OVERCOMING ENVIRONMENTAL, ADMINISTRATIVE AND SOCIO-ECONOMIC BARRIERS TO RENEWABLE ENERGY TECHNOLOGY DEPLOYMENT

A GUIDEBOOK

RETD
IEA - RENEWABLE ENERGY TECHNOLOGY DEPLOYMENT

About RETD

The RETD is an Implementing Agreement under International Energy Agency (IEA). RETD is one of the key outcomes from the International Conference for Renewable Energies in Germany in June 2004. Members of the RETD are countries that want to encourage the international deployment of renewable energy through improved policies.

The contracting parties include Canada, Denmark, France, Germany, Ireland, Japan, Netherlands, Norway, UK.

While the other IEA implementing agreements on renewable energy focus on specific technologies, the RETD is crosscutting from a technological point of view and intends to complement these.

www.iea-retd.org

CONTENTS

1. INTRODUCTION 06

2. BARRIERS 09
- Environmental barriers 10
- Administrative barriers 11
- Socio-economic barriers 12

3. GOOD PRACTICES 15

3.1 Planning: balancing conflicting interests 17
- National planning policy statements 18
- Enabling planning regulation 18
- Municipal spatial planning 27

3.2. Integrating RETs into the local environment 32

3.3. Involving the local community 35
- The perspective of the local authority 35
- The developer perspective 35

4. CONCLUSION 41

1. INTRO-DUCTION

Renewable energy is one of the key solutions to the current challenges for the world's energy future. Years of research and development have brought many renewable energy technologies (RETs) to a stage of technological maturity. Despite the fact that most RETs still require financial incentives, technology costs have come down and RETs are becoming increasingly competitive. But even when RETs are technologically and financially feasible, the technology uptake may be hampered by a range of other barriers.

RETs are often subject to controversy in the local community due to concerns about environmental impacts such as visual impacts, noise from increased truck transport, smell, reduced biodiversity and others. In other instances, developers are faced with difficulties in obtaining the required permissions for a variety of reasons, such as the absence of clear terms and conditions.

Years of experience have shown that these non-technical and non-economic barriers can be effectively addressed when national and local governments as well as project developers all contribute to creating an environment conducive to RET deployment.

> Barriers can be effectively addressed when national and local governments as well as project developers all contribute to creating a conducive envionment.

This guidebook aims to provide insight into case studies that illustrate the successful use of some of the tools and practices available to overcome non-technical and non-economic barriers. The RETs addressed in the guidebook include: wind energy (onshore and offshore); solar thermal and solar electric energy; biomass and biogas; wave and tidal energy; and geothermal energy. The emphasis of the guidebook is mostly on wind, solar and biogas technologies, but many of the barriers and most of the good practices apply across all technologies.

The best practices are described according to the following three dimensions: 1)spatial planning; 2)integration of RETs into the local environment; and 3)stakeholder involvement.

A key to successful RET deployment is proper spatial planning, which balances the many interests surrounding a RET project. National authorities can make a major difference by creating a legal framework that supports effective spatial planning. Local authorities also play a crucial role in being responsible for the planning process itself.

Developers can do a lot to respond to local concerns by carefully integrating the technologies into the local context, respecting the local landscape and other natural assets and seeking ways to harmoniously integrate the RET into the surrounding environment.

The involvement of – and communication with – the stakeholders that are directly affected by the projects should be carefully considered throughout all phases of the project. Stakeholder involvement and communication is principally the responsibility of the project developers, but local authorities can also play an important role.

The RETD hopes that this guidebook will provide guidance to policymakers and project developers for improving the quality of RET projects and facilitating the deployment process.

Farm biogas plant

2. BARRIERS

Hydro power station

As with many other commercial activities, RETs interact with their surroundings and those interactions may cause barriers to potential project development. What makes RETs a special case is that they are often still relatively new, both to the public and with regards to the regulatory system. RET projects often fall under regulation that has been developed for other technologies and particularities of RET projects may not be addressed sufficiently by these regulations. Further, public perception of the impacts of RETs may be based on misconceptions and historical mistakes rather than current facts.

This chapter provides an overview of the most important non-technical and non-economic RET-specific barriers. These barriers may differ by technology, but in many cases the solutions are applicable across multiple technologies.

Environmental barriers

All RETs have some impact on the local environment – be it visual, acoustic, land use etc. Sometimes the impacts may constitute a major conflict with other interests. To some extent, these impacts may be reduced by use of technical means. Still, RETs are often met with local resistance because of their environmental impacts. Table 1 presents a list of the more prominent environmental barriers.

Environmental barriers have been effectively addressed and overcome in the past by developers carefully integrating the RETs into the local environment in order to minimize the impacts (Chapter 3.2). Local governments have also successfully contributed to overcoming barriers by accounting for RETs in local spatial planning. These activities have been supported by governments providing an effective framework for spatial planning for RETs (Chapter 3.1).

Administrative barriers

Most RETs are subject to a building permit . Additional permits are sometimes required, such as a permit to connect to the electricity grid. In the European Union (EU), an average of 18 authorities have to be involved directly or indirectly for the processing of an onshore wind energy project application and the administrative lead time for onshore wind projects can vary from 2 to 154 months. For a project developer, it is of great importance to be able to estimate the time required for obtaining the permits as well as the level of risk of rejection.

Some of the most frequently encountered barriers are presented in Table 2.

Administrative barriers have been successfully addressed through clear guidelines for RET deployment as well as clarification of the procedures applied. In addition, one-stop-shops for permissions processing have proven effective in paving the way through complex permission procedures (Chapter 3.1)

Table 1. Environmental barriers

BARRIER	EXAMPLES
Impacts on flora and fauna	Wind turbines disturbing bird migration Avian/bat mortality Hydropower plants preventing fish migration Construction of offshore wind turbines disturbing fish spawning
Visual impacts	Reflections from solar collectors Flickering from rotating wind turbine blades Impacts on landscape and cultural heritage
Vibrations	Wind turbines emitting vibrations through the ground
Smell	Biogas plants emitting smell Small wood boilers emitting smelly smoke
Noise	Wind turbines producing mechanical noise
Traffic	Transport of biomass (wood; manure etc.) to biomass energy plants

Table 2. Administrative barriers

BARRIER	EXAMPLES
Unclear procedures and/or complex interactions and lack of coordination between the various authorities involved	Lack of information about which authorizations are required for obtaining a permit. Lack of standards for interpretation of legal requirements. No distinction in procedures between small and large projects
Lack of research into the more complex interactions between RETs and the environment	Complex environmental interactions with the natural environment (e.g. marine life) may be very costly to qualify within a specific project and add to risks and costs.
Long lead times to obtain the necessary permits, both with respect to approvals and to complaints procedures.	
Absence of spatial plans by the time of development of a project	When a project developer proposes a RET project in an area with no spatial planning for the RET, the project is often seen as an “intruder”. Project risks increase when the developer has no clear indication of the spatial planning priorities of the area.
Reactive or counteractive rather than proactive authorities	When the permit criteria are unclear, the individual interpretations of the official can make the difference between approval and rejection.

Socio-economic barriers

The major benefits of RETs, such as reduced climate change and improved security of supply, impact on the national or international level. On the other hand, most of the adverse impacts, such as visual impacts, smell etc., tend to affect the local community. As a consequence, most people are in favor of RETs in principle, while attitudes may differ when it comes to specific projects in the local community. Table 3 presents some of the important socio-economic barriers.

A key strategy for overcoming socio-economic barriers is strong local stakeholder involvement in the local spatial planning process to balance conflicting views and build consensus. Project developers have also managed to overcome resistance by inviting the local community to provide their views regarding proposed projects and perhaps even get involved directly as co-investors (Chapter 3.3).

The following part of the guidebook offers insight into experiences and good practices for overcoming the environmental, administrative and socio-economic barriers outlined above.

Table 3. Socio-economic barriers

BARRIER	EXAMPLES
Social acceptance: "Not in my backyard" issues (real or perceived annoyances), unfamiliarity with RETs	Unsuccessful past experience nurtures local skepticism. Projects initiated from outside the area may be considered as intruders offering only disadvantages to the community
Concerns about possible devaluation of asset value	Wind turbines erected within sight of residential buildings or smell from biogas or biomass plants may reduce property value
Lack of information of the benefits of RETs	Focus of the public debate around RET projects are often on the negative impacts while the global, regional and local benefits may be ignored or neglected.
Lack of experience among developers with local involvement	Developers disclose their intentions only once the projects are developed, leaving the local community with a feeling of not being taken seriously
Competition with other interests in the geographic area, such as fishing, shipping and aviation, recreational use of land, archaeological and historical heritage interests, civil and military airport interests	Existing spatial plans do not include RETs, leaving little space for their deployment. Absence of policy directions at national or local level leaves balancing of interests to individual officials
Conflicts of interest with competing sources of energy	Current suppliers of electricity or natural gas use their influence to keep competing RETs out of their market

3. GOOD PRACTICES

Building integrated solar photovoltaics

While the barriers mentioned above have often been found to impede the widespread deployment of RETs, a number of countries and regions as well as project developers have managed to address these barriers effectively. This chapter summarizes some of these experiences.

The responsibility for successful and swift RET deployment is shared between national regulators, local authorities, the civil society, and project developers. In particular, effective national regulation is an important driver.

The good practices are presented with respect to three main dimensions, each presented in a separate chapter:

- Chapter 3.1: Planning as an instrument to balance conflicting interests. This chapter addresses the overall planning framework set by transnational, national and local governments;
- Chapter 3.2: Integration of RETs into the local environment. This chapter addresses the considerations that could be taken into account by project developers to adapt the project to the local context;
- Chapter 3.3: Involving the local community. This chapter addresses how local authorities and developers could involve the local community in their planning and development process.

Each of the three address both environmental, administrative and socio-economic barriers. Table 4 summarizes the main links between the barriers and the good practices.

3.1 Planning: balancing conflicting interests

All stakeholders, from the transnational policy level to the local level, including project developers, share the responsibility for an effective planning process for RETs. Political commitment is of major importance at all levels.

Political decisions, such as targets for RET deployment and enabling regulation, help overcome a range of deployment barriers and facilitate spatial planning at the regional and local levels.

The EU 20-20-20 plan
The EU target of 20% RE share of total energy supply by 2020 is a strong example of this. The target has been implemented at a national level by each of the EU member countries and each member state has committed to a target reflecting its own RE potential. The policy is being implemented through the RE Directive, which calls for national RE action plans as well as a series of specific measures to integrate the EU RE policy at the national level. The 20% target will be exceeded if all member countries implement their national RE action plans.

IOC Guidelines for Marine Spatial Planning
Another example of a transnational RET planning initiative is the issuance of Guidelines for Marine Spatial Planning by IOC (Intergovernmental Oceanographic Commission) and UNESCO (UN Educational, Scientific and cultural Organisation). The Guidelines were developed as a response to the many challenges faced during marine spatial planning, where strong transnational environmental, military and other interests are at play, such as navigation and fishing.

Solar City Freiburg
The German city of Freiburg is an example of the drive and impetus coming from the local community. Freiburg became a solar energy frontrunner following strong local protests against plans for a nuclear power station in the neighborhood. When the nuclear plans were abolished, the local community turned towards the promotion of solar energy. Over the years, a wide range of initiatives were launched that would later inspire policies and regulation at the state and federal level.

National or state governments have a large variety of tools at hand when setting the framework for local spatial planning for RETs, such as: national planning policy statements to specify the overall planning criteria; obligations to undertake planning for RETs; developing guidelines for local RET planning; developing compliance criteria; undertaking national research on the environmental impacts of RETs to facilitate the environmental impact assessment (EIA) of projects, and more. Some examples of how national planning regulation can encourage and facilitate spatial planning are given below.

National planning policy statements

National governments regularly issue a spatial planning statement setting the political direction for regional and local spatial planning. These statements identify principal stakeholders and establish the principles and priorities that should constitute the foundation of spatial planning in their country. Spatial planning statements can

Table 4. Links between barriers and good practices

BARRIERS	PLANNING (National/Local/Developers)	LOCAL INTEGRATION (Developers)	COMMUNITY INVOLVEMENT (National/Local/Developers)
Environmental	Clarifying conditions for environmental impacts to be acceptable	Environmentally benign siting, sizing and shaping	Consensus about siting, sizing and shaping
Administrative	Transparent and efficient planning and permitting procedures		Effective planning and permitting procedures
Socio-economic	Setting the framework for balancing interests	Improving the local acceptance of projects	Improving local acceptance of projects

also be used to communicate national and international renewable energy policy in a spatial planning context.

UK Policy Position Statement 22 Renewable Energy
In the United Kingdom, national renewable energy policy is set out in "Policy Position Statement 22 Renewable Energy". This document highlights the important role for spatial planning in encouraging renewable energy. PPS22 contains a number of principles that are to be implemented by local planning authorities. PPS22 goes on to state that spatial planning policies should identify the scale of renewable energy developments that may be acceptable in particular areas.

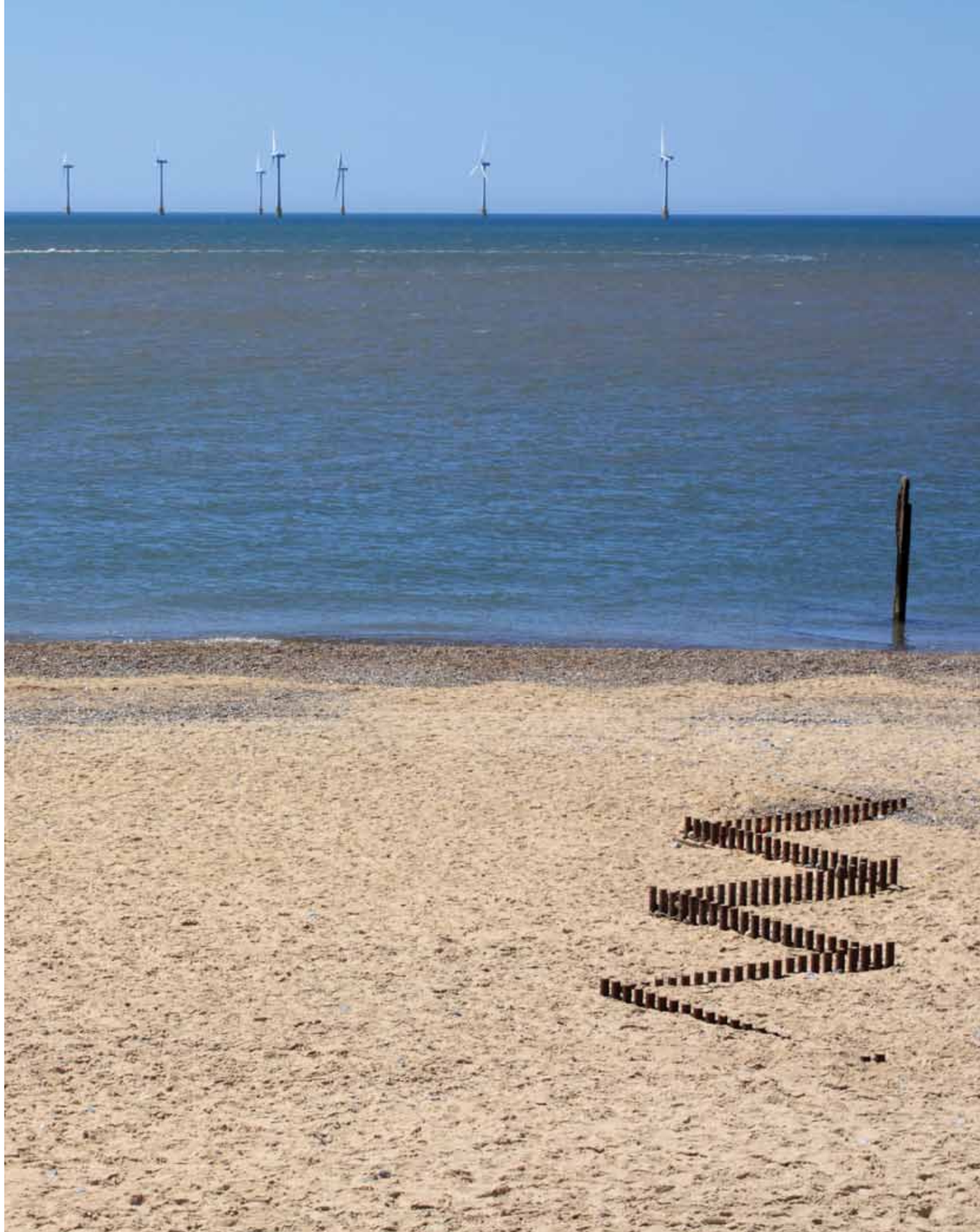
The English National Park Association (NPA) has adopted the PPS22 as the foundation for its own position statement on renewable energy in national parks. The NPA adopts a proactive position, declaring its commitment to demonstrating and supporting small scale renewable energy projects that protect the qualities of the National Parks and the public's ability to experience them.

Enabling planning regulation

Implementation of compliance criteria can significantly simplify the local permitting process for RETs. Compliance criteria could include, for example: minimum distances between a wind turbine and residential buildings and roads; maximum noise levels and maximum shading on residential buildings. Regulations should not prevent local authorities from adopting more strict criteria, but they should serve as a benchmark for the local dialogue. By offering a minimum of protection of local interests, regulations also help reduce opposition against RETs in the community.
Municipalities could be instructed to include RETs into their municipal planning codes, based on an inventory of resources and siting opportunities. This ensures that the issue is being addressed without jeopardizing the local planning authority.

There is strong evidence that local co-ownership of RET projects increases local acceptance, as does compensation for reduced local asset values due to a RET project. Governments could implement regulations that enable local communities to co-invest in and seek financial compensation for RET projects.

DK: Green Fund compensating communities.
An example of national regulation regarding compensation to communities is the Danish Green Fund. The revenues come from onshore wind projects and developers are obliged to contribute approximately 12,000 € per MW of installed capacity to the fund. The funding is disbursed to the local communities in which the wind turbines have been installed, to be used for cultural or landscape investment projects.



Offshore wind turbines

Case 1: Horns Rev 1 and 2, an open sea offshore wind farm

Integrating all stakeholder interests in the design of the project.

The Horns Rev Offshore Wind Farms I and II are among the world's largest concentrations of offshore wind turbines. The two parks are located in an area with a series of competing interests including fishery, navigation, cultural heritage and protected marine life. The planning process has contributed to a quantification of environmental impacts and to novel ways to reduce adverse impacts.

The offshore wind turbine farm at Horns Rev 1 consists of 80, 110m tall turbines with a total capacity of 160 MW. It harnesses a reef with water depths of up to 15-20 metres, which stretches from the west coast of Jutland and 40 km into the North Sea. The park occupies an area of 20 km². Horns Rev 1 was one of the first sites to be identified during the national offshore wind planning process.

Horns Rev 2 was erected from May 2008 to November 2009. Each wind turbine has a capacity of 2.3 MW. With a total of 91, 114.5m tall wind turbines, the wind farm has an overall capacity of 209 MW and occupies an area of 35 km². This part of the extension is located approximately 30 km off of the coast.

Balancing conflicting interests

The Danish government carried out the planning of the area where the Horns Rev Offshore windfarms I and II are located first through the developer, and subsequently through the state-owned power transmission system operator Energinet.dk. The planning was based on a comprehensive environmental impact assessment process. Among the key issues were the presence of protected areas under the EU Habitat Directive and the Ramsar Convention on Wetlands at distances of 5-10 km from the wind farms. The assessment revealed only limited conflicts with natural interests due to the distance and the greater water depth relative to the protected areas. Planning also included fishing interests. The offshore wind turbines seem to have a positive effect on the fish population by creating small biotopes, protected against traditional fishing, which would typically increase fish populations. However, the effect has been difficult to quantify. An adverse effect from a fisheries point of view is that the waters between the turbines are unavailable to trawl fishing due to the power cables.

Fishing interests have been accounted for partly by locating the wind turbine park away from the shallowest parts of the reef, where fish are most plentiful. However, the deeper waters of the reef constitute a seal and porpoise habitat. At the time of the planning, the understanding of the sensitivity of seals and porpoises to wind turbine foundation construction was very limited. A study of the issue was undertaken. As a result of this research, specific regulation was implemented to reduce the acoustic impacts of ramming of the foundation poles. Since the installation of the turbines, seals and porpoises have returned to the area in full scale and no lasting impact on the population has been observed.

Possible impacts on cultural heritage in the area, primarily many ship wrecks, have also been investigated.

The planning for the Horns Rev projects has also paid considerable attention to navigational safety, as several routes for both larger and smaller vessels, including fishing vessels, cross through the project site.

Designing for reduced visual impacts from the shore

The hinterland is one of the most intensively used tourist areas in Denmark, due to its close connection to a pristine natural landscape.

The first offshore wind farm was placed in the areas closest to shore with a distance of 14 to 20 km.

In spite of their distance from the coast, the turbines are still visible day and night due to their significant number and the strong cumulative effect, especially Horns Rev I. However, the wind turbines are perceived as being very far and they occupy only a minimal portion of the horizon, which is still dominated by the open sea. After publishing the EIA, there was little public resistance.

The town of Esbjerg, the closest port town to the Horns Rev I and II, has supported the project. The employment impacts of the projects have been positive for the town of Esbjerg, although this impact has not been quantified. The two offshore wind farms are also the reason for Esbjerg being expected to be the home port for the wind turbine supplier.

Rooftop solar pv installation

National governments can also provide direct support to local RET planning and promotion efforts to overcome environmental as well as administrative and socio-economic barriers. The United States Department of Energy (US DOE) launched the Solar America Cities program in a move to guide local authorities to more efficient planning and permitting procedures and to develop more powerful practices for community involvement (see Case 2). The Danish Government established a "Wind Turbine Secretariat" and a "Biogas Secretariat" to provide assistance to municipalities free of charge in their endeavor to undertake planning for wind and biogas.

DK: local energy offices to encourage local involvement
Also in Denmark, the government supported the establishment of local energy offices managed by local activists. Although the success of the local energy offices varied, a number of early outstanding projects were initiated and driven by these offices. For example, in 1993 the Copenhagen Environment and Energy Office established a wind power cooperative with the purpose of developing a wind farm off of the Copenhagen harbor. The cooperative gained wide local support, and the government supported the initiative by making funding available for research. The cooperative issued shares in the project and 10,000 citizens pre-purchased shares. Strong local support for the project proved to be key to local acceptance and today the 20 wind turbines are an important component of Copenhagen's visual identity.

Case 2: The Solar America Cities Program provides guidance in the local promotion of solar

Government and local authorities join forces to overcome administrative barriers to solar thermal and solar PV system approval and to ensure that solar systems are implemented with consideration to technical and environmental concerns.

The adoption of solar energy in United States has been found to vary significantly between States and local jurisdictions. These differences cannot be explained exclusively by climatic variations or electricity tariffs. A wide range of other barriers were found to be at play with regards to the implementation of solar systems.

In a move to overcome these barriers, the Solar America Cities Program (SAC) was developed by the US Department of Energy (DOE). 25 cities in 17 different States were chosen for the program according to their capacity for solar energy development. The cities are all State capitals or other major cities. The cities were invited to participate in development of new tools and methods for solar promotion through administrative streamlining, public outreach and other means. The program provides financial and technical assistance to the chosen cities, but it also provides a detailed proposed regulatory framework for the cities to adopt in order to encourage solar energy development. The aim is to encourage harmonization across American jurisdictions with regards to solar energy policy and implementation.

The results of these projects are being included in the outreach to thousands of local governments all over US. This outreach also includes a Guide for Local Governments. This step-by-step guide covers a wide range of important areas, including:

- Organizing and strategizing the effort
- Accelerating demand through policies and incentives
- Updating and enforcing local rules and regulation
- Engaging the utility
- Creating jobs and supporting economic development
- Accelerating demand through outreach and education
- Leading by example with installations on public properties

A range of barriers identified by the guide are related to the permit process. Many developers have experienced a lack of transparency in rules pertaining to solar energy project development. This uncertainty can cause potential developers to abandon their project.
The city of Portland (OR) was one of 16 cities to be awarded a grant from Solar America Cities. The two-year grant will facilitate a continued partnership with the US DOE and the City of Portland to execute the Neighborhood Solar Initiative – a complementary suite of neighborhood-focused activities and programs designed to lower the barriers to solar installations for residents.

The City of Portland currently collaborates with several local partners on a "Solar Now!" partnership campaign, a one-stop resource for home owners and businesses. Regular workshops are held for residents and enterprises on the basics of solar energy and how to run a solar project. The program also facilitates bulk purchasing programs, where suppliers are requested to put forward proposals for solar system deployment in a neighborhood. The "Solar Now!" program, in combination with State financial incentives, has lead to an increase in the number of solar thermal and PV systems from about 50 in 2008 to 450 in 2011. Activities are now spreading to other cities of Oregon.

In order to increase transparency of permitting, the City of Portland has produced Permitting Guides for residential and commercial solar PV and thermal installations. The guides specify in detail the requirements for obtaining a permit. For example, it specifies the maximum distance from a flat roof to the top of a solar panel. It specifies under which circumstances a design review is required to ensure that the visual impacts are acceptable. It refers to structural and other applicable standards. It describes in detail the permitting process and what information the applicant must supply. The guide was subject to an extensive hearing process, revealing a wide range diverging interests in the issue, from fire fighters requiring easy access to the roof to solar proponents wanting as much space to be available for solar as possible. The result of the process was a compromise generally accepted by all.

Another major barrier to solar implementation is that building owners often have little idea of the economics of a solar system on their property. An example of overcoming this barrier is provided by the city of Berkeley, which has implemented a web page that assists community members in undertaking an initial assessment of the costs and benefits of a solar energy installation.

The City of Berkeley has also established the public resource base SmartSolar for an early assessment of how to proceed with a solar energy project. The SmartSolar program also includes free and independent advice on the solar potential of a property.

The Solar America Cities program does not include financial investment or production incentives, but many States have implemented various kinds of financial mechanisms such as investment subsidies, production incentives and tax credits.

Wind turbines along the shore

DK: the CO_2 neutral island of Samsoe
In Denmark, the federal government launched a competition among Danish islands to become the first CO_2 neutral island of the country. Candidates were invited to submit a plan for how they would meet the target. The incentive provided was financial support for the planning and the implementation of the plan. The winner, the island of Samsoe, initiated a comprehensive process of planning based on intensive stakeholder dialogue and today the renewable energy production of the island exceeds its total energy consumption.

Another important role of governments is to provide easy access to impartial and comprehensive information about renewable energy technologies and their potential impacts, which are often complex. Lack of awareness of the impacts tends to lead to opposition against projects, especially when the project developer is an outsider to the local community. Information provided by project developers may – sometimes for good reason – be considered biased and met with skepticism. An example of a comprehensive government-initiated public information platform is the UK www.biogas-info.co.uk homepage.

As RE production increases in a given country, the economic impact of the sector on that nation's economy becomes more visible, especially in certain sectors such as agriculture, forestry and the metals industry. National RET policies should be coherent with policies in other relevant sectors, such as agricultural policy and employment policy. In this way, potential synergies between the sectors can be effectively exploited.

For example, the renewable energy industry could boost development in rural areas with high RE potential and low employment. Anaerobic digestion of agricultural waste resources could be promoted through agricultural policy as a means to boost the market for energy crops and reduce nutrient emissions.

Municipal spatial planning

Local spatial planning that carefully addresses renewable energy can considerably facilitate successful project deployment. The planning process helps generate an overview of renewable energy resources in the region and of the potential conflicts of interest. In addition, the process provides an excellent opportunity for community debate about the pros and cons of renewable energy in the municipality, not overruling local autonomy.

Municipal plans (land use codes) should provide the overall framework for RET deployment in the municipality.

As a part of the municipal planning process, it is helpful to map out the local renewable energy resources and assess the viability as well at the physical appropriateness of each of the different possible RET types.

The use of positive wording regarding renewable energy utilization sends a clear message to all stakeholders that renewable energy is a priority. The municipal land use code should include in its preamble that the purpose includes encouraging the development of renewable energy.

Strategic energy planning is a powerful tool for framing municipal planning for renewable energy within a wider context. A strategic energy plan should address the overall perspective of renewable energy in the context of national as well as local policies and priorities such as climate change, security of energy supply, employment, etc. A strategic energy plan can be a very useful foundation for stakeholder dialogue.

Spatial and energy planning can be successfully backed by local regulation. For example, a municipality may choose to issue regulation that specifies exactly how a planning permit may be obtained; i.e. what are the specific conditions to be met, which documents are required, which fees are to be paid, etc. In addition, as demonstrated in the Croydon Borough of London Case 3), a local community can require new and renovated buildings to use a prescribed minimum of renewable energy.

Case 3. London Borough to implement a requirement for 20% renewable energy in new and renovated buildings

The London Borough of Croydon is located about 15 km south of the centre of London. It has a population of 350,000 people and is a major commercial center.

Croydon adopted a regulation requiring all proposals for non-residential developments exceeding 1000 m^2 gross floor space and new residential developments comprising more than 10 units to incorporate renewable energy production to offset at least 10% of predicted carbon emissions. The target was later increased to 20%. The 20% target is relatively modest compared to municipalities in other countries like Germany, but under UK terms and conditions, with limited financial backing (from the government or otherwise) of urban RETs, the target was considered quite challenging by local stakeholders.

Eligible technologies include: photovoltaics; solar water heating; wind; combined heat, power and cooling; communal heating, cooling and power; biomass-fuelled heating, cooling and electricity generation; renewable energy from waste; hydrogen fuel cells and ground-coupled heating and cooling. A total of more than 250 kW of solar PV has been installed on residential blocks as well as commercial and public buildings since program start in 2005.

The regulation is part of the Sustainable Community Strategy, which, amongst other initiatives, stipulates a 80% reduction in CO2 emissions by 2050. Another measure of the strategy is to promote district energy supply based on combined heat and power in the central areas. The Borough has also issued a guide to preparing environmental statements for new developments.

The developer is not required to comply with the regulation if it can be proved conclusively that the policy is either "unfeasible" or "unviable" within a particular development. However, in practice there are few developments with valid reasons to qualify for exemption from the regulation. In these cases, the developer and local authority may negotiate on the percentage target for a given development.

In the first years of application of the regulation, the permit processing time was a major concern, with an average processing time of 700 days (2004). Since 2005, this has been reduced to about 100 days.

> A combination of a RE obligation and permitted development rights paved the way for renewable energy.

In order to assist developers in choosing a relevant technology, the Croydon Council has set up a help line called Croydon Energy Network's Green Energy Centre, which provides technical and financial advice to developers. Still, in the absence of clear rules for calculating energy demand and CO_2 emissions, choosing the best technology can be a matter of trial and error. In practice, most commercial buildings have chosen to install solar PV installations while residential buildings mostly choose solar thermal energy.

Another barrier has been the lack of clarity about the need for a planning permission for solar PV projects. To overcome this barrier, Croydon Council has been lobbying for permitted rights across all Boroughs in England. Permitted development rights have now been introduced throughout England as of April 2008, specifying under which specific conditions a planning permit is required. In the case of roof-mounted panels a permit is required only if installed panels protrude more than 200mm over the edge of the roof or if visible from the highway in conservation areas or in world heritage sites.

For stand-alone systems clear criteria are specified for height, distance from boundaries or visibility from conservation areas or world heritage sites. Thereby the majority of systems can be implemented without a need for permission.

To date, 34 local authorities throughout the UK have fully adopted policies requiring 10%+ on-site renewable energy. More than 140 local authorities are either assessing the feasibility, actively progressing or have incorporated similar draft policies.

In December 2007, the UK government published a planning policy statement, dubbed the Merton Plus, that pushes for an increase in the minimum renewables requirement to 20%. Merton Plus has already been embraced by some city councils, including the Greater London Authority, who want all new commercial and residential buildings to achieve a 20% carbon reduction through on-site renewable energy generation. However, it is the individual councils that will set their ultimate targets.

In towns with a considerable demand for heat, renewable energy can efficiently and cost-effectively be harnessed in district heating systems. District heating allows for large-scale production of heating, and production facilities can be located away from urban areas. For example, in Norway and Denmark, numerous towns and cities supply district heating from local biomass (such as wood or waste), from biogas, or from large heat pumps effectively converting electricity to heat. Municipal governments are key drivers for the establishment of district heating systems, notably in their capacity to develop energy plans for the municipality.

Municipalities with a considerable demand for cooling may likewise encourage the development of district cooling systems to harness local sources of cooling such as sea water and ground water. Stockholm, Sweden, currently hosts the world's largest district cooling system, which is owned by the municipality together with a private developer/operator. The City of Ferrara in Italy also runs a district cooling system owned by a joint venture of the municipality and a private investor.

When mandated by law, municipalities can take a lead in establishing large renewable energy installations. For example, a municipality could initiate and invest in a local wind farm, like numerous German municipal utilities have done. The Munich Municipal Utility has embarked in a joint venture with two private developers for a 576 MW wind farm in the Liverpool Bay.

3.2. Integrating RETs into the local environment

The careful integration of a RET into the local environment helps overcome environmental barriers and improve social acceptability. As such, it may make the difference between project success and project failure. A considerable amount of experience in the field has accumulated over time.

In the early days of onshore wind, many project developers failed to take into account the integration of their project into the landscape. Disorganized single wind turbines as well as monumental rows of wind turbines contributed significantly to opposition against wind power.

Today, many successful wind power projects have proven that wind turbines can be an asset to a landscape, or at least that the negative visual impacts can be reduced. Experience shows that wind energy potential is best tapped with wind turbines clustered in groups of 3-5 turbines. Single turbines tend to dominate disproportionately, and larger groups tend be out of scale of the landscape. Exceptions have been successfully realized in remote and flat areas with little landscape asset value. The design of any specific project should be done in accordance with a landscape assessment method. Several governments have elaborated such methods. In addition, suitable colours and anti-reflective surfaces, together with a balanced ratio between rotor diameter and hub hight, can improve the visual impact. Signposting with lights for air safety may be a source of visual nuisance, but this impact can be mitigated by reducing the intensity of the light when visibility is good and increasing the intensity when visibility is poor. The light can also be shielded downwards to reduce visibility from neighbouring urban areas.

Wind turbines can also be successfully integrated into industrial sites such as harbor areas or power plants, where the scale and the visual impact of the wind turbines match the surroundings.

DK: Reducing truck traffic load from biogas plant

One of the important barriers to biogas implementation is the increase in local traffic due to trucks transporting waste resources and digestate to and from the plant. A 6 MWe/7 MWth biogas plant in Denmark near the town of Holstebro, which processes a variety of biowaste including manure and industrial waste together with energy crops, was facing local opposition during the planning stage due to the transport load, which was calculated to be 40-50 truckloads per day. Most of the trucks would have to make use of the ring road of the town.

In order to reduce road transport to and from the town, an underground pipe system was designed to transport manure from three collection points outside the town to the biogas plant and to bring digestate back from the plant to the collection points, from which it will be distributed by truck back to the farms. This system helped improve local acceptance significantly.

Another important barrier to biogas implementation is the concern about smell. It is possible to design biogas systems such that smell is avoided or at least reduced to an acceptable level. In fact, the net result of a biogas system could be a reduction of the smell impact from agriculture. The odour of digested manure is much less severe than that of raw manure when spread on the fields.

Biogas project developers should develop and communicate a detailed smell reduction strategy for their project, including strategies such as covering of the truck loads, cleaning trucks after each trip and careful ventilation system design.

For both biogas and biomass plants, care needs to be with regards to the architectural design of the buildings that will house the projects. When the building is easily visible and located in valued landscapes, it could be taken a strategy to have the plant designed by an architect and to use quality building materials in order to best integrate the plant to the landscape.

The integration of RET projects in protected areas can be particularly challenging. For example, in Japan, many geothermal wells are located in protected areas where the warm water is used for recreational purposes. Projects of exploitation of geothermal energy are therefore often opposed by the local community. As a result, the government has maintained a low target for geothermal exploitation, despite the fact that Japan holds about 10% of global geothermal resources.

Italy: Visual integration of hydro power plant in natural park
In Northern Italy, the Saviore dell'Adamello hydro power plant is located at a high alpine mountain torrent inside the Adamello natural park, close to a tourist hut attended by thousands of visitors in summer. Following a dialogue with the local environmental officers, several measures were taken to improve the social acceptance of the plant in this pristine environment. Local materials were used for coating the buildings. A fish pass was designed to appear as natural as possible. In addition, a basin was established at the plant intake to be used both to increase the value of the energy (production during peak hours) and for leisure.

DK:National spatial plan for offshore wind
Some installations, such as offshore wind farms, may require a very extensive planning phase to ensure the acceptable integration of a project. An example of this is the integration of wind farms in the marine environment in Denmark. In the 1990s, before the rapid expansion of offshore wind power, the Danish government carried out a comprehensive planning study for wind power deployment in Danish territorial waters. The territorial waters were evaluated with regards to technical feasibility such as water depth and the possibility of connection to the electricity grid on land. Technically feasible areas were then subject to an overall planning covering a number of major issues including: safety of navigation; fishing; nature interests and Natura 2000 areas; bird migration routes; fish; porpoises; etc. Recreational and other tourist-related interests were also examined, due to the key contribution of coastal areas to Danish tourism.

Following the planning process, a limited number of locations were designated for the initial development of offshore wind turbines. It was decided that the designated areas should be sufficiently large to allow for a sizeable number of wind turbines.

In addition to spatial planning, the Danish government undertook and environmental impact assessment with the involvement of the public and in dialogue with interest groups. This helped dramatically reduce the risks of project failure, as well as reducing potential project development costs, even before the tendering process was initiated.

Near-shore wind farms are a particular challenge due to the visual impacts. Experience has shown, however, that the visibility of offshore wind farms may be turned into an asset when carefully designed. The park size should match the scale of the landscape. Rather than long straight lines the turbines should follow organic patterns. All turbines should rotate the same direction. Local acceptance can be further encouraged by developing wind farms in tourist destinations and inviting visitors for excursions to the turbines.

Case 4. The Municipality of Norddjurs
Planning for wind turbines in a large municipality

The coastal municipality of Norddjurs, Denmark, has successfully managed to develop a spatial plan for the deployment of up to 144 MW of wind turbines at six different sites. The plan is the result of decades of continuous spatial planning of the open landscape, strict requirements regarding the design and the integration of the turbines into the landscape, and an active involvement of the local stakeholders.

Norddjurs is a Danish municipality with a population of about 40,000 inhabitants. With 45 km of coastline and large open landscapes Norddjurs is endowed with a significant wind energy potential.

The coastal landscape is rich in cultural heritage and protected natural reserves.

In the early 1990's, a total of 71 wind turbines were erected at 18 different locations with a total capacity of 55 MW. Further expansion was limited by the municipal wind energy plan.

In 2009, the Danish parliament passed a law to promote renewable energy and new guidelines were prepared to promote the erection of wind turbines. In conjunction with the law, all Danish municipalities were encouraged to re-evaluate their planning for wind turbines in order to contribute to the promotion of the expansion.

Since 2009, Norddjurs Municipality has been in the process of planning for a significant extension and replacement of wind turbine energy within the municipality, which will also allow for the possibility of large turbines (125/150 metres). The revised plan was passed in April of 2011.

In agreement with Danish planning practice, the municipality is promoting coherent planning with particular focus on wind resources, available locations and local stakeholder interests. To ensure a balance of interests, the planning process involves broad public participation.

Norddjurs sought assistance from the Danish Wind Turbine Secretariat, which is a state sponsored planning agency offering free assistance to municipalities. The Secretariat offered valued assistance at technical and legal level and also offered assistance on participatory processes.

The wind energy planning process took advantage of years of spatial planning in the municipality, in which the many interests of the community regarding wind energy, such as nature conservation and preservation of the cultural environment, have already been registered and deliberated. Therefore, it was possible to carry out the wind power planning process over a period of just 1½ years.

> A comprehensive wind energy planning process with broad community involvement laid the foundation for a large expansion of the wind power potential without compromising the multiple local interests.

A set of requirements to the sites allocated for wind energy were developed. The requirements dictate among other things that the turbines must be grouped together with a minimum of three turbines and there must be a uniform design regarding color, height, structure and harmony between sea level and rotor diameter. It has furthermore been specified that the wind turbines should not be used for publicity of any kind and that no stage lighting will be permitted other than the required night marking.

The planning process was initiated by an idea phase. The municipality issued a brochure, which was distributed via the citizens services, the libraries and the municipal homepage. The initiative only provoked few reactions from the public.

A comprehensive analysis of the region was carried out by the Norddjurs Municipality. It pinpointed 17 potential areas for wind turbine installation based on the preliminary deliberations of the many interests of the local population in those areas. Specific barriers have required careful planning for noise, the considerable size and the appearance of the turbines, the shape and pattern of each turbine cluster and the impact on protected sites. Many interests of protection are related to concrete, delimited areas, but the planning has also indicated that the visual appearance of the towers and their dominance in the landscape is crucial, particulary with regards to the very large turbines.

A draft wind turbine plan was presented early 2010 to the city council, and articles about the plan were published in the local media. In spite of the large number of sites identified there was no major concern expressed from the public.

The plan was presented to the local politicians. During this process the number of sites was reduced to 6. The sites may accommodate altogether 40 turbines with a total power capacity of 144 MW. Detailed planning, however, may result in smaller wind turbines being more suitable.

The revised plan was passed in the city council and sent for public hearing. The public was notified through newspaper articles and announcements, and two public meetings were organized. The participation was modest with just about 20 citizens at each meeting. In addition to the two meetings ad-hoc meetings were held upon request from groups of citizens. By the end of the hearing a total of 17 objections were handed in, most of which addressed one particular site.

As a result of the protests the size of the one site was reduced to accommodate just 6 turbines instead of the planned 13 turbines.

The overall wind turbine plan has been integrated into the municipal plan, setting the overall framework for the use of the designated areas for wind energy. Actual deployment of the wind turbines will require an elaboration of district plans and EIA's for each location, in order to determine final siting and other conditions. The planning process will – depending on the complexity in each area – take between six months and one year.

Lessons learned

A successful wind energy planning process requires a massive effort over several years to register and balance the interests of multiple stakeholders with regards to the landscape, such as the cultural environment, nature, settlements, noise-sensitive installations, airports, etc. Requirements for the wind turbines with regards to quality and aesthetic design, colours, advertising, lighting, direction of rotation and grouping of the turbines have all been important factors for the public acceptance of the plans.

According to Danish law, local citizens have the right to invest in shares in wind farm projects erected in their neighbourhood. Several of the wind turbines are currently owned by citizens of the Municipality of Norddjurs. This is also and important factor for local acceptance. The requirement for a minimum of three turbines in each group and for an ideal distance between the turbines is also important to maintain the aesthetic and natural qualities of the surrounding area. The wind turbines are required to appear as delimited, sculptural units in interaction with the landscape.

Experience gained in other Danish municipalities indicates that wind turbines of 2 MW and more are a matter of particular concern, especially for close neighbours. Therefore, during the planning stages it is important to allow for a discussion regarding the size of the proposed wind turbines.

3.3. Involving the local community

The acceptance of the local community is key to the successful deployment of RETs. Even if the local community has no official decision-making power regarding RET deployment, local opposition has often been found to be the determining factor behind failed projects. In some cases, they have even caused local governments to fall.

Rather than being deeply rooted in local cultures and perceptions, social acceptance is to a large extent a result of actions taken by local authorities, the local population and project developers.

Developers as well as local authorities should be particularly aware of the impact their actions have on:

Trust
If the community lacks trust in the local authorities or the project developers, they will often oppose a plan or a project, regardless of the nature of the project.

Fairness
Local communities expect all parties to be treated fairly and that their views and concerns will be taken into account.

Local benefits
Local authorities or project developers should be prepared to answer the following question from the local community: "What's in it for us?" They should also be able to give a trustworthy answer to that question.

The perspective of the local authority

Local authorities should seek to understand the community's attitudes towards RETs in order to strategize the planning process. Past experiences of planning can provide guidance as to how the public has valued similar installations with regards to landscape and cultural assets, job creation, etc. If there is no historical evidence of public attitudes towards similar projects, a survey can be helpful.

In order to build or maintain trust, local authorities should communicate their intentions regarding planning for renewable energy as early as possible via local newspapers, public meetings and web sites. Their intentions should be framed strategically in order to assist the public in understanding "the big picture" and how renewable energy fits in. The benefits to the community, as well as the benefits to the rest of the region, the country and the world, should be clearly stated and the community's potential concerns should be addressed in a serious manner.

Citizens should be given a platform for providing their views on the plans. Public hearing procedures are such a platform, but in order to prevent and/or address potential major controversies, a platform for continuous dialogue is also required. The internet is often a good platform for dialogue, and the public should be able to read all comments during the dialogue process.

When issues arise around specific impacts, it can be helpful to provide citizens with opportunities to be exposed to first-hand experiences from other similar projects. This can be done by inviting citizens of other communities that have implemented RET projects to speak about their experiences or – even better – by arranging study tours to visit other projects and talk to members of the local community.

The developer perspective

Many developers experience local resistance against RET projects. Opposition is most often based on a combination of mistrust in the intentions of the developers together with concerns about the environmental impacts.

Project developers should carefully study the local context of the project at a very early stage to pinpoint issues of potential conflict. They should first make sure to understand the big picture: what kind of identity does the community have? Does it consider itself an idyllic rural area with tourism as the main attraction, an environmental frontrunner community, or an industrial hub? Local stakeholder interests should be mapped in order to draw an image of the potential points of resistance towards the project. Local authorities can provide much relevant information.

The results of the mapping of interests could be used to reconsider the project in a number of ways, for instance:

- a wind park could be downsized by number or by size of turbines;
- the location of a biogas plant could be reconsidered;
- local farmers could be invited to join as co-owners of a biogas plant to secure their support;
- a geothermal plant could be redesigned to ensure that an existing spa facility is not affected.

Companies or organizations intending to develop a RET project in a community are at risk of being considered an intruder unless they manage to prove their intentions to work with the local community and to take local concerns seriously.

Project developers should announce their intentions to the local residents and other local stakeholders as early as possible, providing information relevant to the perspective of the local stakeholders:

- How does the project fit into the local context, including the planning code, possible renewable energy plans and strategies etc.?
- What would be the environmental impacts of the project and what measures have been taken or considered to reduce the impacts?
- How will the local community be invited to ask questions and raise their concerns?

The more a project has the potential to have negative impacts on the local community, the more important it is for the project developer to be aware of the need for direct involvement of the community in the project design. Local acceptance is a precondition not only for obtaining permissions for the project but also for successful operation of the plant. In such cases, stakeholder involvement should not be limited to simply informing the community, but it should also be based on a true willingness to listen to the local concerns and to adjust and adapt if necessary.

As a means to increase the direct benefits to the local community of a RET project, a developer may consider including local stakeholders directly in a RET project, for example in the form of co-ownership. In Denmark, wind power development started with local communities coming together to invest in local projects, and in most cases the local community would accept the projects. Later, when large power companies moved into the business, public opposition became much stronger. As a consequence, developers are now required by law to set aside at least 20% of shares in wind energy projects to local stakeholders.

If the project is in danger of provoking local opposition, the project developer should consider alternative options for the project design that could reduce opposition or strengthen social acceptance, for example by relocating the plant, downsizing, or adjusting the fuel mix of a biogas plant to increase the local benefits of the plant. A complementary strategy would be to offer compensatory measures, either directly related to the project, or in the form of support to local community activities. This strategy was adopted by Scottish Power, which chose to offer a compensation for their wind energy activities by developing an ambitious habitat management plan. The plan involved, amongst other initiatives, the restoration of a landscape scarred by opencast mining and developing a wetland area for breeding birds.

4. CONCLUSION

Many RET project delays or cancellations can be attributed to insufficient groundwork from the national governments, local authorities or project developers. Countries or regions that have successfully managed to benefit from local renewable energy resources have done so due to enabling national regulation, proactive local authorities and in some cases a proactive local community. However, even in regions with the highest success for RET deployment, local opposition can become a barrier if projects do not sufficiently address environmental concerns. Examples of this are onshore wind energy deployment in Denmark and biogas deployment in Germany. In both cases the technologies have seen high deployment rates for several years, but as projects move closer to inhabited areas and as the landscape is increasingly being affected, public resistance has been increasing. Projects with a high risk of public opposition require particularly careful project design by the developers and dialogue with local stakeholders becomes a key condition for success.

National authorities should consider whether their existing national frameworks are truly conducive for RET deployment and whether they are facilitating local planning and deployment. National RET policies should be reflected in national targets as well as in the policies for complementary sectors such as agricultural and forestry policies, environmental policies and perhaps industrial and employment policies. The planning framework should take into account the specific particularities of RETs and where controversies persist over planning issues, national authorities should help solve these conflicts with the use of regulation and guidelines for local planning.

At the local level, municipalities can play an important pro-active role by including RETs into the municipal planning code. Once the conditions for deployment in the municipality have been clarified, the risks of controversy and/or opposition are significantly reduced. Such conditions may include zoning for RETs as well as specific guidelines for siting, sizing, etc. Municipalities can also facilitate project implementation by clarifying the procedures to be followed for obtaining the permits required.

Project developers play a key role in the successful implementation of projects. By being careful to take into account the visions and concerns of the local community, as well as the interests of other implicated industries, the chances of success of the project are greatly increased.

Images
Pages 04-05: Rambøll
page 07: Canstockphoto
page 08: Colorbox
page 13: Dreamstime
page 14: Colorbox
page 19: Dreamstime
page 23: Colorbox
page 27: Rambøll
page 33: Dreamstime
back of cover: Rambøll

www.iea-retd.org