators and partners.

As already touched on earlier, it is important to note that partners' and stakeholders positions can evolve during the course of the project (not reflected in Table 7.2). This evolution is an important feature of the social networks building up around new technology projects (e.g., Kemp et al., 1998; Åkerman et al., 2005). In our case studies, for example, stakeholders' commitment could build up so much that they wanted to become partners in the project - for example, in the Bioenergy Village Jühnde case, 10% of the local residents decided to contribute financially to get the project started. On the other hand, some parties could gain the feeling that they have been 'demoted' from the role of partners to stakeholders if they are not allowed full influence on the project. This was the case in the Podhale geothermal project, where the composition of the project Board was altered so that not all participating municipalities were represented, which led to problems in the project. Partners could also exit the project on this own initiative. Originally, the Lund Biogas project had widespread support within the municipal administration, as well as by some active local politicians. As resistance among the neighbours of the planned facility mounted, the support in the municipality broke down fairly rapidly, and a municipal administrative body then actually dealt the final blow that terminated the project by refusing to start a new zoning process for the facility. Finally, a project might also instigate the institutionalisation of a new stakeholder group, as in the French EOLE 2005 case, in which local resistance movements were eventually institutionalised in a nation-wide organisation, *Vent de Colère*, opposing industrial-scale wind power deployment.

7.2 Project partners: bringing in resources and expectations

The wide range of partners involved in the projects reflects the complexity of new energy projects. Partners naturally bring resources into the projects, including financial resources and expertise in different industrial fields and technology applications. Furthermore, public sector involvement can bring to the project the possibility to influence legislation and other policy instruments in favour of the project (cf. Snohvit case). Local actors involved in the project can perform important tasks in bringing information about the local context into the project, as well as in communicating about the project to their local stakeholders (cf. the Podhale case). Partners can also contribute to the project through credibility and legitimacy - e.g., by involving reputable organisations or by involving user or NGO representatives.

Partners with financial resources and expertise can be especially important for projects based on citizens' initiatives, such as the Trinitat Nova case, which was initiated by a local residents' association. Regional and city authorities contributed to the project financially, and later on, also the local Energy Agency was involved, as well as a company specializing in energy efficiency and renewable energy, Aguiasol, entrusted with investigating the technical opportunities. An important resource was also the Community team, a group of professionals and experts contracted by the residents' association to support the Community Plan, and in this specific case, the implementation of energy efficiency measures.

Many of the projects involved a fairly lengthy stage of negotiating expectations within the project. Sometimes, managing the cooperation among partners can be quite complicated and resource-intensive, as partners can bring somewhat divergent expectations to the project, including different time frames and institutional conditions. The Biomass CHP Energy Centre in Bracknell, UK, serves to illustrate some of the complexities involved. In this case, the new energy project, a biomass fuelled combined CHP energy plant, was linked to a plan for a broader urban regeneration project. It involved multiple actors, including EU funding, and aimed to integrate the new energy project into concerns for employment, economic diversification and town centre redevelopment. Making use of such synergies could be a good idea, but it can also involve problems. Because there were so many actors, interests and requirements involved already among the project partners, responsibilities for engaging with the local residents were unclear, and the project ran into problems when it was unveiled to the general public.

The expectations articulated in early stages of the project are constitutive in defining roles, attracting interest and building mutually binding obligations. In the case studies, partners articulated a range of expectations toward the projects. In most cases, 'partners' usually involved one or more parties with a financial interest, but at the same time, these parties usually also argued in terms of common benefits, such as providing solutions to climate change, developing new technology to promote national competitiveness or promoting regional economic development. In some of the cases these 'external' expectations and arguments on behalf of society also generated commitment within the projects to explore the actual effects of the project. Yet in some cases, such arguments for public benefits led to the development of problematic and insular representations of 'society' and 'users' that did not fully correspond to the realities experienced when the project 'went public'. (see Annex 1, London CUTE; Bracknell Biomass CHP Centre, Lund Biogas and Low Energy Housing Finland cases).

We could frame the different roles that evolved for project partners in terms of 'bridging' and 'buffering' (Thompson, 1967). Buffering means protecting an initiative from third parties that disturb the development. Bridging means collaboration, cooperation, or networking with third parties who are able to assist in the development of the initiative. In the new energy projects, buffering was obviously necessary in order to put together a 'presentable' project. For example, the partners of the Lund Biogas project spent a lot of time working in different kinds of expert groups on various aspects of the project and solutions for its problems. Yet in the case, this lengthy internal networking stage and the number of partners involved also seems to have created a false feeling of being in touch with all relevant stakeholders, which turned out not to be the case.

The bridging role of project partners implies that a diverse network of project partners can also help the project to anticipate and keep in touch with external realities. This was the case in the Västerås Biogas project, which involved a regional waste management company, local farmers, the municipality and the local energy company. The group was collectively able to anticipate a number of problems that the project might encounter, and take preventive action. Also, owing to the diverse network of partners, a new 'product' from biogas, automotive fuel, was discovered and selected as a new target for the project.

7.3 Patterns of stakeholder involvement

One of the prerequisites for stakeholder involvement is basic communication between the project and its stakeholders. This sort of communication involves providing information about the project, but importantly also, gaining information about the local context and the stakeholders concerns. Another set of communication issues in the projects involved articulating the vision and intentions of the project, on the one hand, and articulating stakeholders concerns, on the other. The projects dealt with these basic communication issues quite differently: some relying on more 'long-distance' communications and others on more interactive, face-to-face communication patterns.

The projects 'opened themselves' to external stakeholders at different stages in the project. In some cases, stakeholders were involved at a very early design stage and intense interaction continued throughout the project. Others focused their communications on 'key stakeholders' and were less interactive toward the general public. Some projects maintained a tight control on the flow of information into and out of the project throughout, whereas others had less distinct social boundaries, overlapping partner/stakeholder roles and intensive face-to-face communication with a range of stakeholders. We can also consider the involvement of stakeholders in terms of who took the initiative to engage and under which circumstances.

On the basis of these dimensions, we can identify four different patterns of stakeholder involvement that serve to broadly categorise the different cases. Table 7.3 presents these patterns, the cases in which they were prevalent and their typical characteristics. We first summarise the role of different forms of interaction (the columns in Table 7.3). We then turn to the 'patterns' of stakeholder involvement (row headings in Table 7.3) in order to consider how expectations are articulated and aligned in projects with different interaction patterns.

Forms of interactions in the projects

The first two columns in Table 7.3 consider how the projects provided information to stakeholders, and how they obtained information about the local context and the stakeholders. Basic forms of communicating about the project are classified into mass communications and face-to-face. In terms of communicating about the project, mass communications refers to non-interactive forms of communication such as communicating via the mass media. They allowed projects to reach many different parties, and could be helpful if diverse communication channels were used, but could also go unnoticed (as in the Berlin bus trials) or not be fully understood. In terms of gaining information about the local context, surveys are a similar, distal form of information gathering, which enabled the projects to reach large groups of people, but did not allow for interaction. Face-to-face interaction, in contrast, refers to meetings, open events and other forms of direct and interactive communications between the project and its stakeholders and among stakeholders. Face-to-face interaction can be planned and organised or 'naturally occurring', as in the case of a small tight-knit community where people can observe and discuss issues on an ongoing basis.

The cases reveal the importance of interactive, face-to-face communications in communicating the vision of the project and gaining information about the local context. An important task for communication in the projects is to create a forum and 'vocabulary' for discussing the project among stakeholders. This is especially important for technologies that are unfamiliar of 'invisible' like energy efficiency. This is reflected in the different outcomes of the Low-energy housing project from Finland, which mainly communicated with the public via the media and the Hannover social marketing project, which applied a broader set of communications including opportunities for face-to-face interaction. Moreover, face-to-face communications were also important in gaining information about stakeholders' concerns, because articulating concerns usually requires a social context in which people can discuss issues with others, gain information and reflect on it, enabling them to pinpoint more clearly what they like about the project and what worries them.

Table 7.3 *Forms and patterns of stakeholder interaction in the projects*

Case study	*Providing information about the project*	*Gaining information about stakeholders and the context*	*Opening the project to stakeholder influence*
1. Focus on key stakeholders			
Pommerania solar project	• Face-to-face with key stakeholders • Mass communications to the public	• Face-to-face with key stakeholders • Public opinion survey (before)	
PV Accept solar	• Face-to-face with key stakeholders • Mass communications to the public	• Face-to-face & survey of key stakeholders • Public opinion survey (after)	
Low energy housing, Finland	• Mass communications to the public • Face-to-face with key stakeholders	• Face-to-face & survey of key stakeholders • Public opinion survey (after)	• Internet discussions (initiated by members of the public)
CRUST $C0_2$ capture and storage	• Mass communications to the public • Face-to-face with key stakeholders	• Face-to-face with key stakeholders	• Written comments from stakeholders invited
Podhale region geothermal	• Mass communications to the public (also via municipalities) • Face-to-face with key stakeholders	• Face-to-face with key stakeholders • Customer survey (after)	
Berlin hydrogen	• Mass communications to the public • Face-to-face with key stakeholders	• Public opinion and understanding survey (before and after)	
South Africa Solar Home Systems	• Face-to-face with key stakeholders	• Understanding stakeholders through surveys	
Blue Energy	• Mass communications to the public • Face-to-face with key stakeholders	• Face-to-face with key stakeholders	
2. Diverse communications			
Hannover social marketing	• Face-to-face meetings with many stakeholder groups • Use of ‘multipliers’ to disseminate • Many forms of communicating with the public	• Face-to-face meetings with many stakeholder groups • One public open meeting • Customer surveys	
Västerås Biogas	• ‘Naturally occurring’ face-to-face contacts • Mass communications to the public	• Through ‘naturally occurring’ contacts between company and residents	• Legally-mandated public consultation •
Pannon Power biomass	• Face-to-face meetings with many stakeholder groups • Many forms of communicating with the public •	• Face-to-face meetings with many stakeholder groups	• Legally-mandated public consultation • WWF-organised conference • Follow-up civil forums (initiated by residents)
ECTOS hydrogen Reykjavik	• Face-to-face meetings with many stakeholder groups • Mass communications to the public	• Face-to-face meetings with many stakeholder groups • Public opinion survey (after)	• Legally-mandated public consultation •

Case study	Providing information about the project	Gaining information about stakeholders and the context	Opening the project to stakeholder influence
3. Early-stage participation			
Trinitat Nova energy efficiency:	• Many forms of communicating with the public • Face-to-face meetings with many stakeholder groups	• Face-to-face meetings with many stakeholder groups	• NGO initiative, participatory governance • Workshops and forums for residents and other stakeholders
Bioenergy Village Jühnde, Germany	• Many forms of communicating with the public • Face-to-face meetings with many stakeholder groups	• Open meetings for all stakeholders • Public opinion/customer surveys (before and after)	• Local residents involved in planning all aspects of the project
Barcelona Solar Ordinance	• Many forms of communicating with the public • Face-to-face meetings with many stakeholder groups	• Many stakeholders	• NGO initiative • Participatory governance • Public consultation
Suwalki region wind project	• Mass communications to the public • Face-to-face meetings with many stakeholder groups	• Survey of target groups (before) • Face-to-face meetings with many stakeholder groups	• Local stakeholders: consultation & mediation
Szelero Vep wind project	• Many forms of communicating with the public • Face-to-face info for interested parties	• Surveys (two separate dates) • 'Naturally occurring' via diverse contacts	• Civil forum
South Africa Solar Water Heaters	• Consultative community meetings	• Via 'naturally occurring' contacts	• NGO involvement in planning • Public consultation
4. Counter-participation			
Lund Biogas Sweden	• Face-to-face with key stakeholders • Late communication to the public	• Face-to-face meetings with key stakeholders	• Legally-mandated public consultation • Local protests
Crickdale Biomass Power Station, UK	• Late communication to the public	• Face-to-face meetings with local farmers	• Legally-mandated public consultation • Local protests
Bracknell Biomass CHP, UK	• Late communication to the public	• Late interaction with the public	• Legally-mandated public consultation • Local protests
Umbria local bioenergy, Italy	• Early projects communicated late, now mass media used, face-to-face meetings envisioned		• Local protests (early projects)
London CUTE hydrogen, UK	• Late communication to the public	• Late interaction with the public	• Public Inquiry (late)
Snohvit CCS	• Intensive communications with the public, also 'naturally-occurring'	• Face-to-face meetings with locals and key stakeholders	• Legally-mandated public consultation • NGO protests
Schwarze Pumpe CCS	• Mass communications to the public (limited), 'naturally -occurring'	• Via 'naturally occurring' contacts • and key stakeholders	• NGO protests
EOLE 2005 wind, France	• Mass communication to the public, face-to-face with key stakeholders	• -	• Legally-mandated public consultation • Local protests, National NGO established
Cap Eole, France	• Mass communications, local newspaper, public meetings	• Structured in the mandatory Public Inquiry led by state designated Auditor	• Protests by interested parties in neighbouring town

Apart from the type of interaction, important issues also include 'with whom' the project interacted and 'when'. In terms of timing their interaction, some projects started early and others *late.* An important starting point for stakeholder involvement is that stakeholders gain information about the project and about the implications of the project. In the Bracknell, Crickdale and Lund cases, in which the project was eventually aborted, local residents were informed about the new energy project quite late. If the project involved *unfamiliar technology*, people were also concerned about having to serve as a 'test-bed' or laboratory for an unproven, new technology. Furthermore, late information provision can also create uncertainties about the project managers' *intentions,* and hence generate mistrust, as was the base in the Lund and Umbria cases.

Some projects focused their interaction on key stakeholders whereas others made an explicit attempt to reach many different kinds of stakeholders or the general public. Communicating via partners or key stakeholders was helpful and sufficient for some projects, but problematic for others. For example, the French Wind EOLE programme was totally unable to anticipate the local resistance that arose, because the project managers based their views of the popularity of wind energy on information from a narrow group of 'key stakeholders', i.e., environmental organisations. They thus failed to capture local concerns, including the meaning of countryside and place for local people or the way in which people react to 'top-down' measures when they fear their local autonomy is threatened.

The last column in Table 7.3 refers to ways in which stakeholders gained influence on the project plans. Here, timing is also a key distinguishing category: some of the projects were legally obliged to organise public consultation (usually late in the project), whereas others opened up the project to public participation early. Finally, stakeholders could engage with the project without being invited. This could include some 'milder' forms of mobilisation in the upper rows - e.g., critical Internet discussions in the Low energy housing Finland case or forums organised by citizen groups in the Pannon Power case. These were not aimed to overturn the project, but to raise critical discussion. Most of the stakeholder mobilisation observed in the cases was, however, explicitly aimed to stop or stall the project.

The cases show that legally-mandated public consultation rarely managed to improve communications in the project. In uncontroversial projects, people often did not participate and in controversial ones, public consultation was often the first time that local people heard about the project, usually resulting in counter-reactions. This form of interaction seems to serve as a final 'public check' on the project, but if stakeholders have quite different expectations than those of the project, it is difficult to find common ground at that stage.

Patterns of stakeholder involvement

The previously-described elements combined in the cases to reveal four different patterns of stakeholder involvement. In the following, each pattern is exemplified by one or two cases in order to illustrate the dynamics of alignment or misalignment created by different types of stakeholder interaction.

1. Focus on key stakeholders. Projects focusing on key stakeholders would typically organise e.g., meetings with local officials, opinion leaders, gatekeepers and customers. Almost all the projects studied had engaged in this kind of close involvement of key stakeholders, but for these projects it was the dominant or even the only mode of interaction. These projects often had a clearly defined set of key stakeholders, and their impacts on other stakeholders or the general public were minimal. Projects in this category often interacted with the general public using more impersonal forms of communications, such as press releases or public opinion surveys to gain feedback of public responses to the project.

An example of a project following this communication pattern is the Pommerania region solar energy project, which focused on promoting solar energy use at camping sites. Camping site operators were the main target group; it was important to solicit their participation in order to increase the number of solar collectors installed. Camping site operators were involved through an information campaign, training, a survey of camping site operators and hands-on help in the installation of solar collectors. The project organised a help-desk to provide continual support for those interested or involved in installing solar collectors. Networks were also constructed among camping site operators by recruiting early adopters as ‘demonstration projects’, which agreed to share their experiences with others.

In this case, a specific target group had been selected with an appropriate symbolic link to solar energy - tourist sites are places where people enjoy the sun, which provides resonance with the use of solar energy at these sites. Yet many of the camping site operators were initially sceptical, and the project had to deal with a range of practical problems, such as providing credible information, reorganising service provision chains and providing operators access to peer experiences. Gradually, through a range of measures directed at the target group, the project managed to find ways to gain their interest, supply them with the necessary competences, and thus link them to the expanding network.

Another slightly different example focusing on key stakeholders is the Dutch CRUST project, which had an explicit focus on articulating the pros and cons of CO_2 capture and storage and understanding the acceptability issues involved. A set of key stakeholders representing different social interests were brought together to explore the issues and participate in the design of a demonstration project. One of the concerns that arose clearly from this process was the conflict between improving energy efficiency and capturing carbon from combustion processes.

The cases also show that communicating merely with key stakeholders can create problems, because information about the project may not reach all the necessary stakeholders, and projects may have difficulties in understanding the stakeholders and their context. This is particularly the case when there is a large social distance between the project managers and some of the stakeholders. For example, the Solar Home Systems case from South Africa provides evidence of a ‘disconnect’ between the energy service companies providing solar PV systems and the rural poor families who were their designated customers. The service providers had difficulties in understanding the problems encountered by very low-income customers, whereas the customers had difficulties in understanding solar energy and the way in which it was provided.

2. *Diverse communications*. The second pattern refers to two slightly different kinds of projects, yet both involving ample opportunities for face-to-face communications. One type, exemplified by the Hannover and Pannon Power projects, made systematic and consistent use of a diverse and sophisticated range of communications, allowing many opportunities for face-to-face communication: in the Pannon Power project especially, different kinds of forums and workshops, and in the Hannover case, different kinds of social marketing instruments making use of diverse media as well as social networks and social occasions. In other projects falling within this category, interactions were more ‘naturally occurring’. In small, tight-knit communities, project stakeholders can also often draw on a wealth of previous experiences or close contacts, which to some extent replace the role of more formal communication and participation processes. This was the case, for example, in the Västerås Biogas and in the Schwarze Pumpe CO_2 capture and storage project. Whether planned or not, continuity and access are important features of this communication pattern.

The Hannover social marketing campaign for energy efficiency shows how the diversity of communication patterns enabled a mutual articulation of the project’s vision and of the stakeholders’ positions toward it. The way in which the project was organised enabled the creation of new ‘vocabularies’, which is especially important for technologies that are unfamiliar or ‘invisible’ like energy efficiency. For example, the Hannover project involved a variety of measures to demonstrate what energy efficiency means and to popularise the concept of ‘energy modernisation’, e.g., by creating an emotionally charged logo and label: the model of a real polar bear called Irma. With this ‘Eisbär’ - one of the most beloved inhabitants of the Hannover Zoo - the campaigners gained a high level of attention for the problem of global warming and identification with the climate protection measures.. The project also made use of different kinds of ‘promoters’ and ‘multipliers’ - i.e., people with close and natural contacts with the target groups. Thus, the vision of energy modernisation was further translated by local mayors and consultancies providing energy audits. An important part of the campaign was to get people to talk about energy modernisation within their own social networks. Through such face-to-face discussions, people were able to develop social meanings for energy modernisation in the context of their everyday lives.

Energy modernisation is a relatively uncontroversial topic, but requires close participation by those implementing the energy modernisation measures. In the Hannover case, the project had ambitious targets, so a large group of homeowners had to be involved. The problem of alignment was thus one of finding reasons why people would be interested, providing knowledge of effective means, and of creating a social, economic and physical infrastructure to support people in implementing energy modernisation. In the Hannover case, this was accomplished by employing a range of different communication measures to reach target groups in appropriate ways, drawing on a good understanding from previous research of the motives for people to get involved. Close contacts also enabled the project to collect new information on an ongoing basis and adjust project plans. Involvement of promoters, multipliers and service providers enabled the simultaneous creation of a supportive infrastructure.

This pattern is also reflected in the Pannon Power project, which created a number of forums in which concerns could be articulated. One of the many issues that this process revealed was local people’s concern over the impacts of increased use of wood as fuel in the new unit of the Pannon Power district heating plant. The debate revealed that for local people, forests were viewed as having important intrinsic and amenity value, which they feared increased wood use would threaten. The project also maintained contact with local stakeholders on an ongoing basis through a series of ‘follow-up civil forums’ to monitor the project, mainly organised by the stakeholders themselves.

Face-to-face communication does not ensure representation of stakeholders’ interests, but it provides a channel - at best a continuous one - for different parties to share their concerns. Also, other than ‘formally coded’ information can be shared; for example, stakeholders have the opportunity to monitor the project manager’s behaviour for an extended period of time, enabling trust to develop if it is deserved.

3. Early-stage participation: A number of the cases examined here that involved early stage participation were projects initiated by local residents. Yet early-stage participation was also important in cases that were initiated by external project managers, and served a specific and important purpose in projects that could be potentially be controversial, such as in the Suwalki region and Szelero Vep wind energy cases, which applied sophisticated procedures for involving local people in the project, hearing their views, articulating concerns and negotiating project characteristics with them.

Early-stage participation can also be necessary in gaining support for policy measures that are important for implementing the technology. The Barcelona Solar Ordinance and the Solar Water Heaters project in Cape Town, South Africa, describe the development of local legislation to create the conditions for the deployment of solar thermal energy technologies. Such measures can speed up the application of a new technology considerably, but require intensive involvement by stakeholders in order to clarify their implications, take into account different viewpoints, and thus create societal acceptance of the measure.

The Bioenergy Village Jühnde exemplifies how early-stage participation can extend to project design. After one of the 17 villages volunteering to participate in the project had been selected on the basis of the number of residents willing to join the new heat supply system, eight working groups were set up for residents to participate in the planning of various aspects of the project, including the company to be established, technical aspects of the facilities and distribution systems, as well as the public communications activities of the project. Moreover, a system of coordination and information among the groups was established in the form of planning workshops and meetings. Thus, the entire bioenergy system was grounded in the local residents' visions and a combination of local knowledge and external competences.

From the case itself it is not obvious why the use of biogas could be potentially controversial. Yet contrasting the case with the Lund Biogas project (see below) shows that it is not self-evident that people would be enthusiastic about applying this technology in their own community. Many of the participatory and alignment-creating features of the Bioenergy Jühnde case were present already in the design stage and in the way the project was adapted to the local context. Nonetheless, the project increased its popular support and social embeddedness through organising both formal channels for residents' influence and informal and emotional communications, which engaged an ever-widening network of support.

4. Counter-participation refers to the fourth pattern. It concerns actions by stakeholders to counter the project or alert decision-makers to its problems. The cases include many projects in which local residents mobilised to question the design of the project, and often managed to overturn the entire plan. The case of the EOLE Wind programme in France illustrates how counter-participation can be mobilised on a national scale, with national associations established to challenge the programme, which many citizens perceived of as insensitive to local concerns and needs. Two of the CCS projects illustrate a somewhat different pattern of counter-participation. In these cases, existing national-level NGOs mobilised to oppose the project. This provided for media coverage on a national scale. In the Snohvit case, an NGO, Bellona, also took legal action against the project manager, which resulted in significant delays and cost overruns. In contrast, local people were mostly fairly positive or neutral toward the project.

The Lund Biogas project serves as a text-book example of how counter-participation arises (Khan 2004). The residents of Dalby, the planned location, were informed of the project fairly late, in connection with a public consultation meeting required for the environmental permit application. The meeting was held just before the permit application was filed, and all technical details had been fixed at that point. Residents requested further meetings, but the project manager had not planned for such further consultation. The residents' main concerns related to odour, traffic, landscape effects and impacts on a nearby protected area. But there was also a perceived credibility gap: the first consultation meeting had shown off the company as uncaring and uninformed about local conditions, and this impression was difficult to correct. After the consultation meeting, local resistance toward the plant started to mobilise. A small opposition group formed, consisting of both neighbours of the site and residents of the village. They held door-to-door discussions with other residents, handed out flyers, circulated a petition, wrote to local authorities and organised meetings. In this way, they managed to mobilise significant local support for their position. Later, the developer tried to counter by organising local meetings, but at this point, the company's actions were no longer perceived as credible. As local resistance mounted, the previous support for the project among the municipal administration and politicians dissolved.

Influence of early public participation on conflicts

Before going deeper into how different interests were aligned, or failed to reach alignment, it is interesting to consider the *role of early-stage voluntary participation* in pre-empting the emergence of movements opposing the project. It is often argued that involving stakeholders at an early stage in the project allows them to influence project design, to gain sufficient information on the project to alleviate their concerns, and to allow project managers to understand the local context and integrate it into project design (e.g., Khan, 2005; Soerensen et al., 2001; Szarka, 2006). Our case studies provide some further - though not conclusive - evidence in support of this claim. None of the cases that involved early voluntary participation provoked counter-participation movements.

Most of the projects, however, did not include early public participation mechanisms for all of their stakeholders. Not all of these non-participatory projects encountered stakeholder opposition. In fact, some projects applied very ‘low-involvement’ forms of interacting with stakeholders, such as communications through the media, and even these were quite limited in some cases. These projects had the following characteristics:

- Some were quite small in scale or did not have significant external effects over the time-period studied. This includes the solar energy projects, the energy-efficiency and geothermal projects, the Blue Energy case and the pilot with one hydrogen bus in Berlin.
- Others made up for the lack of formal, early stage public participation through long-term face-to-face communication and involvement by key stakeholder groups. This is the case for the Pannon Power and Västerås Biogas projects. In this context, the Dutch CRUST project can be termed extremely early stage as it was more explorative than oriented toward a specific deployment project; hence the general public was represented by different stakeholder groups.

This does not mean to say that participation could not be helpful for such projects, as well. The Bioenergy Village Jühnde case shows that even where ‘naturally-occurring’, close contacts exist and the technology is well-adapted to the local context, formal mechanisms for participation can help to promote societal acceptance and reinforce the project. On the other hand, the case studies also show that participation is not a panacea for project success (in terms of outcomes). In the Trinitat Nova case, problems arose from a lack of financial and administrative support from the municipality, and in the Suwalki region wind energy case, investments were stalled due to policy uncertainties, while in the Szelero Vep case, problems were encountered in gaining authorisation for installing further capacity due to national restrictions on wind power grid connection. We could thus say that early-stage participation is a facilitating condition for project success, but not always a sufficient one (cf. McLarern Lorigan *in press*).

Drawing an equation between early-stage participation and societal acceptance, however, is a quite simplistic way of analysing the interactions in the cases. Often, different stakeholders have slightly different expectations and interests concerning the project, and stakeholder involvement (in its different forms) evolves over time to align, or misalign, these expectations and interests with the original vision of the project.

7.4 Issues arising from stakeholders’ expectations

Communication and participation should be considered in terms of contents, and not merely form. In the case study projects, the stakeholders often had different expectations from those of the project initiators or partners. The following section presents a classification of the different kinds of issues that arose when stakeholders’ expectations confronted those of the projects. A summary of this classification is given in Table 7.4.

In some cases, expectations clashed over the issue of the *distribution of costs and benefits in the project*. For example, environmental benefits were expected to accrue to the global community or for national authorities to meet their greenhouse gas reduction targets, but the environmental impacts on the local community were expected to be negative in the form of increased traffic and emissions, loss of landscape value and biodiversity. This led the local residents to question ‘why here?’ Concerns about the distribution of costs and benefits can also pertain to how they are distributed among stakeholders - as in the Suwalki region wind energy case, where there were some concerns voiced by people with properties adjacent to potential turbine installations. They can also relate to conflicting interests between two adjacent communities, as exemplified by the Cap Eole wind project. Finally, distribution of costs and benefits can be uneven over time, as in the case of energy efficiency, where people are expected to make large up-front investments that will - hopefully - pay back over time.

In a broader sense, renewable energy and energy efficiency imply *new roles for citizens and consumers.* Decentralised forms of energy production (and conservation) imply a shift in the formerly dominant roles of different parties in the energy market. Citizens, local communities and energy users are much more intimately involved in the production of renewable energy, and they may even become energy producers and suppliers. This new role is most visible the Bio-energy Village Jühnde case, but it is also implicit in many of the other cases. Adopting such new roles requires a period of learning and mutual adjustment, and involves a search for new forms of economic and social organisation.

Similarly, new energy projects are often only one solution to different kinds of problems, and there can be intense *competition among different new energy technologies*. This is most obvious in the case of CCS, where stakeholders can question ‘why this technology?’. Other competitive relations can emerge too - for example, a project that supposedly provides new opportunities for forestry or agriculture (e.g., in the Pannon Power and Umbria cases) can run into competition with other economic activities making use of these resources, i.e., ‘why use this resource for energy?’

All new energy projects also involve *uncertainties*. There can be genuine uncertainties about the performance, impacts and future relevance of different new (and old) energy technologies. There are also always uncertainties about policy and market development, which can influence the performance of different new energy technologies. For example, in the case of energy efficiency, the financial impact of the investment depends on the future price of energy and future instruments to promote energy efficiency. Finally, any project necessarily involves uncertainties and potential unforeseeable contingencies. Those in charge of the project may not be so concerned about these uncertainties, because they feel they can control them, whereas those influenced by the project but not exerting an influence on it are naturally more concerned (cf. MacKenzie, 1998). This is an issue of perspective and trust, but the fact that there are always uncertainties is undeniable, as illustrated by the uncertainties involved in various stages of the Blue Energy project.

Sometimes, there are also *fundamental value conflicts* involved in the different actors’ expectations. This could relate, as described above in the context of the Pannon Power case, to contrasts between the intrinsic vs. the instrumental value of natural resources. They can also relate to who has legitimate claims on the use of land and other natural resources - e.g., the Barents Sea in the Snohvit case of the French countryside in the Wind EOLE case. This latter case also reflects the different meanings attributed to ‘place’ by local and non-local actors. From afar, a local pond can appear to be an insignificant small body of water, while locals can view it as a place of great natural beauty, as was experienced in the case of the Lund Biogas controversy. Finally, there may be different views of what constitutes desirable economic and social ‘development’, as reflected in the Snohvit case. Some viewed the project as a great opportunity for the North to become a vibrant economic centre, while others feared it would destroy indigenous local livelihoods and threaten the social fabric of the region. According to the case study, both views are supported by some evidence, and the conflict is thus also over priorities in regional development.

These previously mentioned differences in expectations are presented in Table 7.4 as being closer to ‘genuine’ conflicts of interest, whereas some other differences in expectations are presented as being closer to ‘management and communication failures’, although the distinction is never clear-cut. But ‘genuine’ interest conflicts cannot easily be solved by more communication - unless people start to perceive of their interests differently from earlier. They need to be solved through bargaining - sharing economic benefits for example - or mitigation - for example, reducing environmental impacts or leaving some areas of natural value untouched. A search for a totally new solution might also potentially lead to a resolution of the conflict. Basically, however, they require changes in the project design. Some of them, such as fundamental value conflicts, are impossible to solve completely in the short term. The ‘management and communication’ problems, in contrast, can to some extent be solved during the project by dealing with stakeholders in a more responsible and respectful manner.

Problems presented on the right-hand side of Table 7.4 include problems resulting from a lack of *trust* or a failure to communicate. For example, a *lack of experience with the technology* and a lack of precedents were one important source of concern among stakeholders. Such concerns were in evidence in the London CUTE hydrogen case, the biomass projects in Crickdale and Bracknell (UK) and in Umbria (Italy), as well as in the Low-Energy Housing case in Finland. Other examples include stakeholders’ doubtfulness about, for example, large companies’ motives in a number of projects, as well as concerns in the Podhale geothermal district heating project about the company’s potential future intentions to raise prices.

A failure to articulate and communicate the vision of project convincingly was one of the problems encountered in some of the cases, and it has been also previously identified as one of the weaknesses of many renewable energy projects (e.g., Devine-Wright, 2004b; Firestone and Kempton, 2007). For example, in the Low-energy housing case from Finland, people were unfamiliar with a ‘systems concept’ of low energy housing and failed to see the urgency of a need to introduce energy efficient solutions. Similarly, in the early projects in Umbria, local people equated bioenergy with waste incineration; here, the project managers’ failure to communicate the visions of the project resulted in mobilisation of local resistance, which rapidly overturned most of the early efforts to establish local bioenergy systems. There were also cases in which project managers *failed to account for their projects’ plans adequately* - e.g., in the Lund Biogas case, failing to explain the reason for selecting a specific site, and in the Bracknell case, failing to explain why the urban renewal project ‘suddenly’ included a plan for a bioenergy plant.

Communication problems can also go the other way around - *project managers fail to ‘see’ early signs of problems or to ‘hear’ the concerns of stakeholders.* One example is the London CUTE hydrogen project, where project managers were quite focused on the technology, and failed to identify other concerns, such as local people’s dissatisfaction with the chosen site for a fuelling station. In the Podhale geothermal case, until a large survey study was conducted, project managers had failed to recognise the limitations placed by the local socio-economic context - people could simply not afford to invest in connections to the geothermal district heating system. These kinds of problems can be exasperated if the project managers choose to surround themselves only with partners who are positive toward the project.

Many of the cases indicated a *lack of suitable procedures for incorporating stakeholders’ concerns in the project*. The Bracknell bioenergy case illustrated the need to find explicit processes within which public engagement could be situated, and identified a lack of clarity about how public engagement should occur and whom it should involve. This is in contrast with the Suwalki region wind energy case, in which a very systematic procedure for stakeholder identification was applied, and stakeholder consultation was organised in the context of an ongoing negotiation and mediation process - all before any investment decisions were even planned.

There are naturally always some conflicts of interest, and everyone cannot have what they want all the time. Moreover, costs and benefits are ‘in the eye of the beholder’, i.e., depend on the perspectives and values of different social actors. There is always some uncertainty and risk in every decision, and hence all decisions are to some extent a matter of trust and communication, on the one hand, but also involve a degree of genuine risks and costs, on the other.

The reason why we stress the existence of ‘genuine’ interest conflicts is to complement the tendency to focus on communication and project management during the course of the project. Some conflicts are embedded in the project design, and can only be mitigated and not totally resolved once the basic project design has been set up. For example, the conflicts over the Snohvit LNG plant with CCS relate to the broader issue of the role of oil and gas exploration in the Barents. The location of the project was a fundamental parameter in the project design - the project was set up to exploit the gas reserves off the Northern Norwegian coast. However well the project could manage to communicate and negotiate, it is impossible then to avoid the fact that it is one of the first steps in exploiting an area that some would like to leave totally outside energy production use.

Table 7.4 *Stakeholders' expectations that led to conflicts in the case projects, on a continuum between 'genuine' conflicts of interest and management and communication issues*

'Genuine' conflicts of interest ←		→ *Management and communication failures*
Distribution of costs and benefits: • Environmental benefits for the national and global community are gained at the cost of environmental deterioration of the local environment. • Economic benefits do not accrue to the local community. • Costs and benefits not equitably distributed among local actors. • Benefits do not outweigh costs. • Costs and benefits are unevenly distributed over time. • Changing roles of producers and consumers require new forms of economic organisation. • Competition with other economic activities. *Fundamental value conflicts:* • Instrumental vs. intrinsic or amenity value of nature. • Different views on desirable future economic and social development. • Different meanings of 'place' and 'space' for local and non-local actors. • Different views on who has legitimate claims in land use. *Fundamental limits to knowledge and certainty* • Genuine uncertainties about the performance, impacts and future relevance of different new energy technologies. • Fundamental uncertainties related to any kind of project plan.	*Lack of trust:* • Lack of experience in interacting with project manager, lack of precedents. • Poor earlier experiences of similar projects or managers. • Concern that the project does not care about the local community. • Unwillingness to invest in a system due to concern about how its economics will be managed in the future. *Communication problems:* • Poor articulation of the vision of the project. • Lack of knowledge about the technologies, their performance, their various impacts, and their future relevance. • Lack of knowledge about project plans. • Lack of understanding in the project of local concerns, culture and communication patterns. *Negotiation problems:* • Lack of suitable systems and procedures for negotiation and arbitration. • Poorly defined roles and responsibilities.	

7.5 Negotiating expectations and creating alignment

It is important to realise that expectations are not only 'negotiated' in formal discussions and negotiations. 'Negotiating expectations' refers to all kinds of moves, counter-moves and adaptations to the technology project before and during the course of the project. We can roughly identify two kinds of negotiation or alignment-creating processes in the projects (Table 15). Some were present already at the design stage - in how the project was planned to integrate as wide a range of expectations as possible. This was based on the project managers' good understanding of different stakeholders' needs, or the early involvement of stakeholders in the planning stage. During the progress of the project, alignment creation is more an issue of negotiating contradictory expectations by adapting the project to stakeholders' needs or attempting to influence their positions.

Following the first column in Table 6.5, alignment among different stakeholders' expectations in naturally best created by *grounding the project design in stakeholders' needs.* This can be done by selecting a location where people are already enthusiastic about the technology, or selecting for a specific location a kind of project that has synergies with the local economy or provides benefits for stakeholders. The Szelero Vep wind energy project is a prime example of how projects can be designed so that different parties' (in this case, the project operators' and the local residents') interests are aligned from the start. Allowing stakeholders room to influence the decisions in the project also promotes alignment at the design stage.

As projects are also part of an historical continuum (Engwall, 2003); hence, projects are more likely to achieve alignment if they have *good relations with the community*. Because lack of trust was a feature fuelling conflicts and controversies in the projects, successful projects more likely made use of local partners and opinion-leaders. In the Podhale geothermal and Pommerania solar cases, the involvement of local municipalities or cities in the project was identified as a critical resource. In some cases, projects learned 'the hard way' the importance of having a local champion. In the Umbria cases, the early projects had been initiated by small operators and had almost immediately been overturned by local protests or other problems. The bioenergy proponents finally identified the need to find a trusted and disinterested party able to make connections with other stakeholders and the local media.

Successful projects seem to be capable of making *appropriate use of external resources*. This means that good practices, expertise, and financial and institutional support are drawn into the project from outside in a manner that reinforces the project. For example, many of the project ideas in the case studies derived from somewhere else - even the citizen-initiated Barcelona Solar Ordinance was based on a model from Germany. Well-designed projects, however, spent a lot of time and resources on 'reinventing' foreign ideas in the local context.

Anticipation of the necessary changes facilitated alignment. Projects were more likely to achieve alignment of different expectations if they started out with an initial understanding that expectations can be different and even conflicting, and that the project will imply many different kinds of changes. Projects accomplished alignment more smoothly if they were linked to ongoing, supportive change processes. For example, in the Västerås Biogas case, the project was linked to changes in waste processing practices in the locality, to ongoing local sustainability efforts, and to changes in local agricultural practices. Projects can also anticipate issues at the design change by assessing risks and developing mitigation plans for potential negative effects, as was done in the Pannon Power case.

The characteristics of the technology-in-context also have an influence on how difficult or easy it was to achieve alignment. It is obviously easier to align interests when the technology in question is small in scale - i.e., touches on fewer different interests - and involves few negative external effects. Slow upscaling allows for social learning - people are able to learn about the technology and observe the effects without being subjected to risks of harm or even disturbance. In some cases, technologies that made use of unique local resources also managed to build up a supportive network of local people. Examples include ECTOS in Iceland, making use of the unique renewable energy base allowing for the production of clean hydrogen. Even the carbon capture and storage cases, which were quite controversial on the national scale, seemed to enjoy a degree of local support because they drew on unique local resources, providing the locality with a feeling of having a special advantage.

Only a few of the projects considered here were specifically designed with a view to create societal acceptance. Turning to the second column in Table 7.5, how alignment was created in the process of the project, one of the most important means was by *intensive interaction with stake-*

holders. In projects that attempted to promote new solutions such as energy-efficiency, making use local ‘multipliers’ and ‘promoters’ helped to diffuse the project’s message in locally-appropriate and self-reinforcing ways (cf. the Hannover case). Communication or non-communication also sends ‘messages’ to stakeholders about the motives of the project managers - a failure to communicate can be interpreted as a lack of concern and respect.

Significant alignment may be difficult to achieve without *continuity and availability* of the project managers to the stakeholders. The London CUTE hydrogen project is an example how a conflict situation can be salvaged through intensive communication - which means both providing information and listening to concerns. After intense opposition by local residents and a Public Inquiry, the project initiator, BP, organised four public meetings providing residents the change to speak directly with BP representatives, which significantly improved the relations between BP and the Residents’ Association.

Well-organised participation is exemplified by the Suwalki region wind energy case. This project was conducted in preparation for potential investments in wind energy in the region - i.e., before any concrete investment plans had materialised. The project included an information campaign at the start of the project and initial informal contacts with the local communities in connection with installing wind speed monitoring equipment. A mail survey was targeted to a large number of households near the most promising wind sites, to gain an initial picture of local opinion and concerns. Public consultation sessions were organised for people with land in suitable areas for wind turbines with advice provided for farmers when dealing with potential investors, and a second round of public consultations was conducted on publication of an environmental impact assessment report, including presentations of visual projections and data on the spatial dissemination of noise. Also, a range of local stakeholders were represented in the project’s Advisory Board, and mediation was applied to resolve conflicts between locals and potential investors.

Incorporating stakeholders’ expectations into the project requires *flexibility and adaptability* from the project. For example, in the Västerås Biogas case, the original location of the project had to be abandoned when the local energy company decided to build a district heating system in the area, which would undermine the possibility to sell the gas to households. This change of location also gave rise to the decision to upgrade the gas produced to vehicle fuel quality, and thus find a new market for the product. Almost all the process-successful projects evidenced some adaptations to plans during the course of the project in response to stakeholders’ concerns or needs.

Both the project and its stakeholders need to learn during the process. The most successful cases, such as the Bioenergy Village Jühnde case, created joint forums for learning, providing local people with self-confidence and a sense of ownership over the local bioenergy system. Often, training is also needed for companies providing services for the project, such as installation or maintenance services, and such training was developed and provided in many of the cases. In the Snohvit case, the argument that the project would boost the local economy was central for national-level support for the project. To ensure that this would be the case, the project managers undertook an extensive supplier development programme in order to enable local suppliers to meet contract requirements.

Pilots and demonstrations served to provide hands-on-experiences of how unfamiliar technologies operate. Small-scale pilots and demonstrations were applied in many projects, and for example in the Umbria case, development of a ‘showcase’ was identified as one of the key measures to alleviate concerns and create confidence in local bioenergy systems. There may also be some significance in the fact that the ECTOS hydrogen project and the Suwalki region wind energy project involved some hands-on participation by ordinary residents who voluntarily helped with small technical tasks.

Learning can also occur beyond the project itself. Some of the projects were able to serve as local exemplars, eventually enacting changes in the institutional environment. For example, the Barcelona Solar Ordinance was eventually used as a model for new legislation in Catalonia, and finally on the national scale. Also projects that failed or experienced many problems in managing the alignment process can contribute to learning on the institutional level. In the French Wind EOLE programme, the failures of the initial, top-down approach eventually lead to a bottom-up learning process and alerted national-level decision makers to the need to develop policies that are more sensitive to local needs - hence, creating conditions for future alignment.

Table 7.5 *Project design and project process characteristics promoting alignment of interests*

Project design characteristics ◄	► **Project process characteristics**
Plans well-grounded in stakeholders' needs • Initial high acceptance & interest toward the technology • Synergies with e.g. local economy, urban regeneration, tourism, LA21 • Benefits for stakeholders, e.g., improved living conditions, environmental or economic benefits • Room for stakeholders' autonomy and decisions in project **Good existing relations with the local community** • Good reputation of the operator • Champions: involvement of local operator as initiator or partner, networking with local opinion-leaders **Appropriate use of external support** • Support by regional, national or EU authorities • Use of intermediary organisations • Reputable organisations, regional networks, international interest (e.g., IPCC) • Involvement of experts, authorisation bodies **Systematic change management plan** • Anticipation of problems, risk assessment and development of a strategy for mitigating problems • Linking the project to ongoing change processes **Characteristics of the technology-in-context** • Small-scale, slow upscaling, low external effects • Ability to make use of unique local resources	**Interactive communication** • Diverse & interactive communications • Open discussion, clarification of viewpoints • Multipliers & promoters • Attention to 'language' **Continuity and availability** • Development of good personal relations, continuity and long-term presence • Open communication channels and continued negotiations • Face-to-face communication channels **Well-organised stakeholder participation** • Early involvement of stakeholders • Long-term participatory process with clearly-defined roles and powers • Open communication channels and continued negotiations **Flexibility and adaptability** • Ability of the project managers to absorb new information • Ability to adapt the plan according to stakeholders' concerns **Competence-development and learning** • Available competences and system for their transfer • Training & education for local suppliers and service providers • Pilots and demonstrations • Ability to change institutional environment

7.6 The role of the project manager

The terms 'manager' or 'management' can be interpreted in different ways. Modernist concepts of management have assumed that managers can plan, design, implement and control processes in isolation, failing to acknowledge the mutual interdependence of all organised action (e.g., Raelin, 2003). In the same vein, many of the case projects that ran into acceptability problems exhibited a hubris of self-sufficient management. Those in charge of the project failed to recognise their need to have a place to locate the project and their need to have users for the technology and their need for the resources of others than themselves and the shareholders. They also failed to appreciate the special circumstances of the local context in which they would like to locate their project or the different meanings and perceptions that stakeholders can have of their project.

Managers whose projects were successful recognised these needs, or partnered with parties able to alert them to them. These managers reflected the following qualities:

- Having or developing a constructive relationship with the local community.
- The ability to see the project from a broader perspective and understand local processes and contexts.
- Flexibility and the ability to adapt expectations and plans to circumstances.
- Continuity and patience - aligning different interests takes time.
- The ability to reflect on action even in a fast-moving environment - evaluating before, during and after the project.
- Use of contextually appropriate procedures - no one size fits all.
- The ability to coordinate among many different factors and stakeholders.

The project managers' *relations with the local community* presents different kinds of challenges for different types of project managers:

- Large companies have extensive resources, but the London CUTE case shows that they may find it difficult to focus their attention on issues that are important for local stakeholders. Their size and 'foreignness' to the local context may also raise questions about their intentions. Large energy companies do not always enjoy the best of social reputations, and arguments cast in terms of public benefits may meet with cynicism among some segments of the general public.
- Small companies may lack the resources to build up the expertise, legitimacy and 'critical mass' required to introduce innovative solutions in a context where they are very novel. The early attempts in the Umbria case show that individual entrepreneurs failed because they were unable to prepare the suitable surrounding conditions for their projects. This led the local operators to explore common solutions and consider setting up an impartial intermediary organisation to promote the local bioenergy system.
- Projects initiated by the national government can suffer from a technocratic approach toward local people. Local government can experience constraints to long-term planning, and lack expertise and resources to successfully accomplish the necessary change processes. In many of the cases, municipalities chose to join forces and network with experts and companies.
- Citizen-initiated projects usually enjoy good relations with the local community. Their problems relate to bringing in resources from the outside. As the Trinitat Nova case shows, local resources can also run thin with time, indicating the need to revitalise local activism from time to time.
- All kinds of projects share the challenge of finding the right kinds of partners, who appropriately support the project ('buffer' it) but also enable it to keep in touch ('bridge') with external stakeholders. Intermediary organisations may be suitable partners to perform such functions, as they can link with different stakeholders but are not dependent on them.

The ability to see projects from a broader perspective places a special challenge on people with a strong commitment to a vision. Entrepreneurs have a high level of commitment to their projects, and often are very good at warding off criticism toward it (e.g. Berglund, 2004). Persistence is a very important quality of effective project management, but in process-successful projects, commitment and persistence were coupled with an ability to view the project and their own actions 'from the outside', from another perspective. In many of the case studies, project managers learned, sooner or later, that stakeholders can have quite different viewpoints on the project than the managers themselves. Many also explicitly stated that they wished they had learned this lesson sooner. Some were aided in this process by project partners with linkages to other stakeholders. *Flexibility and adaptability* are related issues, and are similarly necessary counterbalances to entrepreneurial perseverance and commitment.

Continuity and patience are needed to carry projects through while maintaining good relations with stakeholders on an ongoing basis. Engaging with stakeholders cannot be a 'one-off' task to be done and then forgotten. The mutual learning that takes place and the negotiation of expectations require time. The time needed for projects that involve stakeholders from the early stages onward has been one of the sources of concern by previous authors, and project managers may also have misgivings about the amount of time required and the related costs. Time and resources for stakeholder involvement can be particularly limited in 'normal' deployment projects, which need to make efficient use of capital allocated to the project. The case studies dealing with highly participatory projects show that stakeholder involvement, indeed, takes time and ties up resources. Yet projects that have failed to engage have incurred even larger costs and delays due to counteractions by citizen groups.

The ability to reflect on action refers to the need to 'take stock' and change course when necessary, even in a fast-moving project. Many of the projects have failed to recognise threats or opportunities that arise during the course of the project, even though they became evident in hindsight. The case studies suggest that self-evaluation before, during and after the project would have been helpful. One possibility is to include milestones at appropriate stages in the project.

Use of contextually appropriate procedures refers to the variability of local contexts, different technologies and different stakeholder constellations appearing even in the limited set of case studies. The new energy technologies involve different levels and types of concerns. The analysis of the case studies indicated that there are a variety of ways to create a successful process, and there are also different kinds of paths to failure. Thus, there is no 'one size fits all' solution, but project managers need to find the appropriate ways to engage with different kinds of stakeholders in different contexts.

The ability to coordinate among many different factors and stakeholders refers to the complexity of tasks related to stakeholder engagement, but also the complexity of other tasks that project managers need to deal with on an ongoing basis. Success - in terms of outcomes - is not only dependent on stakeholders' views or local acceptance. It can relate to 'objective' characteristics of the technology and the project, and especially to the relation of the project to broader market and institutional factors. Project managers hence face the difficult task of dividing their attention among different kinds of management issues.

The case studies also raise some further issues, which relate to contextual sensitivity. New energy projects almost invariably make use of ideas, technologies and artefacts that derive from beyond the local context in which they are applied. This can entail a positive introduction of new knowledge and resources into a location where they did not previously exist. However, the analysis of controversial and successful projects shows that new technologies cannot be merely 'dropped' into a new context without preparation or adaptation. In the ideal situation, new technologies are 'reinvented' in the local context. The Barcelona Solar Ordinance case exemplifies how this notion of 'reinvention' could work: an idea from a foreign context (in the Barcelona case, an exemplar from a German city) was taken up by local NGOs and processed intensively in order to understand how it could be produced using local resources, and how it could be modified in order to ensure local benefits.

Contextual sensitivity also implies sensitivity in terms of timing. The cases show that timing is often a crucial issue for projects - technological visions often refer to future events that will make the project a logical and necessary solution to problems and conditions that will materialise in the future. Sometimes these events may unfold somewhat more slowly than expected by the project, and at other times, the project may have to struggle to keep up with policy and market developments. Such events can include market developments such as the price of competing technologies, pending legislation, or the development of supporting technologies.

8. Conclusions: challenges for new energy projects

The contribution of this study has been to investigate the historical and recent acceptance of new energy technologies in different geographical contexts and with a special focus on the scope and diversity of different technologies. This has been done by reviewing previous studies, compiling other secondary data and statistics, and by conducting a set of case studies of 27 recent controversies or successful projects in different parts of Europe and in South Africa. These case studies and the contextualising background data consider the following new energy technologies: energy efficiency (with a focus on households), bioenergy, solar energy, wind energy, hydrogen (with a focus on transport fuel use) and CO_2 capture and storage, as well as geothermal energy.

In the literature, social or societal acceptance can refer to acceptance by different social groups, or by persons in different roles (opinion poll respondents, voters, consumers, neighbours or NGO members). Hence, different ways of investigating societal acceptance produce different results. In the present report, we have operationalised societal acceptance at the project level in terms of how well the projects were able to achieve alignment among the expectations and interests of different stakeholders and the vision of the project. We have called such projects that manage these issues well ones that exhibit a 'successful process'. The relation of 'successful processes' to 'successful outcomes' is complex, as exemplified in Table 4.5 in Section 4.4. Successful processes are not a sufficient condition for successful outcomes, but they are very often a necessary or at least a contributory condition.

The aim of the study has been to identify factors influencing the successfulness of new energy projects, with a special focus on 'successfulness of the process'. In other words, the aim has been to identify factors that characterise successful processes in different contexts, and hence are also likely to promote societal acceptance also on a broader, more general level. We identified a range of such factors, which will be discussed in the following paragraphs. Nonetheless, it is important to note that creating societal acceptance, both within and beyond individual projects, is a long process. Moreover, evaluations of project success will change over time, and the successfulness of individual projects contributes only gradually and indirectly to the successful adoption of a new technology in society at large.

The previous literature and statistics[15] pointed to some regional, national and local differences in the uptake and acceptance of new energy technologies, including ones that are not fully explained by differences in natural endowments. These differences are not, however, due to inherent characteristics of different nationalities, or even fully explicable in terms of individual policy instruments. They are the result of a co-evolution of new technologies, their institutional contexts, and social action and meaning. For example, the original Danish and German success stories in implementing wind energy were influenced by an emergent tradition of community ownership that built on existing legacies.

One important component in this co-evolution is the way in which individual new technology projects *interact* with their local historical, cultural, institutional, social, economic, material and geographical context. Thus, societal acceptance is not necessarily an issue of accepting or rejecting a specific technology, but rather pertains to the way in which the technology is introduced in a new context. Important features influencing the process include the policy, economic, social, cultural and infrastructural conditions existing in different locations, as well as the timing of projects vis-à-vis changing framework conditions.

[15] See Chapters 2.2 and 4.1.

There are reasons to stress the role of context in new energy projects. New energy projects are currently proliferating and populating new contexts in Europe, as well as other parts of the world, and these contexts may be quite different from the ones in which they originated. This highlights the importance of policy, institutional, market and cultural contexts. New energy projects also often have a number of impacts on their immediate environment, some of which may be positive, but other may be negative or perceived of as such. Whichever way, they bring about or require change in the local context.

Many of our findings confirm the observations made in previous empirical and review studies. Thus, we can reiterate a number of the ‘lessons’ presented in Chapter 2.3. These are management principles and procedures that appear to be widely applicable to many kinds of new energy projects. Socially acceptable projects tend to (1) be locally embedded, (2) provide local benefits, (3) establish continuity with existing physical, social and cognitive structures and (4) apply good communication and participation procedures. Such procedures include the recognition of different interests and perceptions, the articulation of local concerns and visions, the use of diverse and existing information channels and formats, and the maintenance of ongoing dialogue. Moreover, our case studies suggest that in order to produce the desired techno-economic outcomes (in addition to creating societal acceptance), projects may also need (5) the capacity to leverage the social support they have gained to overcome difficulties in financing, policy instability or lacking market power. Due to the geographical scope of the study and the range of technologies considered, we have also been able to identify some specific contextual factors and features of the different technologies that suggest specific priorities for project managers aiming to achieve societal acceptance.

This section provides a concise summary of our findings in the form of key challenges for new energy projects when attempting to create societal acceptance.

1. The challenge of introducing appropriate projects in appropriate contexts

Different country and local contexts set different conditions for the emergence of societal acceptance. We have identified a set of contextual features that project managers and partners should investigate before launching a project (Table 7.1). These are contextual factors that influence project successfulness in terms of ‘process’, but also - directly or indirectly - in terms of ‘outcomes’ by shaping the context with which the project must achieve mutual adaptation.

It is important to note that such factors operate on both the national and the local level, and should be investigated separately for both levels. Recent data on some of these issues - pertaining to the national level - are provided in Annexes 2-6, but even more important are the sources of data, because statistics become rapidly outdated. We also stress that project managers need to become acquainted with their *local* context, and make use of a range of local sources of data and information.

Three kinds of managerial implications can be derived from these contextual factors. Firstly, they can be used to identify more or less suitable contexts for different projects. Secondly, they can be used to alert project managers to special features of the local context that need to be taken into account when designing and carrying out projects. Thirdly, policy makers and other ‘representatives of the local context’ can use them to develop an awareness of the suitability of different policy contexts for the deployment of new energy technologies.

Even more importantly, project managers should make use of all opportunities to explore the context of their projects. Section 7.3 indicated some of the ways in which previous projects have gained knowledge of their context, while at the same time developing relationships with their stakeholders. The previous analyses framed the issue of introducing a new technology using the metaphors of ‘dropping’ vs. ‘reinventing’. Reinventing a technology in context can rarely be accomplished alone; hence the importance of stakeholder involvement (see points 2 and 4 below).

Table 8.1 *Factors pertaining to the national and local context influencing project success*

Factors pertaining to the national and local context
Government policies
• Types of government policies on new energy technologies and related topics
• Stability of national policy
• Policy culture (consensus, negotiation, confrontation)
• Centralisation of national government
Socio-economic factors
• Availability and perception of natural resources
• Energy prices
• Technology and other input prices, costs
• Perception of foreign investment
• Importance of energy independence
• National competing technologies and industries
• Interest in employment opportunities and regional economic development
Cultural factors
• Trust in institutions
• Tradition of top-down vs. bottom-up initiatives
• Environmental awareness
• Historical experiences
• Attitudes to new technology
Geographic factors
• Climate
• Availability of suitable locations

2. The challenge of identifying critical issues and stakeholders for evolving technologies

Different technologies and different projects have different critical stakeholders and desirable outcomes in terms of societal acceptance. The emphasis in the case studies considered here has been on local residents, but the projects also include ones in which users, local authorities, non-governmental organisations, experts, competitors, infrastructure providers or financial stakeholders are critical. Moreover, ‘accepting’ involves quite different kinds of activities from the stakeholders’ perspective.

It is important to note that the critical issues that we have identified are based on a limited set of cases and are highly site-specific. The issues identified are thus indicative of the range and variety of issues arising in connection with different technologies, rather than conclusive or exhaustive. Moreover, it is also important to understand the culturally and historically evolving nature of societal acceptance. While it is necessary and useful to articulate societal concerns at an early stage of technological evolution, some impacts and relationships only become evident in concrete applications of the technologies and in the kinds of social dynamics that they initiate. Hence, societal acceptance is an evolving and changing phenomenon because it does not relate only to the technology itself but to the economic and social networks that build up around it. Table 7.2 presents some critical issues and success factors for different new energy technologies[16] on the basis of *recent* experiences; with time, new issues may emerge to join them. The table includes both factors with a direct relation to societal acceptance (i.e., factors contributing to ‘process success’) and critical factors for the application context of different technologies (i.e., factors also influencing ‘outcome success’).

[16] Only technologies which are represented by multiple case studies are included in the table. For other technologies, see the case studies (Annex 1) for more details.

Table 8.2 *Critical issues and success factors for different new energy technologies*

	Key problems and uncertainties	Factors likely to promote success
Household energy efficiency	High public awareness and participation needed Existing public acceptance high but understanding low Individual investments; high transition and transaction costs Competing technologies	Financial incentives Information campaigns Support through social networks Potential to promise users autonomy from suppliers
Bioenergy	Siting issues Input logistics: managing economics and social and environmental impacts Variable level of public awareness and understanding in different regions	Respecting existing (regional) networks Integrating local information into project design Management of local benefits and drawbacks Potential to enhance local energy independence
Wind power	Siting issues Land-use intensity Local costs and benefits and their equitable distribution Diverging views of landscape preservation Concerns about health and environmental impacts System operation concerns (intermittency)	Adaptation to local context Management of local benefits and drawbacks Involving local residents in the process
Solar energy	Costs Difficulty of developing economies of scale Small-scale applications require significant user involvement Mistrust in technology as a reliable energy source Small-scale PV: gaps in grid connection rules and bureaucratic procedures Insufficient competences in installation firms	Possibility to link decision making to other (construction) decisions and specify or mandate simple technologies Investment relevant to scale Demonstration investments at public institutions Potential to enhance local/personal energy independence Prosperous and fresh image
Hydrogen	Siting of distribution infrastructure Reputation of the operator or initiator Relations between expectations and current implementation scale Management of risks	Roots in fresh, clean technology Risk tolerance in context Shared investment Sense of shared benefits
CO_2 capture and storage	Low public awareness and understanding NGO resistance on issues of principle Potential exposure to legislative requirements Immature technology High investment, low income Perception that large companies are involved in order to improve image Storage and safety issues emerging?	High interest in the research community Possibilities for shared investment and common ownership?
Other: geothermal energy	Risk and environmental impacts depend on local conditions and technology applied In space heating applications, investment competes with other energy sources and other investments	High public awareness Trust in companies and partners involved Positive impact on local air quality

3. The challenge of reflecting on action at appropriate stages

Projects can only be planned up until a given point in time; implementing a project requires action, and action provides further lessons for the plans and designs of the project. Ideally, the knowledge gained through action and observation of the consequences of action should lead to learning and should thus influence the way in which the project is managed. This can be termed reflection in action (Schön, 1987).

In the context of managing a new energy project, successful reflection on action can be translated into questions that need to be asked at different stages of the project. Table 7.3 presents a summary of the questions that our case study projects had to address pertaining to the societal acceptance of their projects. It is roughly divided into the 'design stage' and 'implementation'. With the benefit of hindsight on previous projects, we have moved to the earlier 'design stage' some questions that have often not been addressed by previous projects until the project was in motion. Thus, we recommend that if projects desire to create societal acceptance, they will start asking these kinds of questions early on, but continue monitoring their social impacts and stakeholder relations throughout the project, and develop a reflective approach to issues and new information arising in the course of action.

Table 8.3 *Questions that help projects to increase the likelihood of creating societal acceptance*

Questions to be answered at the design stage	**Questions to be answered during implementation**
How does the project interact with the local context (or alternative contexts considered): • what kinds of external effects does it involve; does it require user adaptation? • in which ways might it benefit or harm the local context (physical, economic, social or symbolic) and how equitably are the benefits and risks distributed? • what synergies or competition may the project involve with other ongoing developments? • how does it relate to historical experiences and existing competences of those present in the local context? Who are potential partners and stakeholders of the project on the local, national and international level: • whose resources could be important for the project: who might be important 'bridges', 'champions' or 'multipliers'? • who might the project influence and who might exert an influence in it? • how does the project relate to stakeholders' interests and concerns? How will stakeholders be involved and their concerns addressed: • how will stakeholders be informed about the project and how will its vision be communicated? • how will information about stakeholder's concerns be collected? • how early can stakeholders be involved in the project and what aspects of the project design could they influence? • how will different stakeholders interests be represented? • how will stakeholder involvement be integrated in the time frame of the project?	How are communications managed on an ongoing basis: • how does the project keep 'in touch' with its stakeholders (formal and informal channels)? • do new stakeholders emerge as the project evolves? • how can stakeholders monitor the progress of the project and the unfolding of its impacts How is competence developed during the project? • in what ways can stakeholders interact with the project as it unfolds? • what competences are needed for making use of local resources and how do such competences develop? • is there evidence of mutual learning and adaptation? How does the project deal with issues that arise during the project: • issues of representation and division of responsibilities and powers? • resolving potential conflicts among different stakeholders' interests? • dividing attention between stakeholder management and other aspects of project management (technical, operation, market, financial, etc.) When and how should the project 'take stock' and reflect on achievements and remaining problems: • evaluation and milestones? • opportunities for modifying the project according to lessons learned?

4. The challenge of interacting with the 'right people' in the 'right way' and at the 'right time'

In this context, 'right people' refers to partners that bring resources and support the project but also enable the project to interact with its external environment, and to the stakeholders who are influenced by or can influence the project. The case study projects show that there are no *a priori* reasons for any stakeholder group to represent any other group (i.e., e.g., no obvious reasons for municipal decision makers or NGOs to have the same expectations as local residents). This challenge requires that project managers identify the stakeholders, issues and concerns in the local context (for example, the extent and types of external effects resulting from the project; the potential user adaptation required; and the potential links of the project to broader policy debates).

The 'right way' of interacting ensues from the kinds of concerns, issues and people involved. Examples of better and worse practices in the cases indicate some generic issues: starting early and continuously, the importance of articulating concerns, mutual learning, and the need to ensure clarity of purpose and division of power and responsibilities. Formal structures usually facilitate the process and make it more transparent, empowering and credible, but should be complemented with face-to-face interaction and 'keeping in touch'. Formal participation processes do not preclude the need for project managers to listen and learn continually. Project managers should not only involve stakeholders, but also involve themselves.

5. The challenge of combining process success with outcome success

Taken together, and considered against the historical background, the cases highlight the importance of successful processes for the future of individual projects, and for the future of other similar projects that will follow them, i.e., process successfulness also has a 'public good' aspect. This is one a reason for policy makers and institution-builders to support such efforts, also beyond their immediate impact on outcomes. There are naturally other reasons too, such as supporting democracy and promoting social well-being.

In Section 7.6 we identified some management principles that enabled project managers to successfully align the stakeholders' expectations and those of their projects. These are factors contributing to 'successfulness in terms of process'. These included developing good relations with the local community, viewing the project from a broader perspective, flexibility, adaptability, continuity and patience. They also include involving project partners that provide resources for the project but also enable continual channels for interaction, and finding the best ways to interact with the various stakeholders (elaborated above in point 4), as well as reflection at appropriate stages (elaborated above in point 3).

Ideally, projects should be successful both in terms of outcomes and in terms of processes, and the projects considered here show that this is possible. Moreover, as was shown in Sections 4.3 and 7.3, successful processes are likely to contribute to successful outcomes - and unsuccessful processes to unsuccessful outcomes - even though the relationship between outcome and process is not straightforward or deterministic. Yet in order to achieve successful outcomes, project managers need to consider other aspects of the project, as well, including technological, operational, market and financial issues. Table 7.4 outlines some of these issues on a continuum of more process-related vs. more outcome-related tasks, while recognizing that the issues are not totally independent of one another (for example, managing the labour force, local contractors or investor relations obviously depends on the ways in which the process is managed and different stakeholders' interests are aligned). Project managers thus face the challenge of dividing their attention among these different management tasks and integrating the potentially conflicting demands of different stakeholders, including stakeholders at different levels (local, national and international). This problem will be dealt with in more detail in Work Package 3 of the Create Acceptance project.

Table 8.4 *Examples of management activities that are important for successful processes and successful outcomes*

Process-related ⟷	**Outcome-related**
• Developing good relations with the local community • Articulating and understanding the project's and its different stakeholders visions and expectations • Flexibility, adaptability and continuity in managing change • Involving project partners that enable continual channels for interaction and reflection at appropriate stage • Maintaining ongoing dialogue with stakeholders	• Technical and infrastructure issues (e.g., selecting the most viable technologies, gaining access to grid connections) • Operational issues (e.g., gaining and managing the labour force and contractors, managing the logistics of fuel supplies) • Market issues (e.g., competition with other technologies, energy sources and industries; access to international markets) • Financial issues (gaining and maintaining investor confidence, dealing with policy support instruments that influence the viability of the project)

9. Contribution of the report to the Create Acceptance project

One of the important purposes of this report is to provide input for the development of a new multi-stakeholder tool in the Create Acceptance project. This tool should help project managers to enhance the societal acceptance of their projects and the new energy technologies on which they are based. The review of previous research and our meta-analysis of previous projects have highlighted the complexity, diversity and evolving nature of the phenomenon of societal acceptance. The report has also shown that there are degrees of societal acceptance, and while it is not possible to create societal acceptance through any simple 'recipes', it is certainly possible to increase acceptance through improved project design and management procedures.

The immediate contribution of the present report is to the following stage of the Create Acceptance project, Work Package 3, which aims to design a multi-stakeholder tool for managing new energy projects. The report has contributed to the next stage of the project in five different ways:

- First, the report provides confirmation and illustrations of the need to revise the original Socrobust tool, as identified already in the WP1 report (Jolivet et al., 2006). Societal acceptance is indeed one factor that can influence the successful introduction of new energy technologies, and hence project managers need to take into account a broader range of factors than those proposed in the original Socrobust tool. One of the fundamental issues raised by this report is that project managers should not only consider how the project can change its context, but also how the project can adapt to its context. Tables 8.1 and 8.2 in Chapter 8 indicate which factors can be relevant in this task.

- Second, the report has identified specific opportunities and threats that relate to the societal acceptance of new energy technologies under the conditions presented by different local and national contexts. This has also allowed us to identify factors that are likely to promote project success, and which are thus desirable features to include in new energy projects where possible.

- Third, the case studies in Annex 1 can serve as 'learning histories' for project managers to explore potential issues that arise in different contexts and in connection with different technologies and project designs. The case studies will hopefully serve to alert project managers to critical issues as well as enable them to view projects from new perspectives, including those of the different stakeholders involved. Accounts of projects that have been completed and evaluated can also provide project managers with the 'benefit of hindsight' and thus help them imagine the impact of their own actions on future events.

- Fourth, the report has initiated the task of structuring the issues related to managing societal acceptance by identifying different types of stakeholders and their roles, decisions influencing societal acceptance made at different stages of the project, managerial tasks and questions to be answered in connection with societal acceptance, and potential conflicts that can arise with other managerial tasks. This work will continue in WP3 of the Create Acceptance project.

- Fifth, the report and its underlying analysis have also produced some recommendations of how societal acceptance should be understood and investigated in the work of WP3. If we are to understand and shape societal acceptance, the methodological approach to the research developed in WP2 demonstrated the importance of the analysis being framed within a systemic, multi-level technological transitions framework, rather than focusing merely on specific sites in which the technology is situated. The analysis illustrates the necessity of historical reflection on how existing socio-technological regimes afford possibilities and structure constraints on new technologies.

The novelty that the five-step methodological approach developed here adds (Hodson et al., 2006) is that it provides a basis to research the *relationships* between societal acceptance, technology development and local contexts. The implications of the interrelationships between societal acceptance, technology development and local contexts are that:

- The analysis shows that local contexts are active in promoting societal acceptance and requires recognition that technology and local context are mutually shaping.

- The analysis also highlights that we need to be sensitive to the complex and multi-level nature of ‘local contexts’, the differences and similarities between them, and consequently the importance of sensitivity to context, while not assuming that contexts fully determine outcomes.

- The analysis demonstrates the importance for those concerned about societal acceptance of systemically developing social learning about *processes* of societal acceptance by understanding previous experiments, local context and pressures for technological transitions.

- The analysis clearly demonstrates that societal acceptance is not a dichotomy of acceptance or rejection but, rather, we can identify differing indicators and degrees of societal acceptance. This means that methodologies for cross-cultural, multi-context analyses of societal acceptance need to be flexible whilst also being robust.

- The consequences of this analysis is that intermediary organizations have an important role in creating amenable environments for accelerating the societal acceptance of new energy technologies. Seeing intermediaries as a strategic locus allows an understanding of the multiplicity of issues and the multiplicity of actors across local, regional, national and supranational political levels involved in producing societal acceptance. Intermediaries reduce the burden on the project developer, connect them to and help them navigate among other actors and in the context.

These observations will be further utilized in the work of Work Package 3 and further development of the original Socrobust tool (see Jolivet et al., 2006; Poti et al., 2007) into a multi-stakeholder tool for socially robust new energy projects.

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Interview with Mr. Patrick Schmidt from the Ludvig-Bölkow-Systemtechnik GmbH, June the 19th per telephone email (Case 21)

Kårstad, O. (2006): Telephone interview with Mr. Olav Kårsta, Statoil, August 3, 2006. (Case 24)

Lehoczky, István, Head of Forestry Department, Duna-Dráva National Park (Case 9)

Máthé, László, Forest Officer, WWF Hungary (Case 9)

Nádas, József, Director, State Forest Service, Kaposvár (Case 9)

Peredi, Ágnes, Journalist, energy editor, Népszabadság (Press) (Case 9)

Pogány, Anikó, Director of strategy and business development (when implementing the project), Pannonpower Rt. (Case 9)

Ruwisch, V. (2006): *Pers. communication with V. Ruwisch, project manager IZNE.*

Sigfús Ingimarsson ambassador for Germany in 1995 - 2000. and Bragi Arnason Professor (Case 22)

Appendix A Case studies

1. Hannover social marketing for energy efficiency, Germany
2. Low energy housing (LEH), Finland
3. Trintat Nova Ecocity energy efficiency project, Spain
4. Crickdale Bioenergy Power Station, UK
5. Bracknell Biomass CHP Energy Centre, UK
6. Bioenergy Village Jühnde, Germany
7. Västerås Biogas project, Sweden
8. Lund Biogas project, Sweden
9. Pannon Power biomass conversion, Hungary
10. Umbria local bioenergy projects, Italy
11. EOLE 2005 wind energy programme, France
12. Cap Eole wind project, France
13. Suwalki region wind project, Poland
14. Szlero Vep wind project, Hungary
15. Pommerania region solar energy project, Poland
16. Barcelona Solar Ordinance, Spain
17. PV Accept solar project, Italy
18. Solar electricity home systems, South Africa
19. Solar water heaters, South Africa
20. London CUTE hydrogen fuelling station, UK
21. Berlin H2Accept hydrogen bus trials, Germany
22. ECTOS hydrogen project, Reykjavik, Iceland
23. CRUST CO_2 capture & storage project, Netherlands
24. Snohvit CO_2 capture & storage project, Norway
25. Schwarze Pumpe CO_2 capture and storage project, Germany
26. Podhale region geothermal project, Poland
27. Blue Energy (salinity power) in the Netherlands

Appendix B Key energy figures for European regions and countries

North Europe

The Nordic region has a population of about 25 million, but a total land area of 1,155,574 km^2. The Nordic countries consist of Denmark, Finland, Iceland, Norway and Sweden. The countries have maintained long-standing political and cultural co-operation through the Nordic Council of Ministers. Denmark, Finland and Sweden are members of the European Union, and Norway and Iceland are members of the EEA. In the field of energy, Nordic co-operation focuses on the electricity market, climate issues, regional co-operation in the Baltic region and energy supply in sparsely populated areas. Table B.1 provides an overview of key figures for countries in this region.

There are differences among the countries in terms of economic structure. The countries also have very different natural endowments in terms of energy (IEA, 2004), although the countries are increasingly integrating their electricity systems and trade. All countries except for Finland are relatively self-sufficient in terms of energy - and energy security is a key aspect for Finnish policy. Finland's main domestic energy sources are hydroelectric power, peat and wood, and the economy is dependent on imports of oil, coal, gas and nuclear energy, as well as electricity imports. Denmark also relies on oil, coal and gas, but has also developed a large share of renewable energy sources (14.6%). Denmark and especially Norway are significant oil and gas producers. Norway and Sweden have significant domestic hydropower resources. Iceland is in a league of its own, providing 72% of its energy from renewable energy sources.

Table B.1 *Key figures for Nordic countries*

	Total population 2005, millions (1)	GDP per capita in PPS index EU-25=100 2004 (2)	Final energy consumption (1000 toe) in 2004 (2)	Energy use by sector 2004, industry; transport; households, trade and services (HTS), % (2)	Energy intensity of the economy, Gross inland consumption (kgoe/GDP 95) (3)	Energy dependency in 2004, Net energy imports /gross consumption, % (2)	Share of main energy sources in gross inland consumption 2004, % (4)	CO_2 emissions from fuel combustion per capita, 2003, tonnes (2) (total CO_2 emissions)(5)	Distance to EU Kyoto targets in 2002, % (6)
Denmark	5.4	122	15,168	industry: 19 transport: 34 HTS: 47	120.3	-49.8	Coal: 21.8 Oil: 41.6 Gas: 23.1 Renewables:14.6	10.6 (11.3)	16.3
Finland	5.2	112	26,541	industry: 50 transport: 18 HTS: 33	273.7	55.2	Coal 19.9 Oil 29 Gas 10.5 Nuclear 15.5 Renewables 23.4	13.5 (14.0)	6.8
Iceland	0.3	123	2267	industry: 33 transport: 15 HTS: 52	462.5	30.6	Coal 3 Oil 24.7 Renewables 72.3	6.2 (7.5)	?
Norway	4.6	153	18,634	industry: 36 transport: 26 HTS:38	189.1	-760.5	Coal 3.3 Oil 38.3 Gas 16.1 Renewables 38.7	7.6 (9.4)	7.4
Sweden	9.0	117	33,952	industry: 39 transport: 24 HTS: 37	217.5	37.7	Coal 5.5 Oil 28.9 Gas 1.7 Nuclear 37.6 Renewables 26.6	5.6 (6.2)	-6.1

* PPS (‘purchasing power standard’) is an artificial common reference currency unit that eliminates price level differences.
1) Source: Eurostat / U.S. Bureau of the Census
2) Source: Eurostat
3) Source: Eurostat: Energy - Yearly statistics 2004
4) Eurostat Yearly Energy Statistics (2006)
5) UN Millennium Indicators
6) EEA IMS Indicators

The Nordic countries have also managed to increase their share of renewable energy use. Table B.2 presents the most important renewable energy sources in the electricity supply of the Nordic countries. The large share of biomass in Finland and Sweden is partly due to use of black liquor as a fuel in integrated pulp and paper production, but the use of biomass has increased also in district heating. Sweden has also increased its use of ethanol as a transport fuel in recent years. Denmark has increased its use of biomass in CHP plants, and has set ambitious targets for increased use of biomass in electricity production, district heating, and individual space heating. The share of wind energy in electricity production has also grown significantly in Denmark, and was 17% of electricity supply in 2004 (Danish Energy Authority, 2005).

Table B.2 *Nordic countries: Key figures on renewable energy*

	Share of renewable energy sources in gross inland consumption 2004,% (2)	Renewable energy sources in total primary renewable production, 2004 (2), %	Increase in the primary production of renewable energy sources in the period (2) 1994-2004, %	Renewable energy in gross electricity consumption 2) 2004 and target for 2010 % (3)	Main renewable energy sources in electricity generation 2003 (1)
Denmark	14.6	Hydropower 0.1 Wind 20.7 Solar heat 0.3 Biomass and Waste 78.8 Geothermal 0.1	122.8	2004: 27.0% 2010: 29.0%	wind 12% biomass and ren. waste 6.1% other 0.1%
Finland	23.4	Hydropower 14.6 Wind 0.1 Biomass and Waste 85.3	48.9	2004: 28.3% 2010: 31.5%	hydro 11% wind 0.1% biomass and ren.waste 11.4%
Iceland	72.3	Hydropower 25.3 Biomass and Waste 0.1 Geothermal 75.6	78.3	2004: 100.0%	hydro 39.1% biomass 5.6%
Norway	38.7	Hydropower 87.7 Wind 0.2 Biomass and Waste 12.1	-2.2	2004: 89.8%	hydro 98.9% wind 0.2% biomass and ren. waste 0.1%
Sweden	26.6	Hydropower 36.6 Wind 0.5 Biomass and Waste 62.9	15	2004: 46.1% 2010: 60.0%	hydro 39.3% wind 0.5% biomass and ren. wastes 4%

1) Source: IEA Share of renewables: Renewable energy. Market & Policy Trends in IEA Countries. OECD/IEA 2004. p.44
2) Source: Eurostat: Energy and environment - tables. Primary production of renewable energy.
3) EEA - IMS Indicators

Central and East Europe

The region here considered as Central and East Europe consists of eight countries: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia. The region has total population of approximately 73 million citizens and total surface area of 729,000 km^2. There are many differences among these countries, e.g., the population density varies from 31 inhabitants per square kilometre in Estonia to 132 in the Czech Republic. The countries also have very different indigenous endowments of energy, as well as different energy infrastructure legacies.

A common feature of these countries is that they joined the EU in 2004 and form the majority of the ten new EU members, representing nearly 99% of the population of the newcomers. On the other hand, there are also systems of co-operation within the region: Poland, the Czech Republic, Slovakia and Hungary are members of the Visegrad Group, a form of regional co-operation with energy as one key issue. The countries have, e.g., promoted grid interconnections within and beyond the group (EIA 2006a). Similarly, the Baltic states of Estonia, Latvia and Lithuania have significant co-operation in energy; among other projects, they are currently planning a cable linking the Baltic states to the Nordic power grid (EIA 2006b). Many countries in this group prioritise enhancing the diversity of energy supply, and reducing oil and gas imports from Russia. Table B.3 provides key figures in the economies and energy sectors of Central and East European countries. The countries come from the former Soviet block, and thus share the heritage of centralised economic planning. The energy produced from the abundant coal and lignite resources and imported from the former USSR used to be both inexpensive and rather polluting. The energy production was mainly devoted to the industrial sector. The still comparatively high energy intensity also originates from those days (Renewable, 2004). A common feature of the countries is the recent change in the general economic and energy demand structure: the energy consumption of industry has decreased significantly, and the relative share of traffic and service sectors have been growing rapidly. The decrease of industrial energy consumption is due to both closing old industries and increase in energy efficiency. All the countries in this group, except perhaps for Slovenia, are thus expected to achieve - and some to considerably exceed - their Kyoto commitment targets. However, it is generally considered that there still remains much scope to improve energy efficiency.

Table B.3 *Key figures for Central and East European countries*

	Total population 2005, millions (1)	GDP per capita in PPS index EU-25=100 2004 (2)	Final energy consumption (1000 toe) in 2004 (2)	Energy use by sector 2004, industry; transport; households, trade and services (HTS), % (2)	Energy intensity of the economy, Gross inland consumption (kgoe/GDP 95) (3)	Energy dependency in 2004, Net energy imports /gross consumption, % (2)	Share of main energy sources in gross inland consumption 2004, % (4)	CO_2 emissions from fuel combustion per capita, 2003, tonnes (2) (total CO_2 emissions)(5)	Distance to EU Kyoto targets in 2002, % (6)
Czech Republic	10.2	70	25,784	industry: 38 transport: 24 HTS: 38	851.8	25.3	Coal 44.8 Oil 21.5 Gas 17.9 Nuclear 15.6 Renewables 3.1	11.3 (12.4)	-21
Estonia	1.3	51	2747	industry: 23 transport: 17 HTS: 60	1140.2	29.3	Coal 59.1 Oil 19.1 Gas 13.7 Renewables 10.8	13.9 (14.2)	-50
Hungary	10.1	60	17,399	industry: 20 transport: 22 HTS: 58	534.0	60.8	Coal 13.2 Oil 24.1 Gas 44.7 Nuclear 11.7 Renewables 3.7	5.7 (6.0)	-27
Latvia	2.3	43	3873	industry: 19 transport: 25 HTS: 56	696.3	66.2	Coal 1.5 Oil 29.6 Gas 29 Renewables 35.9	3.0 (3.2)	-58
Lithuania	3.4	48	4281	industry: 22 transport: 31 HTS: 47	1135.6	48.6	Coal 2 Oil 28.2 Gas 25.9 Nuclear 42.6 Renewables 8	3.2 (3.6)	-55
Poland	38.2	49	56,935	industry: 31 transport: 20 HTS: 49	596.6	14.7	Coal 59 Oil 23.8 Gas 12.8 Renewables 4.7	8.1	-29
Slovak Republic	5.4	52	10,024 (p)	industry: 42 transport: 16 HTS: 43	854.3	67.4	Coal 24.9 Oil 19.3 Gas 30.3 Nuclear 24.2 Renewables 2.2	7.4 (8.0)	-24
Slovenia	2.0	79	4787	industry: 32	329.1	52.1	Coal 21.4	7.5 (8.2)	3.7

					transport: 29 HTS: 39			Oil 35.9 Gas 12.5 Nuclear 19.6 Renewables 11.4	

* PPS (‘purchasing power standard’) is an artificial common reference currency unit that eliminates price level differences.
1) Source: Eurostat / U.S. Bureau of the Census
2) Source: Eurostat
3) Source: Eurostat: Energy - Yearly statistics 2004
4) Eurostat Yearly Energy Statistics (2006)
5) UN Millennium Indicators
6) EEA IMS Indicators

The shares of the main renewable energy sources are presented in Table B.4. Renewable energy has been promoted by the governments for only a short period in these countries, compared to the old EU members. The situation varies in the countries, but in general the support systems are not yet mature and well established, and a lack of trust on the side of the investors in the continuity of the promotion policies has been a barrier to more extensive exploitation of renewables in most countries (Renewable, 2004).

Table B.4 *Central and East Europe: Key figures on renewable energy*

	Share of renewable energy sources in gross inland consumption 2004, % (2)	Renewable energy sources in total primary renewable production, 2004 (2), %	Increase in the primary production of renewable energy sources in the period (2) 1994-2004, %	Renewable electricity in gross electricity consumption 2004 and target for 2010 % (3)	Main renewable energy sources in electricity production, 2003% (1)
Czech Republic	3.1	Hydropower 11.6 Wind 0.1 Biomass and Waste 88.3	100.6	2004: 4.0 2010: 8.0	hydro 1.7 biomass and ren. waste wastes 0.6
Estonia	10.8	Hydropower 0.3 Wind 0.1 Biomass and Waste 99.6	36.1	2004: 0.6 2010: 5.1	hydro 0.1 wind 0.1 biomass and ren. waste 0.3
Hungary	3.7	Hydropower 1.9 Solar Heat 0.2 Biomass and Waste 89 Geothermal 8.9	70.1	2004: 2.3 2010: 3.6	hydro 0.5 biomass and renewable wastes 0.5
Latvia	35.9	Hydropower 12.5 Wind 0.2 Biomass and Waste 87.3	59.8	2004: 47.1 2010: 49.3	hydro 57.0 wind 1.2 biomass and renewable wastes 0.6
Lithuania	8	Hydropower 4.9 Biomass and Waste 95.1	50.8	2004: 3.5 2010: 7.0	hydro 1.7 biomass and renewable wastes 0.1 other 0.9
Poland	4.7	Hydropower 4.1 Wind 0.3 Biomass and Waste 95.4 Geothermal 0.2	13	2004: 2.1 2010: 7.5	hydro 1.1 wind 0.1 biomass and renewable wastes 0.3
Slovak Republic	2.2	Hydropower 47.5 Biomass and Waste 51.8 Geothermal 0.7	20.2	2004: 14.3 2010: 31.0	hydro 12 biomass and others 1
Slovenia	11.4	Hydropower 42.8 Biomass and Waste 57.2	38.6	2004: 29.1 2010: 33.6	hydro 22.5 biomass and renewable wastes 0.9

1) Source: IEA Share of renewables: Renewable energy. Market & Policy Trends in IEA Countries. OECD/IEA 2004. p.44
2) Source: Eurostat: Energy and environment - tables. Primary production of renewable energy.
3) EEA - IMS Indicators

South Europe

The South European region consists of six countries: Cyprus, Greece, Italy, Malta, Portugal and Spain, of which Cyprus and Malta joined the EU in 2004. More than 120 million people live in the region.

Even though the countries in this region vary quite a lot in terms of size, geography, economy and culture, they share some common features in terms of their energy economies (Table B.5). All countries in this group are quite dependent on energy imports, and many are more dependent on oil than EU25 countries on average. This has served as a major stimulus to develop alternative energy sources. On an average, per capita carbon dioxide emissions are somewhat lower than in West Europe. Nonetheless, some countries in this group have made ambitious commitments to reduce emission levels, and many (most notably Spain) have quite a way to go before reaching their targets for greenhouse gas reductions.

Table B.5 *Key figures for South European countries*

	Total population 2005, millions (1)	GDP per capita in PPS index EU-25=100 2004 (2)	Final energy consumption (1000 toe) in 2004 (2)	Energy use by sector 2004, industry; transport; households, trade and services (HTS), % (2)	Energy intensity of the economy, Gross inland consumption (kgoe/GDP 95) (3)	Energy dependency in 2004, Net energy imports /gross consumption, % (2)	Share of main energy sources in gross inland consumption 2004, % (4)	CO_2 emissions from fuel combustion per capita, 2003, tonnes (2) (total CO_2 emissions /capita)(5)	Distance to EU Kyoto targets in 2002, % (6)
Cyprus	0.7	83	1850	industry: 29.5 transport: 46.4 HTS: 24.1	261.8	96.7	Coal 1.5 Oil 94.5 Renewables 3.9	8.8	-
Greece	11.1	81	20,245	industry: 20 transport: 39.3 HTS: 40.7	240.4	80.3	Coal 29.7 Oil 57.1 Gas 7.3 Renewables 5.1	9.2 (9.9)	11
Italy	58.5	106	131,206	industry: 31.4 transport: 33.5 HTS: 35.1	189.1	86.1	Coal 9 Oil 46 Gas 35.7 Renewables 6.8	7.9 (8.4)	13
Malta	0.4	69	456	industry: 10.3 transport: 58.6 HTS: 31.1	292.4	100	Coal 100	6.2	-
Portugal	10.5	72 (f)	20,122	industry: 35.8 transport: 36.2 HTS: 28.0	239.6	85.7	Coal 12.9 Oil 57.5 Gas 12.6 Renewables 14.9	5.5 (6.2)	25
Spain	43.0	98 (f)	94,317	industry: 32.5 transport: 40.7 HTS: 26.8	222.5	81.3	Coal 15 Oil 49.1 Gas 17.9 Nuclear 11.7 Renewables 6.4	7.2 (7.9)	30

* PPS ('purchasing power standard') is an artificial common reference currency unit that eliminates price level differences.
1) Source: Eurostat / U.S. Bureau of the Census
2) Source: Eurostat
3) Source: Eurostat: Energy - Yearly statistics 2004
4) Eurostat Yearly Energy Statistics (2006)
5) UN Millennium Indicators
6) EEA IMS Indicators

The shares of renewable energy sources in total energy supply and electricity generation are presented in Table B.6. The large countries in this group have set quite high targets for the share of renewable energy in electricity production. They have also relatively high growth rates for primary energy production from renewables - as a region, South Europe is the fastest growing renewable energy market in Europe.

Table B.6 *South Europe: Key figures on renewable energy*

	Share of renewable energy sources in gross inland consumption 2004, % (2)	Renewable energy sources in total primary renewable production, 2004 (2), %	Increase in the primary production of renewable energy sources in the period (2) 1994-2004, %	Renewable electricity in gross electricity consumption 2004 and target for 2010 % (3)	Main renewable energy sources in electricity production, 2003% (1)
Cyprus	3.9	Solar Heat 94.8 Biomass and Waste 5.2	708.3	2004: 0.0 2010: 6.0	all renewables 0.0
Greece	5.1	Hydropower 25.8 Wind 6.2 Solar Heat 6.9 Biomass and Waste 61.1 Geothermal 0.1	43.9	2004: 9.5 2010: 20.1	hydro 8.2 wind 1.8 biomass and ren. waste 0.2
Italy	6.8	Hydropower 30.9 Wind 1.3 Solar Heat 0.2 Biomass and Waste 26.5 Geothermal 41.1	31.8	2004: 15.9 2010: 25.0	hydro 11.9 geothermal 1.9 wind 0.5 biomass and ren. waste 0.8 other 0.3
Malta	0	N.A.	N.A.	2004: 0.0 2010: 5.0	0
Portugal	14.9	Hydropower 21.8 Wind 1.8 Solar Heat 0.5 Biomass and Waste 73.9 Geothermal 2	30.9	2004: 24.4 2010: 30.0	hydro 33.8 geothermal 0.2 wind 1.1 biomass and ren. waste 3.2
Spain	6.4	Hydropower 30.2[17] Wind 14.9 PV 0.1 Solar Heat 0.6 Biomass and Waste 54.1 Geothermal 0.1	54.8	2004: 18.2 2010: 29.4	hydro 15.9 wind 4.7 biomass and ren. waste 1.2

1) Source: IEA Share of renewables: Renewable energy. Market & Policy Trends in IEA Countries. OECD/IEA 2004. p.44
2) Source: Eurostat: Energy and environment - tables. Primary production of renewable energy.
3) EEA - IMS Indicators

West Europe

The region classified here as West Europe consists of eight countries: Austria, Belgium, France, Germany, Ireland, Luxembourg, the Netherlands and the United Kingdom. Almost 250 million people live in the region, and the economies of countries in this region account for more than 62% of the total GDP of the 25 EU member states. The countries are very different in many respects, including size, structure of the energy supply and natural endowments of energy sources (Table B.7). The region includes countries with significant oil and gas reserves, such as the UK and the Netherlands, and ones that import almost all of their energy, such as Belgium and Luxembourg. France makes extensive use of nuclear energy, whereas many countries included in this group do not produce nuclear energy or have planned to phase out its production.

17 Large-scale hydropower (>10 MW) has a share of 25% of renewable energy production in Spain.

A common feature, however, is the above-average GDP per capita in most countries, and the (partly related) below-average energy intensity of the economy.

Table B.7 *Key figures for West European countries*

	Total population 2005, millions (1)	GDP per capita in PPS index EU-25=100 2004 (2)	Final energy consumption (1000 toe) in 2004 (2))	Energy use by sector 2004, industry; transport; households, trade and services (HTS), % (2)	Energy intensity of the economy, Gross inland consumption (kgoe/GDP 95) (3)	Energy dependency in 2004, Net energy imports /gross consumption, % (2)	Share of main energy sources in gross inland consumption 2004, % (4)	CO_2 emissions from fuel combustion per capita, 2003, tonnes (2) (total CO_2 emissions)(5)	Distance to EU Kyoto targets in 2002, % (6)
Austria	8.2	123	25,550	industry: 23.9 transport: 30.1 HTS: 40	146.1	70.8	Coal 12.1 Oil 42.2 Gas 23.3 Renewables 20.7	8.3 (9.4)	16
Belgium	10.4	118	37,416	industry: 33.3 transport: 27.3 HTS: 39.5	208.2	89.9	Coal 11.1 Oil 36.6 Gas 26.6 Nuclear 22.3 Renewables 2.1	11.2 (12.2)	6.6
France	60.6	109	157,903	industry: 22.7 transport: 31.8 HTS: 45.5	185.5	51.1	Coal 5.1 Oil 33.9 Gas 14.3 Nuclear 42.2 Renewables 6.3	6.4 (6.8)	-1.9
Germany	82.5	109	229,920	industry: 25.4 transport: 27.2 HTS: 47.4	158.8	61.7	Coal 24.7 Oil 36 Gas 22.6 Nuclear 12.4 Renewables 4	10.2 (10.5)	-6.3
Ireland	4.1	137	11,528	industry: 18.5 transport: 39.9 HTS: 41.6	156.9	87.3	Coal 14.7 Oil 59.1 Gas 23.2 Renewables 2.1	10.5 (11.1)	21.1
Luxembourg	0.5	226 (f)	4396	industry: 22.6 transport: 60.1 HTS: 17.4	194.3	98.2	Coal 2 Oil 64.6 Gas 25.6 Renewables 1.6	22.1 (23.6)	1.7
Netherlands	16.3	124	52,456	industry: 28.2 transport: 28.7 HTS: 43.1	209.3	36.1	Coal 11.2 Oil 38.4 Gas 44.7 Nuclear 1.2 Renewables 2.9	10.4 (11.0)	4.2
United King-	60.0	116	152,022	industry: 22.7	207.2	5.2	Coal 16.5	9.1 (9.4)	-7.4

dom	transport: 35.2 HTS: 42.1	Oil 35.1 Gas 37.6 Nuclear 8.9 Renewables 1.6

* PPS ('purchasing power standard') is an artificial common reference currency unit that eliminates price level differences.

1) Source: Eurostat / U.S. Bureau of the Census
2) Source: Eurostat
3) Source: Eurostat: Energy - Yearly statistics 2004
4) Eurostat Yearly Energy Statistics (2006)
5) UN Millennium Indicators
6) EEA IMS Indicators

Most countries in this group have invested in renewable energy technology for decades: this pertains especially to Austria, Germany and the Netherlands. Some countries in this group have also managed to increase renewable energy production significantly during the past decade: most notably, the Netherlands, the UK and Germany. The countries have set relatively ambitious targets to increase renewable energy sources in electricity consumption by 2010.

Table B.8 *West Europe: Key figures on renewable energy*

	Share of renewable energy sources in gross inland consumption 2004, % (2)	Renewable energy sources in total primary renewable production, 2004 (2), %	Increase in the primary production of renewable energy sources in the period (2) 1994-2004, %	Renewable electricity in gross electricity consumption 2004 and target for 2010 % (3)	Main renewable energy sources in electricity generation 2003 ()
Austria	20.7	Hydropower 46.3 Wind 1.2 Solar Heat 1.3 Biomass and Waste 51 Geothermal 0.3	15.8	2004: 58.8 2010: 78.1	hydro 59.4 wind 0.6 biomass and ren. waste 2.8
Belgium	2.1	Hydropower 2.8 Wind 1.2 Solar Heat 0.3 Biomass and Waste 95.6 Geothermal 0.1	86.3	2004: 2.1 2010: 6.0	hydro 0.3 wind 0.1 biomass and ren.waste 1.0
France	6.3	Hydropower 29.8 Wind 0.3 Solar Heat 0.1 Biomass and Waste 69.1 Geothermal 0.7	-8.1	2004: 12.9 2010: 21.0	hydro 10.5 tide, wave and ocean 0.1 wind 0.1 biomass and ren. waste 0.6
Germany	4	Hydropower 13.2 Wind 15.8 PV 0.3 Solar Heat 1.6 Biomass and Waste 68.1 Geothermal 1	125.1	2004: 9.7 2010: 12.5	hydro 3.2 wind 3.2 solar 0.1 biomass and ren. waste 1.1
Ireland	2.1	Hydropower 16.7 Wind 17.3 Biomass and Waste 66	64.2	2004: 5.1 2010: 13.2	hydro 2.4 wind 1.8 biomass and ren. waste 0.3
Luxembourg	1.6	Hydropower 12.5 Wind 4.2 PV 1.4 Biomass and Waste 81.9	41	2004: 3.2 2010: 5.7	hydro 2.8 wind 0.9 biomass and ren. waste 1.5
Netherlands	2.9	Hydropower 0.3 Wind 6.8 PV 0.1 Solar Heat 0.8 Biomass and Waste 92	185.6	2004: 5.7 2010: 9.0	hydro 0.1 wind 1.4 biomass and ren. waste 2.6 other sources 0.2
United Kingdom	1.6	Hydropower 12.2 Wind 4.8 Solar Heat 0.7 Biomass and Waste 82.3	74	2004: 3.7 2010: 10.0	hydro 0.8 wind 0.3 biomass and ren. waste 1.6

1) Source: IEA Share of renewables: Renewable energy. Market & Policy Trends in IEA Countries. OECD/IEA 2004. p.44
2) Source: Eurostat: Energy and environment - tables. Primary production of renewable energy.
3) EEA - IMS Indicators

Appendix C Indicators of public awareness of new energy issues in different countries

The figures reported here aim to provide some comparative information on European citizens' awareness of climate change and energy issues. They are from survey studies - hence, e.g., data on 'willingness-to-pay' do not reflect actual willingness, but are used here more as an indicator of overall awareness of renewable energy. The figures are presented as relative rather than as absolute measures, and aim to reflect an overall awareness of environmental issues in an environmental context.

North Europe

Nordic citizens share a widespread concern for climate change, which is also reflected in above-average willingness to pay for renewable energy (Table C.1). On the other hand, awareness about energy conservation among the general public is somewhat below-average in Finland and Sweden, with relatively low electricity prices. The countries, however, have quite varying track records in terms of social acceptance of renewable energy projects, and some highlights from these experiences are presented below in the text concerning individual Nordic countries.

Table C.1 *North Europe: Indicators of citizen's awareness of climate change and energy issues*

	Share of citizens mentioning 'climate change' as 1 of 5 main environmental concerns, % (1)	Share of consumers willing to pay more for renewable energy, % (2)	Price of electricity for average (3500 kWh) household , €/100 kWh (PPS)*(3)	Share of consumers reducing energy consumption as an environmental measure, % (1)
EU 25	45	40	14.16	39
Denmark	52	54	23.62 (17.17)	48
Finland	53	52	10.78 (9.38)	37
Iceland	N.A.	N.A	N.A.	N.A.
Norway	N.A.	N.A.	11.01	N.A.
Sweden	60	48	14.35 (12.06)	36

* PPS ('purchasing power standard') is an artificial common reference currency unit that eliminates price level differences.

1) Source: Eurobarometer 2005. The attitude of European citizens towards the environment.
2) Source: Eurobarometer 2006. Attitudes towards Energy. Special Eurobarometer 247
3) Eurostat: Statistics in Focus, Environment and Energy 11/2006.

Central and East Europe

In terms of public awareness of climate change, renewable energy and energy conservation, there are some differences between these countries (Table C.2). Generally, willingness to pay for renewable energy is lower than in North or West Europe, most probably due to lower income levels of the population (Eurobarometer, 2006). However, awareness of the environmental relevance of energy conservation is also markedly low in some countries in this group.

Table C.2 *Central and East Europe: Indicators of citizen's awareness of climate change and energy issues*

	Share of citizens mentioning 'climate change' as 1 of 5 main environmental concerns, % (1)	Share of consumers willing to pay more for renewable energy, % (2)	Price of electricity for average (3500 kWh) household , €/100 kWh (PPS)*(3)	Share of consumers reducing energy consumption as an environmental measure, % (1)
EU 25	45	40	14.16 (13.33)	39
Czech Republic	43	39	9.85 (15.81)	42
Estonia	45	38	7.31 (11.78)	39
Latvia	28	29	8.29 (15.37)	33
Lithuania	29	27	7.18 (13.77)	16
Hungary	32	18	10.75 (17.44)	23
Poland	32	25	11.90 (20.05)	20
Slovakia	54	21	14.48 (24.48)	42
Slovenia	52	39	10.49 (13.71)	43

* PPS ('purchasing power standard') is an artificial common reference currency unit that eliminates price level differences.
1) Source: Eurobarometer 2005. The attitude of European citizens towards the environment.
2) Source: Eurobarometer 2006. Attitudes towards Energy. Special Eurobarometer 247
3) Eurostat: Statistics in Focus, Environment and Energy 11/2006.

South Europe

Table C.3 provides some indicators on the general population's attitude to climate and energy issues. It shows an average level of concern for climate change throughout the region, with some variances with respect to willingness to pay for renewable energy and awareness of the environmental relevance of energy conservation, however.

Table C.3 *South Europe: Indicators of citizen's awareness of climate change and energy issues*

	Share of citizens mentioning 'climate change' as 1 of 5 main environmental concerns, % (1)	Share of consumers willing to pay more for renewable energy, % (2)	Price of electricity for average (3500 kWh) household, €/100 kWh (PPS)*(3)	Share of consumers reducing energy consumption as an environmental measure, % (1)
EU 25	45	40	14.16	39
Cyprus	50	37	14.31 (15.01)	33
Greece	46	38	7.01 (8.01)	30
Italy	41	33	21.08 (10.23)	32
Malta	42	27	9.49 (13.26)	34
Portugal	41	24	14.10 (16.30)	34
Spain	45	41	11.47 (11.95)	39

* PPS ('purchasing power standard') is an artificial common reference currency unit that eliminates price level differences.
1) Source: Eurobarometer 2005. The attitude of European citizens towards the environment.
2) Source: Eurobarometer 2006. Attitudes towards Energy. Special Eurobarometer 247
3) Eurostat: Statistics in Focus, Environment and Energy 11/2006.

West Europe

Table C.4 shows indicators for citizen's awareness of climate change and energy issues in West Europe. In general citizen's awareness is high and consumers are willing to pay relatively high prices for renewable energy in most West European countries (with the exception of Ireland).

Table C.4 *West Europe: Indicators of citizen's awareness of climate change and energy issues*

	Share of citizens mentioning 'climate change' as 1 of 5 main environmental concerns, % (1)	Share of consumers willing to pay more for renewable energy, % (2)	Price of electricity for average (3500 kWh) household , €/100 kWh (PPS)*(3)	Share of consumers reducing energy consumption as an environmental measure, % (1)
EU 25	45	40	14.16	39
Austria	48	43	13.40 (12.47)	34
Belgium	45	45	14.42 (13.33)	42
France	42	49	12.05 (10.92)	43
Germany	57	42	18.32 (16.65)	50
Ireland	39	33	14.90 (11.95)	37
Luxembourg	58	60	16.03 (13.97)	46
Netherlands	53	51	20.87 (19.15)	54
United Kingdom	42	45	10.20 (9.05)	42

* PPS ('purchasing power standard') is an artificial common reference currency unit that eliminates price level differences.

1) Source: Eurobarometer 2005. The attitude of European citizens towards the environment.
2) Source: Eurobarometer 2006. Attitudes towards Energy. Special Eurobarometer 247
3) Eurostat: Statistics in Focus, Environment and Energy 11/2006.

Appendix D Highlights of energy and policy profiles of European regions and countries

North Europe

Denmark

In 1997, Denmark became self-sufficient in energy for the first time in modern history, as a result of steadily increasing production (especially offshore oil and gas) and stagnating consumption. In 2000, the degree of self-sufficiency was 139% compared with only 5% in 1980. Moreover, Denmark has the lowest energy intensity in the EU, owing to both the relative absence of energy-intensive industry and strong government efforts to promote greater efficiency. Due to the oil crisis in the 1970s, Denmark made a concerted effort to introduce combined heat and power production (CHP) as a key means to bring down energy consumption. Today, the country has Europe's largest share of CHP production, and an increasing part of the small-scale CHP development is based on biomass (IEA, 2006b).

The Danish energy sector has a fairly decentralized structure and a high degree of co-operative and municipal ownership. Together with the central government, the municipalities participate in the decisions on fuel choices, waste incineration and surveys on renewable energy sources. Many district heating and co-generation companies are owned by co-operatives or municipalities. Yet recent years have seen some market concentration, e.g., a merger between state-owned DONG and Denmark's two major electricity companies (IEA, 2006b).

Government support has been very important in increasing Danish renewable energy production. This has included intensive R&D investment in renewable energy, as well as early capital grant schemes, investment incentives and purchasing agreements (later converted to feed-in-tariff). Due to these measures, the share of renewables in electricity generation rose from 3% in 1991 to 27% in 2004. The current government has sharply curtailed subsidies for renewable energy, as it believes they are no longer necessary or compatible with competitive markets (IEA, 2006b).

Denmark also has a longstanding tradition of community ownership and civic engagement in renewable energy. For example, it is estimated that approximately 150,000 families have an ownership stake in wind energy projects. Due to this co-operative tradition, acceptance of renewable energy is reported as being high, and there are few reports of local controversies concerning renewable energy (Sørensen et al., 2001; Predac, 2003).

Finland

Finland has one of the largest per capita energy consumption levels in the world. Energy consumption per capita is almost double the EU25 average. The country is dependent on imports of coal, oil and natural gas - and in recent years, also electricity. Hence, security of supply is very important for Finland, and efforts are continually made to increase the diversity of energy sources and suppliers.

The importance of saving energy and using renewable energy resources has been stressed in the Finnish environmental debate since the oil crises. Industry, in particular, has achieved considerable energy savings, and is generally considered to be highly energy-efficient. Combined heat and power plants have also been adopted extensively. Finland has been one of the leading countries in the use of bioenergy and development of related firing technologies. At the same time, the prevailing energy policy has always stressed the importance of providing a cheap and reliable supply of energy. Currently, a fifth nuclear power plant is being constructed, and a sixth one is being debated.

Total primary energy consumption has levelled off in recent years, but electricity consumption has continued to grow. Finland has agreed to keep GHG emissions at 1990 levels during the first Kyoto commitment period, yet projections show a 15% increase in emissions under business-as-usual conditions. The recent National Climate Strategy (MTI 2005) emphasizes the diversity of the energy system and indigenous renewable energy sources. The target is to increase the share of renewable energy to at least one third of primary energy consumption by 2025, as compared to 23 per cent in 2003. For energy conservation, the target is to bring about savings of 5% by 2015, compared to the business-as-usual scenario. Instruments used include energy tax exemptions for renewables and investment subsidies for wood-fired plants, as well as intensive R&D funding (IEA, 2004; MTI, 2005).

Finns have exceptionally positive attitudes toward the most important renewable energy source in the country, bioenergy (Energy attitudes, 2004; cf. Rohracher et al., 2005), and there are no reported siting conflicts for wood-fired power plants. In contrast, there have been But wind energy projects have raised some controversies, especially in the archipelago (e.g., Soerensen and Hansen, 1999).

Iceland

Iceland has huge natural endowments of hydropower and geothermal energy. Heat is provided to more than 90% of industrial plants, households and services through geothermal district heating systems or local hot springs. Electricity is generated either by hydro and geothermal power. Therefore approximately 70% of the total energy demand in Iceland is produced with renewable energy. The remaining 30% (mainly oil imports) is used exclusively for transportation, agricultural vehicles and the fishing fleet.

Even though the share of domestic renewable energy has been steadily increasing in the last three decades, Iceland still uses only a part of its potential energy sources. There is a strong political commitment to further development of the domestic energy resources. The focus is on the transportation sector, with hydrogen and methane vehicles exempt from the fuel tax.

Iceland's Kyoto obligations allow the country to increase its greenhouse gas emissions by up to 10% of the emissions levels of 1990. The climate change policy focuses on reforestration and revegetation. Since 1998 the government has worked to tempt foreign investors, mainly aluminium smelters, offering the untapped hydropower energy and geothermal electricity as the cleanest and cheapest energy in the world. Due to these foreign investments is currently expected that emissions of CO_2 will have grown by approximately 30% by 2010 compared to 1990.

In recent years, Iceland has gained international acclaim for technological advances in creating a hydrogen economy. Iceland's 3rd National Communication under the United Nations Framework for Climate Change mentions international hydrogen projects and the ECTOS project (featured in the ECTOS Case Study in Annex 1) as important measures to reduce oil dependency in the transport sector, and eventually make the country's energy supply fully renewable-based (UNFCCC, 2003).

Norway

Norway is Europe's largest exporter of oil and gas. The country's CO_2 emissions are rising because of increased production of petroleum and increased demand in all sectors of the economy. This is predicted to make the achievement of Norway's Kyoto target difficult without the extensive use of the Kyoto mechanisms (SFT, 2006). Norway has been a pioneer in introducing a CO_2 tax system. However, the effectiveness of this tax has been limited due to significant exemptions to major emitters. The country has also set up a quota-based emissions trading system (ETS) and linked it with EU-ETS, but its current effectiveness is restricted due to its small coverage (Hovden and Lindseth, 2002). Norway is also encouraging the development of new renewables such as biomass and wind. There are plans to introduce a joint green certificate system with Sweden (IEA, 2005).

In the 1990s, Norway fundamentally reformed its electricity sector, leading to the development of the Nordic electricity market. However, municipalities and county governments own a large share of the power generation capacity, and the state owns a large proportion of the central grid. Private companies, counties and municipalities own the remainder. Municipalities and county governments own the majority of the regional and distribution grids (IEA, 2002a).

Since 1990, Norwegian energy consumption has grown slowly, but has still outpaced onshore energy production. Norway's domestic energy demand is unusual because it consists primarily of renewable electricity in stationary use, with a very high share of the electricity consumption used for heating. The use of gas is still very limited within Norway. Introducing gas-fired power plants and installing new renewables are deemed necessary for supply security in the power sector. However, construction of gas-fired power has been held up due to environmental concerns about CO_2 emissions.

An important part of Norwegian energy policy is promoting energy efficiency, renewable energy sources and energy technologies. Instruments utilized include R&D funding, which has grown significantly in recent years, as well as tax exemption and state support for renewables, a feed-in tariff for wind energy, and financial incentives for non-electric renewable home heating (IEA, 2004). Norway is expecting that carbon capture & storage (CCS) will play a significant role in reducing emissions from increased gas use onshore. The construction of additional hydropower stations and wind farms has been also delayed due to local environmental concerns, and electricity grid operators face constraints on expanding their capacity (IEA, 2005).

Sweden

The Swedish economy has many heavy industries, which account for a large share of primary energy consumption. Yet Sweden also has a long-standing policy commitment to renewable energy, even though the driving force for this policy have changed over time. After the oil crises, the main focus of the policy was to secure the energy supply through an increase of domestic energy sources. After a rapid expansion period of nuclear power, a decision in 1980 to phase out nuclear power led to a high level of spending on renewable energy R&D, which has continued and even grown over the past three decades. Energy taxes have also contributed significantly to the development of renewable energy: oil taxes in the 1980s, a carbon tax introduced as early as 1991, and an energy tax for other than electricity production. Sweden has also applied a wide range of other instruments, such as grants for renewable-based energy plants, a tax exemption for renewable transport fuels, and a quota-based green certificate system for renewable-based electricity (EREC, 2004a; IEA, 2004).

The exemption of biomass from the energy taxes led to the growing popularity of biomass use, especially in district heating, during the 1990s (Nilsson et al., 2004). Biomass use grew by 88% between 1980 and 2002 (Johansson, 2004). This record growth is a result of four factors (McCormick 2005): available natural resources and competences, demand for heat in the district heating system, the carbon tax and local and regional initiatives, such as active engagement by the municipalities. As oil prices have peaked, there has also been growing interest to increase the share of biofuels in the transport sector, and the current Government has proclaimed it will make Sweden 'fossil fuel free' by 2020 (Sahlin, 2005).

Popular opinion is quite positive about renewable energy and energy conservation. For example, there has been a significant increase in the consumption of green electricity in Sweden, which doubled to 9% between 1999 and 2001 (Ek, 2004). Some municipalities and citizen groups have mobilized to promote renewable energy projects. Nonetheless, Sweden has experienced its share of controversies in the siting of especially wind power plants, most of which are owned by utilities or private companies (Soerensen et al., 2001; Khan, 2004).

Summary

Table D.1 provides a summary of factors influencing renewable energy development in the Nordic countries. Demark, Finland and Sweden are EU members, and thus apply the EU-wide energy policies such as the CO_2 emission trading scheme, national targets for electricity produced from renewable energy sources. Also Iceland and Norway have set CO_2 caps under the Kyoto Protocol. Denmark, Finland, Norway and Sweden all have policies to promote renewable energy sources, but their intensity varies (IEA 2004). In Denmark, the policies have been historically very supportive and ambitious, and have served as a model for other countries. In recent years, however, support measures been partly dismantled, as renewables have become more competitive, and government views have changed. Today, Sweden seems to have the most ambitious and supportive policy environmental for renewable energy sources, employing a combination of market pull and technology push measures.

Table D.1 *Factors influencing renewable energy development in the Nordic countries (Sources: IEA, 2004; Eurobarometer 2005, 2006)*

	Denmark	Finland	Iceland	Norway	Sweden
Geography	Densely populated, indigenous energy sources recently discovered & offshore	Large biomass reserves	Large natural endowment (geothermal, hydro)	Large natural endowment of hydroelectricity, offshore oil and gas reserves	Large biomass reserves
Economic environment	Net energy exporter High electricity price for households	Relatively low electricity prices Energy-intensive industry: nuclear power investments	Master plan for hydro and geothermal energy resources Very low electricity and heat prices Foreign investment (aluminium smelters) due to cheap energy	Large energy exporter Relatively low electricity prices	Relatively low electricity prices Phasing out of nuclear energy
Politics and policies	EU policies Long history of support (partly dismantled) Minimum feed-in tariff for renewable energy Biomass target + tariffs, certificates & investment incentives Tendering process to foster offshore wind Net metering for small PV	EU policies Electricity tax, exemptions for renewables Investment subsidies for wood-fired plants	Promotion of foreign investment in metal industry CO_2 cap targets High gasoline tax + diesel fuel tax Tax exemption for hydrogen and methane vehicles Political support for hydrogen economy	CO_2 cap targets CO_2 tax and emissions trading Electricity consumption tax Tax exemption and state support for renewables Feed-in tariff for wind energy Financial incentives for non-electric renewable home heating	EU policies Energy tax, CO_2 tax (direct fuel use), special CHP tax Green certificates for electricity Investment incentives and grants Tax exemption for biofuels High-level plan to make country fossil-free by 2020
Technology funding	33% of R&D budget (1974-2001) for renewables Leading exporter for wind technology	11% of R&D budget (1974-2001) to renewables Fluidised bed boiler specialist	Hydrogen roadmap	11% of R&D budget (1974-2001) for renewables (large hydro dominates)	25% of energy R&D budget (1974-2001) for renewables Bioenergy firing technology
Environmental awareness in energy issues (general public)	Concern for climate change and interest in renewables High awareness about energy conservation Tradition of community-based renewable projects	Concern for climate change and interest in renewables Below-average awareness about energy conservation	Environmental awareness mostly confined to damage to natural habitats from hydro dams	Initially high level of environmental awareness has declined in recent years	High concern for climate change and above-average interest in renewables Below-average awareness about energy conservation Grassroots activism both for and against renewable energy

Central and East Europe

Czech Republic

The country has a population of 10.2 million inhabitants and area of 78,900 km^2. The Czech Republic has municipalities as key actors on the local level and regions on the regional level. The responsibilities of the municipalities consist of e.g. urban planning, housing, agriculture and local development. Public transport, environment and regional development are responsibilities of the regions (CCRE, 2005).

The Czech Republic inherited from the former Czechoslovakia an economic structure with labour- and energy-intensive heavy manufacturing and construction sectors of extensive size, leaving a legacy of excess industrial capacity and underdeveloped services. Following the market transition, the economic significance of industry has declined rapidly. The relative contribution of agriculture has fallen as well. Wholesale and retail trade, catering, repair and financial services have expanded rapidly since 1989, as well as tourism, which has seen a huge increase (The Economist, 2006).

The country is very dependent on abundant and inexpensive local fossil fuels coal and lignite, which represented 46% of total primary energy supply and 62% of electricity generation in 2003 (IEA, 2006). 31% of electricity was produced by nuclear power. Biomass is the most common supply of renewable energy, mostly used for heating. Bioenergy consumption has increased rapidly over the last few years. It is anticipated, that biomass will play the most important role in the growth of renewables. Most of the renewable electricity is produced with hydroelectricity, although its share of the total electricity production is but minor.

The Czech government has made efforts to promote renewables since 1991, when the State Programme to Support Energy Savings and Use of Renewable Energy and Secondary Sources came into effect, offering incentives and excise and sales tax exemptions. Since 2001, feed-in tariffs, tax incentives and direct investment incentives are available (IEA, 2004).

However, a number of factors have restricted the growth of the renewable energy market. Insufficient financial and human resources at the Czech Energy Agency have limited the effective implementation of renewable energy programmes. The surplus of electricity supply dilutes the interest in both energy conservation and new electricity generation from renewables. The dominant market position of the primary power utility hinders the entrance of new power producers (IEA, 2004)

Public awareness of renewable energy issues is low, because consumers have little involvement in choosing energy suppliers and sources and the renewable electricity tariffs have only a minor effect on consumer prices. The wider use of green electricity has encountered no public opposition, but it has been argued that the situation may change as the increased use of renewables is expected to drive up the electricity prices by 10% in a few years (IEA, 2004).

Estonia

Estonia has a population of 1.4 million inhabitants and area of 45,200 km^2; thus, in terms of population density it resembles the Nordic countries rather than the Southern countries in this group. Like the other Baltic countries, Latvia and Lithuania, Estonia regained its independence from the Soviet Union in 1991. Estonia consists of rural municipalities and cities; at the regional level the authorities are the counties. The municipalities/cities are responsible for local government, including e.g. planning and public transports and construction and maintenance of infrastructure. The counties are responsible for economic and spatial development of their region, and their role is focused on management, administration and supervision. Infrastructure development and maintenance as well as industry and commerce affairs are also dealt with on the state level (CCRE, 2005; Ministry of the Interior, 2006).

Forest-related industries are a cornerstone of the Estonian economy, but the service sectors experienced a rapid development in the early 1990s. More than 67% of the Estonian GDP is derived from the service sectors, industrial sectors yield over 28% and primary branches (including agriculture and forestry) approximately 5.5% of the overall output (Estonica, 2006).

The Estonian energy sector is based on oil shale, a resource quite rare elsewhere in the world. Almost all electricity (over 90%) is produced from oil shale in the two largest plants. Renewable electricity was long in practice non-existent, but there has been a rapid increase in the field recently, mostly due to wind power installations. Wind power is seen as the most potential green electricity supply in Estonia. In terms of heat, the renewable energy sector forms about 10% of total consumption. Practically all biomass used in energy supply is firewood or wood waste or chips and consumed in domestic heating. As half of Estonia's surface is covered with forests, there is also potential for more extensive use of biomass in energy generation (Renewable energy, 2004, EREC, 2004b; Estonian energy, 2005).

Since 1998, purchase obligations of green electricity at fixed prices have been offered. Capital grants for projects increasing the efficiency in municipal facilities or district heating with bioenergy became available in 2000, and in 2004 for grid connection establishments for green energy producers. According to the EBRD (2006), public awareness about renewables is high in Estonia.

Hungary

Hungary has a population of 10.1 million inhabitants and surface area of 93,036 km^2. The local level authorities are the municipalities, which include rural municipalities, towns, cities and cities with provincial status. Urban planning, environment protection, district heating and public transportation are governed by the municipalities. Environmental protection is governed also centrally and via regional inspectorates. At the intermediary level there are 19 counties and the capital (Budapest), which are responsible for land development, along with other tasks. There is no hierarchy between the county and the municipal local government but they have equal powers. In 1999, Hungary was additionally divided into 7 administrative regions, but a clear distinction between local and regional competences is not yet defined (CCRE, 2005).

The same pattern of reshaping the economy that was seen in other Eastern bloc countries after 1989 also took place in Hungary. The dominant role of industry as well as that of agriculture declined substantially, and the formerly neglected service sector grew to its major role in today's Hungarian economy. However, since the mid-1990s, Hungary has seen a revival in manufacturing, as it established itself as a component production base and low-cost assembly area for EU-based supply chains (The Economist, 2006; Eurostat, 2006).

In Hungary, the primary energy supply is mostly derived from fossil fuels and especially from gas. The major share of energy sources are imported. Green electricity has only a minor role in electricity production. In TPES the renewables have somewhat larger share (3.6% of TPES in 2003), mainly due the use of firewood in residential heating. In Hungary, the greatest potential for the use of renewables in energy production resides in biomass. It is estimated that 90% of forest waste remains unexploited. There is a promising potential for geothermal energy, but its exploitation is hampered by legal inconsistencies and the overlapping mine-allowance, taxes and fees for the industry, which can undermine the grants and low interest loans offered by the government (IEA, 2004; Renewable energy, 2004).

Hungarian energy policy aims to maintain a balance between security of supply, cost-effective delivery of energy to the economy and energy-efficiency. There is a special interest in reducing dependence on imports from Russia, and in ensuring security of supply. The energy policy also features a large number of measures to improve energy efficiency, including modernisation of the district heating system, energy audits and building codes. The Government's Energy Conservation and Energy Efficiency Improvement Action programme also includes a target to raise the share of renewables in primary energy consumption to 6% by 2010 (IEA, 2003).

To promote renewable energy, the government provides grants for renewable energy industry, low interest rate loans, tax incentives and feed-in tariffs. As a result, several investments in renewable energy projects have been carried out since 2000. However, the feed-in tariff became only recently sufficient, and there is uncertainty associated with the decree that regulates the tariff, which has reduced the investments (IEA, 2004).

According to IEA (2004), the awareness among the Hungarian people on the benefits of renewable energy is weak in spite of the 1995 Energy Savings Action Plan, which stated the education the public on renewable energy as one of its goals. This claim gains support from Eurobarometer (2006) data, which show an exceptionally low willingness to pay for renewable energy (see Table C.2).

Latvia

Latvia has a population of 2.3 million inhabitants and surface area of 64,600 km^2. Latvia is composed of communes on the local level and regions on the regional level. Communes' competences include water and heating supply, urban planning and licensing for commercial activities. Responsibility for public transports is divided among local and regional authorities.

The food industry holds a share of 25% of the total added value of the Latvian manufacturing; the next important sector is wood processing with 20% (Latvian Ministry of Economics, 2006).

Renewable energy sources have a substantial share of 34% (in 2003) of the total primary energy sources in Latvia, one of the highest among the EU countries. This is due to the very considerable use of heating wood in households and large share of hydropower in electricity generation, as 57% (in 2003) of electricity is generated by hydropower. Wind power, biomass and renewable wastes only make up a minor share of electricity generation. Gas and oil, all of which are imported, constitute the major part of the energy mix (IEA, 2006; Renewable energy, 2004).

The potential for more extensive use of biomass in energy generation is high, as forests cover some 45% of the country and currently only small proportion of forestry waste is exploited. Wind power and small hydropower installations grew substantially in the late 1990s, but lots of potential remains untouched, especially as the Baltic coast's wind power prospects are very good (Renewable energy, 2004).

Between 1996 and 2002, Latvia applied very highly incentive purchase tariffs for small wind power and hydropower production units. Today the tariffs are not sufficient to attract investors, compared to the costs of importing electricity in a very competitive regional market (Estonia, Lithuania and Russia are all electricity exporting countries) (Renewable, 2004).

Lithuania

Lithuania has a population of 3.5 million inhabitants and surface area of 65,300 km^2. Lithuania consists of communes on local level and provinces on regional level. Communes are responsible for local development, environment and public transportation, but broad development policies and urban plans are approved in the provincial councils.

The share of agriculture in the economy is still relatively large (6% of total value added), and industry also holds a major position with 26% of value added. In contrast, financial and business services hold a relatively minor position in the economy (Eurostat, 2006). Yet the Lithuanian economy is one of the fastest-growing ones in Europe, with significant investments to upgrade infrastructure.

The Lithuanian energy sector relies on fossil fuels and nuclear power. In 2003, 82% of electricity and 42% of TPES was produced by nuclear power. Renewables held a minor share of 8% in TPES and 3% in electricity production, majority of it coming from use of biomass at CHP plants. The Ignalina nuclear power plant produced 80% of national electricity until the decommissioning of the first reactor in the end of 2004, which reduced the nuclear electricity production by a third. This appears in the national energy balance as a sharp decrease in electricity exports. Lithuania has committed itself to close the second reactor by the end of 2008, which will lead to further changes into the energy economics of the country (IEA, 2006; Renewable energy, 2004; Statistics Lithuania, 2006).

Regarding renewables, the most significant developments are expected from biomass. There is also geothermal energy accessible for 80% of Lithuania's area, and its significance has been growing lately, though it still remains moderate. Along the Baltic Sea coast, there is a good potential for wind power, which yet remains almost completely unused (Renewable energy, 2004).

<u>Poland</u>

Poland is the largest country in Central Europe with an area of 311,904 km^2 and a population of 38.2 million[18]. Forests cover 29.9 % of the country's land area, *i.e.* 8.97 Mhectares[19]. Agricultural areas are a vital element of the Polish economy and occupy about 54% of total land.

The adminstrative system have been activelly involved in the set-up and promotion of the renewable energy projects in the form of either Action Programs (the voivodship level) or support for concrete investments (municipality level or county level). In any cases without the initial support of the local or regional authorities the investment would not have been realised.

The voivodeship (Polish: województwo) has been a second-level administrative unit in Poland since the 14th century. Pursuant to the Local Government Reorganization Act of 1998, effective January 1, 1999, 16 voivodeships were created, replacing the former 49 voivodeships that had existed from July 1, 1975. The new units range in area from under 10,000 km² (Opole Voivodeship) to over 35,000 km² (Masovian Voivodeship), and in population from one million (Lubusz Voivodeship) to over five million (Masovian Voivodeship). Voivodeships are governed by voivod governments, and their legislatures are called voivodeship sejmiks. A county (Polish: powiat, is the Polish third-level unit of administration, equivalent to a county, district or prefecture (NUTS-3) in other countries. A county is part of a larger unit called a 'voivodship' (in Polish, województwo - an entity whose equivalent in most other countries is rendered in English as 'province'), and in turn usually comprises several communes, each called a gmina (plural: gminy). There are now 314 'land counties' (*powiat ziemski*) and 65 'urban counties' (*powiat grodzki*).Commune or municipality (Polish: gmina, plural: gminy) is the principal unit (lowest level) of territorial division in Poland. As of 2004 there were 2,478 communes. There are three types of commune in Poland (1) municipal commune (municipality, urban commune) (gmina miejska) - consists of one city (2) mixed commune (gmina miejsko-wiejska) - consists of a city and surrounding villages (3) rural commune (gmina wiejska) - consists only of villages. The legislative and controlling body of each commune is the commune council (rada gminy). The executive power is held by the head of the commune: wójt (head of the rural commune), mayor (burmistrz, head of the mixed and municipal communes) or president (prezydent, head of municipal communes with more than 100,000 inhabitants).

The important drivers for change in the energy sector result from the membership in the EU resulting in several new aspects of organisation and development of this sector. Restructuring is unfolding as the energy markets are liberalised, and several companies from Western and Northern Europe are moving in as investors in the energy sector. Poland is the third largest greenhouse gas emitter in Central and Eastern Europe, after Russia and Ukraine. Polish econ-

[18] Central Statistical Office (GUS). 2003. *Statistical Yearbook of the Republic of Poland.* GUS: Warsaw.
[19] Central Statistical Office (GUS). 2005. *Forestry 2005.* GUS: Warsaw.

omy is highly carbon intensive. Coal also dominates the final energy consumption structure, which means that coal is not only burnt in power plants but a significant amount of it is used directly by various branches of industry, over a million of small local heating units and boiler houses and several million households.

The total primary energy supply in 2003 (latest available information) amounted to 3,895 PJ. So far, bioenergy has played a minor role in the primary energy supply in Poland. Bioenergy use was about 4.2% (165 PJ) of the primary energy use and 95% of the total renewable energy use (174 PJ) in 2003, mainly as firewood in the domestic sector and by-products used by wood industries.The structure of primary energy production and consumption has been changing in the last years. Domestically produced hard coal still dominates this structure, but its share in the national energy consumption has decreased. At the same time the share of crude oil in the national energy consumption increased from 16.8% in 1998 to 22% in 2003 and of natural gas from 9.8% in 1998 to 12 % in 2003.The share of other: non-fossil primary energy carries (fuel wood, waste fuels, hydro energy and other renewable sources) has been growing slowly though still does not exceed 5% of total primary energy consumption.

The late 1990’s marked the start of political interest in creating conditions for renewable energy development. The *Resolution on the Increase of Utilization of Renewable Energy Sources* [20] approved by the Parliament in 1999 was a milestone. Subsequently the Parliament called on the Council of Ministers to prepare the *Development Strategy of the Renewable Energy Sector* in Poland and its harmonization with the energy- and environmental policies. The Ministry of Environment took over the task of preparing the *Strategy* on behalf of the Council of Ministers. The *Strategy*[21] adopted by Parliament in 2001, is a key document supporting renewable energy in Poland. It stipulates short-, mid- and long-term objectives for renewable energy. The objective is to increase the share of renewable energy in Poland's primary energy balance to 7.5% in 2010 and to 14% in 2020.Targets have been set to increase the contribution of renewable electricity to 7.5% in 2010, in accordance with the *2001/77/EC Directive*[22]. The bioenergy is expected to be the main contributor to reaching the above mentioned targets. It is a challenge to deliver large supplies of solid biomass - up to +100-120 PJ will be required to reach the 2010’s goals. A 2-3 fold increase in bio-energy volumes is expected in the next decades.

Slovak Republic

Slovakia has a population of 5.4 million inhabitants and surface area of 49,000 km^2. Slovakia is composed of municipalities and regions. Municipalities are responsible for public transports, urbanism and environment. Regions are responsible for land development (CCRE, 2005).

In Slovakia, the main primary energy sources are fossil fuels, gas being the major source, and nuclear power. The share of renewables is modest, although large hydropower constitutes about 12% of the total electricity generation (in 2003). The energy consumption of the industry is declining, but it still remains the largest energy consumer due to the concentration of energy intensive industries such as chemical and iron and steel. Coal and natural gas are the main sources of energy in this sector (EVA, 2006).

Good potential exists for both biomass (heat and electricity) and geothermal energy (heat) production. Geothermal energy is already exploited in a somewhat wider range than biomass energy, which still remains almost negligible in spite of its high potential (Renewable energy, 2004; EVA, 2006).

[20] Polish Parliament. 1999. *Resoution on the Increase of Utilization of Renewable Energy Sources* of 8[th] July 1999.
[21] Council of Ministers. 2000. *Development Strategy of Renewable Energy Sector*. Document No 2215.
[22] *Directive on the Promotion of Electricity Produced from Renewable Energy Sources in the Internal Electricity Market’* of 27[th] January 2001 No 2001/77/EC *(O.J. L 283, p.33 of 27[th] October 2000).*

Slovakia has implemented large energy reforms over the recent years (IEA 2005a). The 2000 energy policy prioritised market reforms and sectoral policies, especially on energy security and environment, in order to comply with EU requirements. Slovakia also established new regulations, e.g., on cost reflective pricing enforced by an independent energy regulator, thereby attracting significant foreign direct investment. The focus in the first phase has been on the supply side: recent commentators have called for more efforts in improving energy efficiency (IEA 2005a).

Fixed feed-in prices for renewable energy have been in use for some years, but until 2006 the tariffs were very low and independent of the energy source. For the year 2006, the Regulatory Office has set differentiated fixed feed-in prices for electricity from renewable energy sources and CHP by decree. In April 2003, the Ministry of Economy adopted a program which aims to promote energy savings and renewable energy sources and is supposed to be in force until the end of 2006. This program offers financial support of up to € 100,000 for the reconstruction of renewable energy facilities. This program is under the supervision of the Slovak Energy Agency Support is also available through the Structural Funds (EVA, 2006).

According to the European Renewable Energy Council (EREC, 2004c), the level of public awareness about renewable energy technologies is low. Eurobarometer (2006) data (Table C.2), however, present a different picture, as willingness to pay for renewable energy is close to the EU average, and among the highest among the countries in this region.

Slovenia

Slovenia has a population of 2 million inhabitants and surface area of 20,300 km^2. At the local level, the authorities are municipalities. In addition, there are administrative units on the regional level, which, however, are not regions but bodies set up by municipalities to address issues of common interest. Housing, urbanism and land development, trade and industry and environmental issues are examples of tasks falling under the municipalities' competences (CCRE, 2005).

Electricity is produced mainly by coal and lignite, nuclear power, and to a smaller but still significant extent by large hydropower. In total primary energy supply, renewables hold a share of more than 10% due to the production of heat from biomass. A minor share is held by geothermal heat.

Half of the country is covered by forests, thus making biomass the most potential renewable energy source. Due to Slovenia's latitude, solar thermal energy is also worth considering, although today there is no widespread implementation (Renewable energy, 2004; EVA, 2006).

Slovenia's National Energy Programme (2004) sets the objectives of energy policy for the next ten years. This programme defines three strategic objectives for sustainable development in the field of energy: security of supply, a competitive energy sector and reduction of negative environmental impacts. The programme has set ambitious objectives for energy efficiency, including increasing the energy efficiency of final energy use by 2010 by 10-15% in different sectors, doubling the share of electricity from co-generation, and increasing the share of renewable energy to 12 % (Slovenia, 2005).

Feed-in tariffs are offered for qualified producers of green energy. Investment subsidies and loans are also available for projects promoting renewable energy sources and rational use of energy. The subsidies, however, are calculated in every year's budget and therefore are limited (EVA, 2006).

Table D.2 *Factors influencing renewable energy development in the Central and East European countries (Sources: IEA 2004, 2006; Eurobarometer 2005, 2006)*

	Czech Republic	Estonia	Hungary	Latvia	Lithuania
Geography	Rich in coal and lignite	Large deposits of oil shale (70% of world production)	Potential for geothermal energy, biomass, agricultural residues	45% of country covered by forests	Geothermal energy
Economic environment	Over-capacity in electricity supply	Only one third of energy imported Almost all electricity generated from oil shale, low electricity prices	Imported electricity is rather cheap relative to electricity from most domestic plants	Two-thirds of energy imported Hydroelectric capacity covers about half of domestic electricity consumption	Highest nuclear percentage contribution in the world (43% of TPES and 82% of electricity generation in 2003) Net exporter of electricity
Politics and policies	Technology-differentiated feed-in tariffs for renewables	Capital grants for grid connection establishments Feed-in tariffs for renewable electricity Capital grants for projects increasing the efficiency in municipal facilities or district heating (biomass boiler installations)	Feed-in tariffs for renewables, duration is pay-back time specific Low interest rate loans Investment incentives Fossil fuel taxes	Feed-in tariff for wind power, biomass and small hydropower electricity	Differentiated feed-in tariffs for geothermal, hydropower and wind power electricity
Technology funding	No specific energy R&D funding, 9 R&D programmes reported for renewables in 2001[23]	No specific energy R&D funding, 11 grants awarded for renewable R&D in 2001-2005[2]	46% of R&D budget (1995-2002) for renewables; before that period little governmental support to renewables	?	Particularly research on efficiency of solid biomass usage for energy production
Environmental awareness in energy issues (general public)	Climate change and energy awareness close to the EU25 average	Climate change and energy awareness close to the EU25 average	Relatively low awareness of climate change and renewables	Relatively low awareness of climate change and renewables, low propensity for energy conservation	Relatively low awareness of climate change and renewables

[23] Source: IEA 2001

[2] Source: Roos & Soosaar (2004). Status of Renewable Energy Development and Review of Existing Framework Conditions in Estonia. Tallinn University of Technology.

Table D.3 *(continued) Factors influencing renewable energy development in the Central and East European countries (Sources: IEA, 2004, 2006)*

	Poland	Slovak Republik	Slovenia
Geography	Rich in minerals, especially coal and lignite Almost 30% of surface area covered by forests Some geothermal energy	Potential for more hydroelectric capacity	Potential for more hydroelectric capacity Large forest resources
Economic environment	The biggest coal and lignite producer in the EU High energy independence The highest unemployment rate in the EU	Low energy prices 85% of energy imported Major foreign direct investment	Low energy prices 1/3 of electricity from nuclear power
Politics and policies	Energy distributors are obliged to hold at least 5.1% of green electricity by 2007; proportion will be gradually increased to 10.4% in 2010 Fiscal exemptions (need more continuity and coherence)	Feed-in tariffs for renewables Investment supports	Feed-in tariffs for renewables Subsidies for investments (renewables, energy efficiency, local energy) Attractive loans for environmental and RES projects
Technology	Significant increase in funding since 2002, totalling 180 m. euro in 2006	Low spending on energy R&D	Renewable R&D prioritised in National Energy Research Programme
Environmental awareness in energy issues (general public)	Relatively low awareness of climate change and renewables Low awareness of energy conservation	Climate change awareness high, high propensity for energy conservation Relatively low willingness to pay for renewable energy	Climate change and energy awareness close to the EU25 average

South Europe

Cyprus

Cyprus, one of the ten new EU member states, has a population of 0.7 million inhabitants and surface area of 9 300 km^2. On the local level, Cyprus consists of municipalities in urban and tourist areas, and communities in rural areas. Local authorities are responsible for e.g. urban planning, environment protection and land planning. The districts coordinate the activities of all ministries on the regional level (CCRE, 2005).

Energy is a considerable burden for the island, as it depends on oil importations for almost all of its electricity and over 90% of total primary energy supply (Renewable energy 2004). Almost half of the energy demand is due to the transport sector. The industrial sector uses about 20% of total energy, and is dominated by the cement industry which consumes 50% of energy, followed by the food and beverages industries with 23%. The service sector accounts for about 76% of the country's GDP (totaling about € 13 billion in 2005), and tourism in particular plays an important role. In the commercial sector, most of the energy is consumed by hotels, restaurants, and shops (CIE, 2006).

The main objectives of the national energy policy are in line with the principles of the respective EU policy. They concentrate on securing energy supply under satisfactory economic conditions, energy conservation and development of renewable energy sources, mitigation of impact on the environment and (d) the harmonisation of the energy sector with relevant EU provisions.

Solar energy also plays an important role in Cyprus, as about 90% of individual houses, 80% of apartments and 50% of hotels are equipped with solar water heating systems. Cyprus has the largest surface area of collectors per inhabitant globally. Further prospects for utilizing solar energy are good, as well as those of wind power and biomass, which today remain almost totally unexploited. For small hydro installations there exists only very limited potential (CIE, 2006).

The first formulation of Renewable Energy and Energy Conservation Action Plan was done in 1985 and it was revised in 1998. Currently, the Electricity Authority of Cyprus is obliged to buy RES at a fixed feed-in purchase price. Investment subsidies are also offered for wind, solar thermal, biomass and photovoltaic energy utilization projects (CIE, 2006).

Greece

Greece, officially the Hellenic Republic, has a population of 11.1 million inhabitants. The surface area is 131,900 km^2, including more than 2000 islands on the Mediterranean Sea. Greece is a federal state composed of municipalities on the local level, departments on the intermediary level and regions on the regional level. Municipalities' competences include public transports and gas and water supply; the departments answer for development and urbanism of the department, while regions have a role in higher level economic development and coordination (CCRE, 2005).

The service sector has a major role in the economy, with approximately 70% share of the GDP. The contribution of agriculture, forestry and fishery to the GDP is largest in the EU with its relative share of above 6%. The industry sector (about 20% of GDP, of which about 10% from manufacturing), has always been relatively small compared with other EU countries (The Economist, 2006; AGORA, 2006).

Greece relies mainly on fossil fuels for its energy supply. All of the oil, which covers more than a half of the total primary energy supply, is imported. Coal, which covers a third of TPES, is mostly indigenous. Renewables covered about 5% of TPES in 2003 and over 10% of total electricity generation. Large hydropower accounts for about three-quarters of green electricity generation. Wind power was promoted strongly in the 1990s, which tenfolded the installed capacity from 1995 to 2001. Biomass is utilized to a smaller extent in electricity generation, but has a larger role in domestic heating. Solar energy utilization has seen substantial increase in the recent years in the domestic water heating applications. (IEA, 2004; 2006) It is estimated that there still remains great potential for increasing the use of renewables. According to the Greek Centre for Renewable Energy Sources (CRES, 2003), with 300 sunny and warm days a year, over 1000 islands with sea wind, an average wind speed exceeding 7.5 m/s and an important number of geothermal fields, Greece is an ideal country for wind, solar and geothermal energy production.

Since 1998, the energy policy in Greece has pursued the following objectives: energy security, with a focus on developing interconnections with neighbouring countries, diversification of energy sources and reduction of dependency on energy imports; introduction of natural gas, increasing the use of indigenous energy resources including renewables, reducing energy intensity and CO_2 emissions, energy market reform and stimulation of research and development and energy sector investments (IEA, 2002b; 2004f). Following this policy, the energy market has increasingly opened for competition and private investment. The government is focusing on establishing Greece as the energy hub of southeast Europe, with large projects for new gas pipelines, as well as facilitating entrepreneurship in the field of renewable energy and cogeneration (Papadosifaki 2005).

Fiscal incentives have been the most widely used measures to promote renewable investments in Greece. Large hydropower and residential biomass use, which account for almost 90% of total renewable energy supply, do not receive policy support. Renewable energies are promoted by preferential feed-in tariffs introduced in 1994 and consolidated in 1999, and by investment grants provided to private investments in renewable energy technologies and in co-generation plants of less than 50 MW, with grant levels differing according to technology. The licensing procedures for renewables have been complex, but the government simplified them in the recent years. (CRES, 2003, IEA, 2004, 2004b, 2006)

Studies have found significant variance in local attitudes to renewable energy projects in Greece (Polatidis & Haralambopoulos, 2004; Kalldellis, 2005). Attitudes vary between islands and the mainland, and according to the extent to which local people are included in decision-making. In some regions, there is strong public opposition towards wind power installations, which have caused the government to introduce a 2% compensation tax on renewable electricity. As the revenue is used for community projects, it is expected to increase the public acceptance of wind power. (IEA, 2004)

Italy

Italy has a population of 57.8 million inhabitants and surface area of 301,200 km^2. Italy is a federal state made of communes, provinces and regions. There are two autonomous provinces, Trento and Bolzano. Regions are the key actors in the production and delivery of energy, and also answer for land development and urbanism. Both communes and provinces have competences related to environment. The communes answer for urban planning, economic development and land development. (CCRE, 2005) Legislation based on the national plan has established the responsibility of local authorities for planning and control of energy, but only a few municipalities, mainly in the North, have taken up their new responsibilities (Climate Alliance, 2001).

Italy is one of the largest economies in Europe, with a GDP of € 1417 billion in 2005. Italy's strongest industrial sectors are machinery, clothing and textiles. The Italian economy is characterised by an unusually large share of small and medium-sized enterprises. (MFA, 2006). The economy is also clearly less energy-intensive than that of its neighbours, and was early in phasing out production of coal and nuclear energy (EIA, 2006c).

Italy relies on oil for half of its primary energy supply. Renewables and wastes account for 6%, gas and coal for the remaining share. In electricity generation, renewables play a larger role, contributing approximately 16% to total electricity generation, mostly due to hydropower. Italy has also succeeded to promote other renewables, especially biomass and geothermal power, to make them significant contributors to the total energy mix (IEA 2004; 2006).

Italy's energy policy has focused on market liberalization, devolution of decision-making powers to the regional authorities as well as on diversification of supply sources, security and efficiency improvements as well as climate change mitigation. Privatization of the large state-owned energy companies, Eni and ENEL, has changed the structure of the energy market and made room for new market players (IEA, 2003). In response to power blackouts experienced in 2003, the government eased regulations on building new power plants and sought to encourage greater investment (EIA, 2006c).

Diversification of energy sources is an important policy priority in Italy owing to a high dependence on imported oil and gas from limited supply sources. This goal also implies expanding the use of renewable energy. Over the past two decades, Italy has applied several strategies for promoting renewables: loans, financing and capital grants, tax incentives, feed-in tariffs and green certificates are applied. Today, Italy is moving away from using fixed feed-in tariffs for renewable energy to minimum quota obligation scheme with tradable green certificates. The greatest barrier to market deployment of renewables is the complicated licensing procedures (IEA, 2004, 2004b).

While concern for the environment has grown among the Italian public, willingness to pay for renewable energy and conserve energy are relatively low in relation to income levels and the price of energy (Table C.3). Some local controversies have been observed in renewable investments (IEA, 2006x), but partly these may be connected to a more general tendency to local opposition and political conflict over energy investments (IEA, 2003).

Malta

Malta is the smallest EU country and one of the ten new member states. It has a population of 0.4 million inhabitants and area of 320 km^2. Malta consists of three regions that are administrative bodies made of the local level authorities, communes (CCRE, 2005).

Malta is almost totally dependent on its oil imports. Renewable energy sources remain unexploited (Renewable energy journal 2004). Strategic thought and planning considering renewable energy policies is underway. At moment, solar energy is supported by a reduced VAT rate (Renewable energy, 2004).

Portugal

Portugal has a population of 10.3 million inhabitants and surface area of 92,400 km^2. Portugal is a federal state composed of parishes and municipalities on the local level, districts in the intermediary level, and regions. There are two autonomous regions, the Azores and Madeira. The regions are the administrative bodies responsible for the development of the regions. Environment and urbanism are responsibilities of the local level authorities (CCRE, 2005).

In 2005, GDP in Portugal amounted to € 147 billion, with an originally high growth rate that has stagnated in recent years (Eurostat, 2006). In the past decades, Portugal has become a diversified and increasingly service-based economy. Many state-controlled firms have been privatized and key areas of the economy, including the financial and telecommunications sectors have been liberalized.

Total primary energy supply in Portugal has increased rapidly in the past decades, and unlike in the other IEA countries, the growth has been more rapid than that of GDP. Portugal still depends heavily on imported oil, which accounted for 60% of the TPES in 2003. The share of renewables is increasing, and was 17% of TPES in 2003. Hydropower covers a third of the country's electricity generation. The significance of biomass is increasing (IEA, 2004, 2004b, 2006).

To relieve the country's dependence on imported fossil fuels, a number of policies to promote renewables have been established. These include feed-in tariffs, grants and investment incentives (IEA, 2004).

There are many reasons why the attempts to promote new renewable developments have not been very successful. There has been a level of uncertainty on the investors' side associated to the time the feed-in tariffs will be in force. The licensing procedure for renewable energy is complex and lengthy. There is also reported to be unawareness about the economical and environmental benefits of some technologies among prospective customers and consumers (IEA, 2004).

Spain

Spain has a population of 40.4 million inhabitants and surface area of 504,800 km^2. Spain is a unitarian state composed of municipalities, provinces, and autonomous communities. The municipalities' competences depend on its size, e.g. only municipalities with more than 50,000 inhabitants are responsible for public transports and environment protection. Land development, environmental management and development of economical activities are examples of the regional authorities' competences. (CCRE, 2005) Local authority involvement in energy remains quite limited. Towns play almost no part in electricity distribution. Only a few municipalities have carried out pilot projects with district heating or combined heat and power plants or are involved in projects promoting renewable energy (Climate Alliance, 2001). In 2003, EnerAgen, the Association of Spanish Energy Management Agencies was created by 23 Spanish energy agencies (local and regional Energy Agencies, and IDAE, the national Institute for Energy Diversification and Saving).

In 2005, GDP amounted to about € 905 billion, and economic growth has remained above-average throughout the past ten years. Services, especially trade, hotels, restaurants, transport and communications, have a major position in the economy, accounting for almost 29% of total value added. The role of agriculture has declined to 3.5% of total value added, but the country remains a major agricultural producer in Europe. Spain is, among other things the largest producer of fuel ethanol in the EU.

Energy consumption has grown rapidly during the last decade, considerably faster than in other European countries (IEA, 2004). The Spanish primary energy supply relies mainly on fossil fuels, especially on oil. Nuclear power has a contribution of 12% and renewables 7% in the TPES. Renewable energy use is dominated by hydropower and biomass. Wind power has taken a share of 5% in electricity generation (IEA 2004, 2006), and Spain became the world's second-largest producer of wind energy in 2004, and many new investments are underway (EIA, 2006d).

Spain's energy policy has focused on improving security of supply by increasing the share of natural gas and renewables in the energy supply, as well as on further liberalization of the energy market and opening it up to new players. The government has also introduced an energy efficiency strategy with sectoral targets, which has not however, managed to curb the steadily growing demand. Ambitious targets for renewable energy have been introduced in the 'Renewable Energy Plan 2005-2010' which aims to increase the share of renewable energy in primary energy supply to 12%, and in electricity, to 30%. The plan also includes provisions for improving energy efficiency.

A fixed feed-in tariff that is differentiated by technology has been the primary tool to promote renewable electricity in the past, and has delivered impressive growth rates for wind generation. Low-interest rate loans and capital grants have also been available for renewable energy projects. In 2004, a new incentive was introduced, whereby renewable energy producers can directly sell their power to the market receiving the average market price plus differentiated premiums based on the market price. (IEA, 2004; 2005). Gaps in grid-connection rules are seen as a major obstacle for the development of renewable electricity (IDEA, 2005).

Spain has been rated the most attractive country for renewable investments for a number of years (Ernst & Young, 2006). This is due to the record growth rate of the wind power sector, as well as the steady growth in energy consumption and rapid increases in electricity prices.

Table D.4 *Factors influencing renewable energy development in the South European countries (IEA, 2004; Eurobarometer, 2005; 2006)*

	Cyprus	Greece	Italy	Malta	Portugal	Spain
Geography	Island in the Middle East	Good potential for solar, wind and geothermal energy	Good potential for solar, wind and geothermal energy	Island state, no mountains or rivers Potential for solar energy	38% of surface area covered by forests	Limited oil and coal reserves, major importer
Economic environment	Almost total dependence on energy imports Oil dominant in TPES, concern for security of supply	Heavy dependence on energy imports	Low energy-intensive industry structure Relatively high energy prices	Completely dependent on oil imports	High dependence on imported oil	Weak cross-border gas and electricity interconnections and low electricity trade
Politics and policies	Feed-in tariffs Investment grants	Tax breaks Investment grants Feed-in tariffs Tax exemptions for households for the purchase of renewable energy equipment	Favourable lending schemes, financing and capital grants Tax incentives Feed-in tariffs based on avoided costs Green certificates Progressive carbon tax to coal, natural gas and oil	Reduced VAT rate for solar energy	Feed-in tariffs Grants Investment incentives	Feed-in tariffs Premium for green energy
Technology funding	Recent investments in R&D institutes Strong solar industry	41% of R&D budget (1977-2002) to renewables	15% of energy R&D budget to renewables since the mid 1990s; before that period the annual average was between 3% and 5%		Renewables' share of energy R&D budget increased from 17% in 1980 to more than 40% in 2001, but overall energy funding has decreased significantly since early 1990s	20% of energy R&D budget (1974-2002) to renewables
Environmental awareness in energy issues (general public)	Average awareness of climate, renewables and energy conservation	Average awareness of climate change and renewables Below-average propensity for conservation	Average awareness of climate change Below-average willingness to pay for renewables	Low willingness to pay for renewables	Low willingness to pay for renewables	Average awareness of climate and renewables Below average consumer behaviour

West Europe

Austria

Austria has a population of 8.2 million inhabitants and surface area of 83,900 km^2. Austria is a federal republic composed of nine federal states (provinces). Energy distribution is stated as one of the federal states' responsibilities (CCRE, 2005). Municipal authorities are responsible for e.g. urban planning and land development and urban transport. Energy production and distribution are the municipalities' optional powers, which they make great use of. As part of the development of local heating systems, municipalities are increasingly imposing a requirement or providing incentives for people to link up to district heating systems in certain areas through the local planning process (CCRE, 2005; Climate Alliance, 2001).

Due to hydropower resources, the price of electricity in Austria is relatively low, and Austria also exports electricity. The country has a quite diversified industrial structure, with services accounting for 68% of gross value added, but industry maintaining a share of about 30% of total value added in 2004 (Eurostat, 2006). The main industries are construction, machinery, vehicles and parts, food, chemicals, lumber and wood processing, paper and paperboard, communications equipment and tourism (The Economist, 2006). GDP at market prices totalled about € 245 billion in 2005, and the growth rate of the economy in the past 10 years has been close to or slightly above the EU 25 average (Eurostat, 2006).

Austria's energy policy objectives include security of supply, cost-effectiveness, environmental compatibility and social compatibility (IEA, 2004c). Priority is given to energy conservation, to increased use of renewable energy sources, and to a shift of emphasis from government interventions to market forces. Austria's Kyoto Protocol commitment is to reduce greenhouse gas emissions by 13 percent from 1990 levels. This has not been easy to achieve, as greenhouse gas emissions have been growing (especially in transport) rather than declining, and an ambitious climate strategy was instituted in 2003 (IEA, 2004c). Furthermore, the country has intensified co-operation in renewable energy with Central and East European neighbours. (Heindler, 1998).

Austria has one of the largest shares of renewables in its total primary energy supply in Europe (21% in 2003), due to the efficient utilization of hydropower and bioenergy resources. In 2003, 60% of electricity was generated by hydropower. While biomass and hydropower are significant contributors to energy supply, solar PV and wind energy have exhibited little market growth until recently, when new, more effective promotion policies were introduced. Today, Austria has the second largest installed solar thermal capacity per capita in the Europe (IEA, 2004; 2006). Renewable energy has been promoted through quotas and feed-in tariffs, federal grants and incentives, portfolio standards and personal tax incentives for the purchase of biomass and solar technologies are employed to promote renewable energy deployment (IEA, 2004; 2006).

Grassroots support for climate change mitigation appears to be high in Austria. Eight out of nine federal states and many municipalities and villages have joined the 'Climate Alliance of European Cities' with its aim of a 50% reduction of CO_2 emissions by 2010. Another example of the socially-engaged energy policy is the Government programme 'Energy Systems of Tomorrow', which includes a focus on both technological, structural and social innovations (IEA, 2004c).

Belgium

Belgium has a population of 10.3 million inhabitants and surface area of 30,500 km^2. Belgium is a federal state composed of municipalities, provinces, regions and communities (the French, Flemish and German communities). The regions have competences in most fields, including land development, urban planning, environment, and energy policy. Each region has its own, different energy policy (IEA, 2005). Municipalities are also responsible for urban planning on their area. (CCRE, 2005) The energy production system in Belgium is centralised and local authorities have a very limited role in energy management, and municipalities are hardly ever involved in energy production (Climate Alliance, 2001).

Belgium is the most open economy in the EU, with exports accounting for 82% of GDP. Industry, including construction, has seen its share of GDP decline to less than 20% of value added in 2004. At the same time, the share of the services sector has risen from to 74% of total value added (Eurostat, 2004), driven mainly by increased business services such as financial, real estate and rental services (The Economist, 2006).

As a small and densely populated country, Belgium has few indigenous energy sources, which applies to renewables as well. Most of the energy is produced by imported fossil fuels. Nuclear power has over 50% share in electricity generation. In 2003, Belgium decided to phase out nuclear power between 2015 and 2025. This is expected to lead to a supply gap, which will need to be covered by improved energy efficiency, electricity imports or new electricity generating capacity (IEA, 2005).

Promotion of the use of renewables may differ by market deployment strategy and by technology according to the region, as these are competences that fall under the regional governments. Several market deployment strategies have been applied, including preferential deduction rates for industry, green frank system, preferential grid connection to renewables, direct investment incentives, consumer grants and rebates, and green certificates. The government perceives three main barriers to the penetration of renewables: limited renewable energy endowments and land-use constraints, the existence of large centralised energy production systems, and the low relative price of conventional energy (IEA, 2004). Belgium's natural gas and electricity markets are highly concentrated. Companies owned by the international power group Suez SA dominate at all levels (IEA, 2005).

In 2004, renewables accounted for 1% to the total primary energy supply and little more than that to the electricity generation. Biomass and waste utilization has increased rapidly in the recent years and are by far the most important renewable energy supply in Belgium. There has also been interest in increasing the use of wind and solar energy (IEA, 2004; 2006).

France

France has a population of 59.3 million inhabitants and surface area of 544,000 km^2. France is a unitary state composed of municipalities, departments and regions. Land planning and transport are part of the regional authorities' competences. Urban planning is carried out by the departments. Municipalities are responsible for town planning. Environment and economic development are concerns of both local and intermediary level authorities. French energy policy over the past decades has been characterised by a centralised, nation-based approach with strong government involvement, but this has been under change for the recent years (CCRE, 2005; IEA, 2004b). The municipalities have limited direct responsibility in energy production and distribution. French municipalities have concentrated on the management of consumption in their own property. District heating, however, is predominantly provided by municipalities or operates via a municipal concession (Climate Alliance, 2001).

France has a very diversified economic structure. Agriculture and the agro-food industries account for a relatively large share of economic activity. Industry's share of total value added is less than 16%, whereas services accounted for 76% of total value added in 2004 (Eurostat 2006). France's foremost industries in manufacturing include motor vehicles, pharmaceuticals, transport equipment and aerospace (The Economist, 2006). The carbon-intensity of the economy is one of the lowest in the EU, due to structure of the economy and the country's reliance on nuclear energy (EIA, 2006e).

Nuclear power accounts for approximately 80% of electricity production and 40% of total primary energy supply, the largest share in any country. The share of renewables is about 7% of TPES and 12% of electricity, mostly due to biomass combustion for heat and hydropower for electricity (IEA, 2004; 2006).

Much of France's early renewable energy market deployment efforts were directed to the overseas departments, especially during the 1980s. To promote renewables, lower taxation for biofuels, investment grants and incentives, feed-in tariffs for renewables (excluding large hydro), tax credits or reductions for purchase of renewable equipment are applied. These incentives have boosted the use of biomass and biofuel, solar thermal applications and renewable electricity generation to some extent. The biofuels and biomass policies are mentioned by EREC

(2004d) as examples of progressive policies. Biofuels are promoted by an excise tax exemption, which makes them cost competitive. Biomass district heating is supported by investment subsidies, mainly from the local region.

Incentives to promote wind energy are in place, but wind energy expansion has been hampered by small operators' problems in accessing the grid (EREC, 2004). Wind energy developments have also faced public acceptance difficulties which slow new installations (IEA, 2004). Problems in public acceptance of the EOLE 2005 programme are analysed in case study 12 in Annex 1 of this report.

Germany

Germany has a population of 82.1 million inhabitants and surface area of 357,000 km^2. Germany is a federal republic composed of municipalities, districts and federal states. Federal states are responsible for the environment. Urban planning is a compulsory competence of the municipalities. The municipalities also have facultative jurisdiction in the sectors of energy, economic development and public infrastructures (CCRE, 2005). A German particularity is the existence of municipal companies, so-called Stadtwerke, which produce 30% of the electricity used in the country (Climate Alliance, 2001).

Germany's economy is the largest in the EU, and one of the largest in the world. The economy has been struggling, with even zero growth rates, during the past years, and growth rates are still well below the EU25 average. Manufacturing and related services are still very important for the German economy, although the share of overall industrial output (excluding construction) in GDP has declined in the past decades. The country has an exceptionally low energy intensity, and even in absolute terms, Germany's per capita energy consumption has decreased by 5.5% since the early 1990s.

The Federal Government has made key decisions about its future energy supply structures. These include decisions on an orderly termination of use of nuclear power, expansion of use of renewable energies, development of new energy technologies and loan programmes for energy efficiency measures. Germany has completely liberalised its electricity market which led to lower electricity prices especially for the industrial sector, as well as to the provision of new energy products (e.g., 'green' electricity). In spite of this, the energy sector is relatively concentrated, with for example a few large domestic and a few large foreign companies dominating the power market (JGCRI, 2005).

In 2003, renewables constituted about 4% of Germany's total primary energy supply. In electricity generation, their share was almost 9%. Fossil fuels still supply more than 80% of Germany's energy. Coal is the main fuel used for electricity generation, followed by nuclear power and gas. Renewable energy supply has been growing rapidly since the beginning of the 1990s, due to substantial growth in biomass use and very rapid growth of wind power. The share of renewables in electricity production has already doubled since 1990 (IEA, 2004; 2006). Although Germany is the world's largest wind energy producer (39% share of the world total), wind power only accounts for a few percent of the large country's electricity supply. Two-thirds of the installed PV capacity in the European Union are located in Germany (IEA, 2004).

In Germany, many technologies for renewable energy generation were ready for market deployment by as early as the mid 1980s, and investment incentives were offered to make them competitive. Since the early 1990s, the central policy to promote the deployment of electricity from renewables has been a feed-in tariff fixing a minimum price for electricity from renewable energy sources. Grants and loans to support renewables in the heating sector were also introduced early in the 1990s. Later, ensured grid accession and premium prices became available for green electricity producers (IEA, 2004).

The roots of Germany's progressive renewable energy policy are in the longstanding public support for environmentalism (JGCRI, 2005). The broad public support is also evident in data from Eurobarometer surveys (see Table C.4). Community involvement in renewable energy is deeply rooted, and Predac (2004) reports that the problems observed elsewhere in siting renewable energy installations have not occurred in Germany. Yet JGCRI (2005) argues that there is also local resistance to, e.g., wind power plants, while the subsidy systems have also encountered political pressure.

Ireland

Ireland has a population of 3.9 million inhabitants and surface area of 70,300 km^2. Ireland is a unitary state composed of municipalities on the local level, counties and cities on the intermediary level, and regions on the highest level. Both local and intermediary level authorities hold competences in urban planning (CCRE, 2005).

Ireland's GDP amounted to € 161 billion in 2005, and the country has experienced rapid economic growth and modernization over the past ten years (Eurostat, 2006). In contrast to other European countries, the importance of industry is growing, and it now accounts for more than one-third of GDP, up from 31% in 1981. While services output also grew, it did so at a slower pace than industry. The country also has an exceptionally large export sector, dominated by foreign-owned multinationals. Thus, GNP is 25% less than the country's GDP (The Economist, 2006).

Ireland relies on fossil fuels for 98% of its total primary energy supply, of which over 50% is oil. Renewables account for the remaining 2%. Most of the renewable energy comes from traditional biomass and hydropower. Gas has rapidly taken over large part of coal's share in electricity generation. Wind power and landfill gas generation have increased considerably in the recent years, but still only have a minor share to the total supply (IEA, 2004).

Most developments aimed at promoting renewables have focused on electricity market. The primary fiscal instrument in use is the competitive tendering approach, funded through a Public Service Obligation payment made by all electricity consumers. Other policies include investment tax credits, feed-in tariffs for wind and bioenergy, capital grants, and consumer grants or rebates for renewable energy applications (IEA, 2004).

Eurobarometer (2006) data suggest that lack of public awareness concerning energy and environment issues hinders a positive change towards renewable energy in Ireland (see Table C.4). There is a special interest in wind energy in Ireland, however, and quite recently, efforts have been made to promote community-based wind energy development (REP, 2004).

Luxembourg

Luxembourg has a population of 0.44 million inhabitants and surface area of 3000 km^2. Luxembourg is a unitary state made of communes. Communes are responsible for urban planning (CCRE, 2005). In general, towns have little executive power in energy matters (Climate Alliance 2001).

Luxembourg has a very service-oriented economy, with financial and business services accounting for 47% of total value added. GDP (total € 29 billion) is high in relation to the small population, and has experienced above-average growth rates for the past ten years. Energy intensity and carbon dioxide emissions are relatively high, taking into account the structure of the economy.

Luxembourg's total energy supply is mainly made of oil and gas. Luxembourg imports almost all of its energy supply, as it has limited endowment of indigenous energy resources. The IEA (2004d) has argued that Luxembourg will have a major challenge in meeting its Kyoto commitments. The main drivers of the increasing CO_2 emissions are population increase and strong demand for petroleum products. Low taxes attract non-residents for vehicle refuelling, pushing up petrol consumption. Thus, IEA (2004d) has recommended further improvement of energy efficiency in the residential/commercial and transport sectors to enhance energy security.

Increasing the use of renewables therefore offers another means to diminish the dependence on imports. Renewables hold a share of 1.5% in TPES (in 2003). In the electricity generation renewables, most of which are hydropower and biomass, account for about 6% share. Wind power experienced the greatest growth of the new renewable technologies at the turn of the millennium. Neither PV nor solar thermal technologies contribute much to the energy supply, but he PV market has been growing in response to feed-in tariffs provided since 2001 (IEA, 2004; 2006). Luxembourg has promoted renewable energy technologies by demonstration projects, feed-in tariffs and investment incentives (IEA, 2004).

Netherlands

The Netherlands has a population of 16 million inhabitants and surface area of 41,500 km^2. The Netherlands is a unitary state composed of communes and provinces. The provinces' competences, most of which are shared with the central government, include regional planning, environment and energy (CCRE, 2005). The communes are responsible for urban planning and transport. Municipalities are responsible for town planning and for all sorts of concessions. Municipalities are in charge of issuing planning permission. The main influence of municipalities is through negotiating conditions during the planning process to increase the use of renewable energy, particularly solar energy. Local authorities have no jurisdiction over heat production but they hold shares in utilities involved in district heating (Climate Alliance, 2001).

In 2005, GDP in the Netherlands amounted to about 506 billion, with a long-term growth rate close to the EU25 average (Eurostat, 2006). The Dutch manufacturing sector is relatively small, accounting for about 15% of GDP, whereas services accounted for more than 70% of GDP in 2002. Commercial services make up 48% of GDP. The Netherlands hosts a relatively large number of multinational companies, and the economy relies heavily on imports and exports (The Economist, 2006). Electricity prices are relatively high, whereas natural gas is relatively expensive for households, but somewhat cheaper than average for industrial customers. The energy supply is dominated by fossil fuels, and natural gas accounts for about half of the total primary energy supply (EIA, 2004). In 2003, renewables had a share of 2.6% in total primary energy supply and 5.7% in electricity generation. Biomass and wind power are the most important modes of renewable energy generation in the Netherlands. Electricity imports have been rising gradually (IEA, 2004; 2006).

The Dutch energy policy emphasizes security of supply, a competitive market and environmental protection. Security of supply has recently gained importance, whereas in the past the market and the environment featured more prominently on that agenda. Energy-efficiency has been promoted through an ambitious policy which includes the use of benchmarking covenants and active evaluation and monitoring. The electricity market and a large share of the natural gas market have been liberalized. The Dutch government has also made large efforts to meet its Kyoto target of a 6% reduction in greenhouse gas emissions (IEA, 2004e).

Both demand-side and supply-side measures are taken in the Netherlands to promote renewable energy. These include feed-in tariffs for green electricity, tax exemptions and green certificates to promote investments on the supply side. On the demand side, exemptions for renewable energy from the fuel tax and investment subsidies for households purchasing renewable equipment have been applied (IEA, 2004). On the other hand, it has been noted that licensing and permit procedures and spatial planning of e.g. wind power projects can take a rather long time in the Netherlands. The government is making efforts to reduce barriers of this kind (IEA, 2004).

Dutch citizens and policy makers share a long tradition of high environmental awareness and concerted efforts to solve environmental problems. This can also be seen in Eurobarometer

(2006) data on awareness of climate change and energy issues among the general public. But there have also been local controversies over renewable energy installations (e.g., Wolsink, 2000).

United Kingdom

The United Kingdom has a population of 60.1 million inhabitants and surface area of 244,800 km^2. In the UK there are 4 regional governments in Scotland, Wales, Northern Ireland and London; the rest of England has no directly elected regional authorities (CCRE, 2005; Climate Alliance, 2001). The structure of local government varies in different parts of the country. There are 5 different types of local authorities in England. In Scotland, Wales and parts of England, a single tier 'all-purpose council' is responsible for all local authority functions (Unitary, Metropolitan or London Borough). The remainder of England has a two-tier system, in which two separate councils divide responsibilities between district and county councils. In addition to the nearly 400 local authorities in England there are around 10,000 parish and town councils that are mostly, but not exclusively, in rural areas (Friends of the Earth, 2002). Local authorities have various responsibilities for provision of services, such as education and waste disposal. In relation to energy generation and distribution, local authorities have no formal role, however most support the Local Agenda 21 and are attempting to take leadership on environment issues and becoming energy efficient.

The UK economy is about three-quarters the size of Germany's and competes with France for the position of fourth-largest economy in the world. Compared to other European economies, the UK economy is characterized by low levels of public spending and capital investment (The Economist, 2006). The share of manufacturing of GDP has declined more strongly than in other industrialised countries and manufacturing now represents less than 20% of gross value added, whereas financial and business services hold a relatively prominent share (30%) (Eurostat, 2006).

Energy industries contribute significantly to the country's wealth, and the UK is net exporter of oil and gas. Most of the country's own energy supply is also comprised of these two supplies. In addition, nuclear power and coal are seen to have significant roles in electricity generation in the future. Renewable energy has grown rapidly in the past three decades, but from a very low base to a share of 1.7% in 2004. Biomass is most widely used renewable energy source. There is also an emerging market in the offshore renewables, as the UK has a pool of skills and experience working in the offshore environment (IEA, 2004; 2006). Despite the UK having the largest resources for wind, wave and tidal energy in Europe, they currently perform badly in comparison to other European countries, who generate significantly more electricity from renewable sources (Environment Agency Website).

The UK Department of Trade and Industry's Energy White Paper identifies as key energy challenges the environment, the decline of indigenous energy supplies and the need to update energy infrastructure. It sets out four policy goals: (1) to reduce carbon dioxide emissions by about 60% by about 2050 with real progress by 2020; (2) to maintain the reliability of energy supplies, (3) to promote competitive markets in the UK and beyond; (4) helping to raise the rate of sustainable economic growth and to improve productivity, and to ensure that every home is adequately and affordably heated (DTI, 2003).

The Government's main support mechanism for renewables is based on green certificates trade introduced in 2002, and it will remain in place until 2027 to secure a stable and long-term market for the renewables. Electricity distributors are required to source a portion of their electricity supply from renewables, and this share will rise to 10% by 2010. In addition, capital grants for biomass and offshore wind are offered. In 2001, the UK introduced the Climate Change Levy, a tax levied on commercial and industrial energy users for the use of carbon dioxide emitting energy sources. Green energy is exempt from this tax (IEA, 2004; 2006).

In the UK, a number of surveys concerning public awareness and attitudes towards renewable energy have been conducted (DTI, 2006). It was found that solar, wind and hydroelectric energies are the most well known, whereas less than half of people have heard of biomass or bioenergy. Overall, people have positive attitudes towards renewable energy, and they support Government policy on this subject. However, there are significant differences related to, e.g., social group, age and area. There is also a well-documented history of local controversies over renewable energy deployment, partly due to the top-down and large-scale nature of the investments (e.g., Devine-Wright, 2004; Upreti, 2004).

Table D.5 *Factors influencing renewable energy development in the West European countries (Sources: IEA, 2004, 2004b; Eurobarometer, 2005, 2006)*

	Austria	Belgium	France	Germany	Ireland	Luxembourg	Netherlands	United Kingdom
Geography	Large natural endowment of hydroelectric power	Small land area, densely populated	Largest EU country by area with diversity of geography including mountainous areas, flat plains and long coastlines	Located in the middle of the European energy markets → important transit country	Geographical position isolated from the European energy market	Renewables are the only indigenous energy source	Small land area, densely populated	Producer of gas, oil and coal
Economic environment	Relatively low electricity prices	Almost 90% of total energy supply is imported (2001)	Strong dependency on nuclear power (42% of TPES and 79% of electricity generation in 2003) Relatively low electricity prices	Largest EU country by population and GDP and largest European energy market	Rapid economic growth and modernization process in recent years	98% of TPES imported (2001)	Natural gas important energy source Relatively high electricity prices	Leader in energy market liberalisation Net exporter of energy (oil and gas) Relatively low electricity prices

	Austria	Belgium	France	Germany	Ireland	Luxembourg	Netherlands	United King-dom
Politics and policies	Quotas Feed-in tariffs Federal grants and incentives Portfolio standards Tax on oil products, gas and electricity Personal tax incentives for the purchase of biomass and solar technologies	Green certificates Mandatory buy-back of green electricity Priority grid access Consumer grants and rebates	Lower taxation for biofuels Investment grants and incentives Feed-in tariffs for renewables excluding large hydro Tax credits or reductions for purchase of renewable equipment Competitive tendering	Feed-in tariffs Grants and low rate loans Ensured grid accession for renewables Premium prices Fossil fuel taxes Consumer grants / rebates	Investment tax credits Feed-in tariffs for wind and bioenergy Capital grants Consumer grants / rebates for solar thermal and bioenergy Fossil fuel taxes	Feed-in tariffs Investment incentives	Feed-in tariffs Tax exemptions Green certificates Fossil fuel tax Investment subsidies for households purchasing renewable equipment	Green certificates Capital grants forr biomass and offshore wind Tax exemptions for renewables
Technology and technology funding	20% of R&D budget for renewables (1977-2002), of which 56% for biomass technologies	Small fraction of R&D budget for renewables after the mid-1980s	< 2% of energy R&D budget (1985-2002) for renewables	10% of energy R&D budget to renewables (1974-2002) hosts more than a third of globally installed wind power capacity and two thirds of PV capacity of EU	32% of energy R&D budget (1974-2002) for renewables; no significant funding between 1990 and 2001	Few financial resources to energy R&D	15% of total energy R&D budget (1974-2001) allocated to renewables	5% of R&D budget (1974-2002) to renewables

	Austria	Belgium	France	Germany	Ireland	Luxembourg	Netherlands	United Kingdom
Environmental awareness in energy issues (general public)	High environmental awareness Less concern over energy consumption	Close to EU average on many issues Above-average willingness to pay for renewable energy	Below-average energy prices and awareness of climate issues, but willingness to pay for renewables relatively high Some local controversies about renewable deployment	High awareness of both environment and energy Some significant differences between East and West	Below-average environmental awareness and willingness to pay for renewables	High environmental awareness and willingness to pay for renewable energy	Very high environmental awareness High willingness to pay for renewable energy and to conserve energy Some local controversies about renewable energy deployment	Above-average awareness of renewable energy and energy conservation Local controversies about renewable energy deployment

Appendix E Comparative data on national cultural factors[24]

	UK	Germany	NL	France	Italy	Spain	Hungary	Poland	Iceland	Finland	Sweden	Norway
Policyculture												
Lijphart's (1999) classification	majorita-rian-unitarian	consen-sual-federal	consen-sual-unitarian	majorita-rian-unitarian	consen-sual-unitarian	majorita-rian-federal	has shifted btwn con-sensual & bipolar	has shifted btwn bipo-lar & con-sensual	consen-sual-unitarian?	consen-sual-unitarian	consen-sual-unitarian	consen-sual-unitarian
Strong leadership												
Autocratic leadership score (between - 1.894 - 2.33 globally)	- 0.54	-0.89 West - 1.15 East	- 0.79	-0.22	-0.13	0.70	0.54	0.66	-	-1.13	-0.30	-
Role of entrepreneurship												
"Never thought of starting a business" (EB 2004)	59%	47%	51%	66%	62%	70%	57%	50%	53%	51%	64%	60%
"One should not start a business if there is a risk of failure" (EB 2004) (EU25=51%)	**43%**	**61%**	**44%**	**43%**	**51%**	**44%**	**80%**	**56%**	**47%**	**41%**	**49%**	**40%**
Shared benefits important												
More participation (work & where they live) important (WVS 1999)	50%	44%	43%	47%	40%	45%	33%	49%	42%	34%	64%	47%
Reducing economic inequalities very important (WVS1999)	42%	37%	41%	47%	51%	64%	48%	60%	58%	47%	39%	45%
Attitude to foreign ownership												
Support foreign ownership, % of population							(1993): 24%	(1993): 48% (2001): 63%[25]				

[24] These data should be treated as indicative only, as they originate from surveys with varying purposes, sample sizes and quality. In the present context, they aim to provide background for Chapter 6.2 of the report.

(Rohrschneider & Whitefield 2004)												
"Globalization will have a positive impact on employment in our county", % agreeing (EB 2003)	50%	34%	45%	27%	51%	47%				40%	48%	-
Globalization means FDI in our country (EB 2005a)	11%	7%	9%	9%	20%	18%	26%	14%	-	8%	6%	-
Policies to promote FDI (Brown & Raines 2002) for WE, Sass (2003) for CE	strong investment promotion					Strong investment promotion	Strong investment promotion	Strong investment promotion	Strong investment promotion			

[25] This figure is from a CBOs poll reported in the Warsaw Voice, 8.April 2001.

	UK	Germany	NL	France	Italy	Spain	Hungary	Poland	Iceland	Finland	Sweden	Norway
Civil society												
"I know how to get my voice heard in public affairs" (EB 2005b)	31%	36%	67%	33%	34%	33%	26%	17%	45%	58%	54%	48%
Average membership in voluntary organizations (Fidrmuc & Gercani 2005)	0.88	0.93(West) 0.54(East)	1.70	0.58	0.49	0.35	0.40	0.35	-	1.24	2.00	-
Trust in institutions + generalized trust												
The press - tends to trust (EU25 = 45%) (EB 2005c)	19	52	64	53	41	49	25	45	-	56	32	find!
The Government -tends to trust (EU25: 31%)	33	28	40	23	32	42	33	14	-	64	33	find!
Big companies - tends to trust (EU25: 32%) (EB 2005c)	29	24	45	34	40	32	25	23	-	35	33 (comp. to other inst.)	find
Religious institutions - tends to trust (EU22: 47%) (EB 2005c)	43	51 (West 55, East 34)	46	36	56	37	46 (comp. to other inst.)	56	-	70	28	-
Charitable & voluntary org. (EU25: 66%) (EB 2005c)	74 (comp. to other inst.)	68	77	74	61	61	55	65	-	58	61	-
Generalized trust "Most people can be trusted"(WVS 1999)	30%	33% West 43% East	60%	22%	33%	39%	22%	19%	41%	58%	66%	-
Environmentalism												
Instrumental vs. intrinsic value: "we have a right to exploit nature for the sake of human well-being" (EB 2005b)	32%	12%	56%	67%	47%	45%	10%	70%	74%	63%	62%	60%
Participation in env. organization (WVS 1999)	1.5%	2.8 (West) 2.1 (East)	43.6%(?)	2.2%	3.8%	1.7%	1.7%	1.2%	4.6%	4.0%	11.3%	-
Risk propensity												

tech / optimism												
One should be <u>cautious</u> about major changes in life (vs. one should act boldly to achieve one's goals) (VWS 1999)	-	-	-	52% agree	-	-	-	-	27% agree	41% agree	-	-
"Science and technology will improve the quality of life of future generations" (Eurobarometer 2005b)	82%	75%	72%	69%	78%	79%	82%	91%	89%	80%	74%	74%
Attitude to novelty												
Time-to-takeoff for new products, average number of years (Tellis et al. 2003)	8.5	6.4	5.4	7.4	6.7	7.1				4.6	4.3	4.0
Willingness to try innovative product, % willing (EB 2005d)	44%	43	53%	53%	44%	35%	55%	31%	-	56%	62%	-
People working in creative occupations, % (European Innovation Scoreboard 2003)	32.0	29.2	40.0	27.0	19.8	20.8				32.7	37.0	