

A partnership approach to local energy management between European and Asian cities

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organisations and individuals, with actions being identified to improve the local management of energy, such as raising awareness and ensuring easy access to information.

Abstract

In Europe, several local areas have a number of years of experience with implementing local energy and greenhouse gas management policies, addressing national and international climate change targets. For example, in the city of Leicester in the UK, local strategies and measures have been implemented over several years to improve the energy efficiency of the Council's own operations and to manage city-wide energy consumption and greenhouse gas emissions. Recently, Leicester has participated in a European Commission funded project, which explores the potential for European local authorities and agencies to use their experience to work with a local area in a developing country where energy demand has been increasing rapidly, addressing climate change and sustainable development issues.

The project has aimed to provide support at the local level with developing a framework to minimise energy-related contributions to climate change and air pollution, while giving quality of life benefits. It has used a partnership approach between Leicester, Vila Nova de Gaia municipality in Portugal, and a city in the Gujarat, India. The local level's role in each country in local energy management has been investigated. This has included a baseline assessment of local energy use, renewable energy and climate change issues in each partner city. The most locally relevant energy technologies have been selected and their implementation discussed in the local workshops involving a range of

Introduction

There have been an increasing number of energy and greenhouse gas emissions targets at national and international levels and frameworks to support measures to meet these targets have been developed. For example, the European Union has a target to reduce greenhouse gas emissions by 8% of 1990 levels by 2008-12, under the Kyoto climate change agreement and has several measures and programmes to address climate change. At national level, within Europe, strategies and policies have been developed further in recent years to address climate change and sustainable development issues. Also, action on managing energy consumption and greenhouse gas emissions at the local and regional level in Europe and elsewhere has been increasing and making a contribution to national and international targets.

A recent European Commission (EC) supported project helps to address issues related to climate change and sustainable development, particularly those connected with meeting increasing energy demand in Europe and Asia and the consequent impacts on the environment. The aim of the project has been to develop a framework for minimising energy-related contributions to climate change and air pollution while improving the quality of life and developing partnerships through the use of renewable energy in cities in the UK, Portugal and India.

The objectives of the project 'Partnership support for renewable energy between European and Asian towns' have been:

- To develop an appropriate framework to undertake renewable energy initiatives,
- To promote sustainable development through partnerships and the involvement of the public and local business,
- To reduce negative energy-related environmental impacts through good practice, increasing awareness of alternative energy options and promoting energy efficiency.

The project has drawn on the experience of two local areas in Europe with implementing local energy and greenhouse gas emissions management, the City of Leicester, Vila Nova de Gaia municipality (ENERGAIA, the Energy Management Agency of Gaia, Portugal), working with the local government for Rajkot, Leicester's twin town in the Gujarat in India (Rajkot Municipal Corporation).

Details of the methodology followed, the local energy workshops held, and some discussion of the outcomes of the workshops and partnership in the project are given below.

Methodology

Initially, the project partners undertook background research into local energy supply and use in their towns in order to establish a baseline for the project, giving a better understanding of the local energy situation and possible requirements in each town. Information was gathered on existing areas of energy use and supply, on the use of renewable energy, energy efficiency and on climate change issues in the partners' local areas. Also consideration was given to the perspectives of local residents and businesses to renewable energy, and the local potential for different renewable energy technologies, and possible social and other non-technical barriers for renewable energy and energy efficiency were considered.

The approach in the project has been related to that in the EC funded SIREN project, which built on a European Awareness Scenario Workshop (EASW) approach. This EASW approach has been used in a number of cities to investigate a range of different topics including urban sustainable development and urban mobility. In this project, each partner has selected a limited number of renewable energy technologies, judged to be particularly relevant to the local area, on which to focus in the project and the local workshops. However, it is considered that the approach is also relevant to energy efficiency technologies, particularly for new energy efficiency technologies or those with significant potential for local uptake.

An important part of the project has been to contribute to raising public awareness on the potential for new and renewable energy projects at the local level. Recognising the value of practical examples of local implementation of the technologies a number of local energy-related case studies have been developed and training material has been made available, for example for use by workshop participants.

Seminars/workshops have been arranged in each of the partner towns discussing strategies for the selected energy technologies. It has been intended that the workshops would be based on those in the European Commission funded SIREN project (e.g. Bilderbeek, 2002), which used a highly participatory approach involving delegates from local government, business representatives, energy technology experts and local community representatives/residents. This workshop approach can help with establishing a locally agreed future vision for renewable energy or energy efficiency and with identifying actions to address obstacles facing the uptake of individual energy technologies or projects, and so can help with the development of local or regional energy policies.

In addition to the workshops, further efforts are undertaken to support the individual energy technologies and to help with the implementation of specific local or regional projects, drawing on the findings from the project.

Local energy management in Leicester

Under the Kyoto climate change agreement the UK has a greenhouse gas emissions target of reducing emissions to 12.5% below 1990 levels by 2008-12. The Government has also set a voluntary target of reducing carbon dioxide emissions by 20% from 1990 levels by 2010. In the Energy White Paper (DTI, 2003) the Government has announced a target of a 60% reduction in carbon dioxide emissions by about 2050. At the regional and local level there has been increasing recognition that there are a variety of actions that can be taken to contribute to these targets such as the implementation of energy and climate change strategies including improving energy efficiency and increasing the use of renewable energy.

Leicester is a city in the East Midlands region of the UK. It covers an area of 73 km², has a population of almost 300 000, and has an ethnic minority population of about 29%. The textiles industry has been a significant manufacturing sector in the city while other major industry sectors have included engineering, food and drink, and printing and publishing. 27% of employment has been in the public administration, education and health sectors with 24% in the manufacturing sector (1999).

Leicester has several years of experience with implementing local energy and greenhouse gas management policies, addressing climate change targets. For example, in 1990 Leicester became Britain's first Environment City, with the aim of promoting more sustainable development in the city. A range of local strategies and measures are being implemented in Leicester to improve energy efficiency in the Council's own operations and to manage city-wide energy consumption and greenhouse gas emissions (e.g. Fleming and Webber, 2004). For example, in Leicester, the City Council has developed an Energy Action Plan, and produced its city-wide energy strategy in 1994 (Leicester City Council, 1994) which considered both energy supply and demand and means of working towards the City Council's target of reducing energy consumption in the city by 50% of 1990 levels by 2025. Leicester also has a target for 20% of Leicester's electricity to be obtained from renewable energy sources by 2020. In 1996 the Leicester Energy Agency was

set up with support from the European Commission's SAVE II programme, to implement the strategy's recommendations, as a partnership between Leicester City Council and Leicester's De Montfort University. Building on the city's energy strategy, Leicester's climate change strategy (Leicester Environment Partnership and Leicester Partnership, 2003) was produced in 2003.

To contribute to existing strategies and targets Leicester City Council has carried out a number of activities to improve energy efficiency and manage energy consumption in the domestic, non-domestic and transport energy end use sectors. Energy advice and information has been made available, and opportunities for improving the local management of energy through the planning system have been considered. For example, Leicester's work to improve energy efficiency in heating has included the installation of combined heat and power projects (e.g. in community heating), providing advice and information on energy efficiency for homes and businesses, the use of an environmental show-home (the EcoHouse), the promotion of available financial assistance for energy efficiency measures, and giving encouragement to the use of highly energy efficient heating systems with good heating controls. Also, specific measures have been carried out in support of renewable energy. For example, the City Council has set up renewable energy demonstration projects (solar water heating panels, passive solar lighting techniques, and the use of photovoltaic panels), and the Council has purchased a share of its electricity requirements from renewable energy sources.

In a recent project, Leicester, with Energaia and Rajkot Municipal Corporation, has been exploring the potential for European local authorities and local energy agencies to use their experience to work with a local area in a developing country. This has looked at the potential for the transfer of experience in managing energy and greenhouse gas emissions at the local level, helping the local partner in the developing country address issues of increasing energy demand, climate change and sustainable development (as well as enabling the European partners to learn from experience elsewhere).

Energy management in Vila Nova de Gaia

The Portuguese Government has devised a National Energy Strategy to support a sustainable economic growth. Portugal is increasingly dependent on imports of fossil fuels (especially oil) and on the other hand the energy intensity of the economy is significantly higher than the average of the EU-15 member states (Conselho de Ministros, 2004). Therefore the Government decided to launch an action plan that is aiming to reduce the energy consumption of the economy for the same level of production, and at the same time reduce the importance of oil in the primary energy. The action plan sets a 20% reduction target for energy intensity by 2010. This programme comprises a large set of measures for the main sectors of the Portuguese economy, which are associated with the national Climate Change Action Plan. It is expected that the measures included in the baseline scenario of this Climate Change Plan will contribute to the reduction of 7.8 Mt to 8.8 Mt of CO₂ emissions for the period between 2008-2012, when comparing to the business

as usual scenario. Additional measures are also being implemented in order to meet the national greenhouse gases emission reduction targets.

Gaia is the largest municipality of the Porto metropolitan area. It has a population of more than 287 000 and covers an area of 171 km². Major industries in the area are retail, food and drinks, automobile components, services and tourism. It contains a mixture of urban and more rural areas.

Over 329 000 tonnes of oil equivalent (toe) are used in Gaia, with about 1.2 toe per capita energy consumption. Energy demand has been rising and has increased at a rate of 7% per annum in the last decade. While energy supply relies heavily on fossil fuels about 9% of total energy supply is met by renewable energy sources (Energaia, 2000).

In 2000 ENERGAIA, the energy management agency of Gaia, was set up with the support of the municipality and European Commission's SAVE II programme. Since then, there have been a number of local policies and measures in Gaia to support the implementation of energy efficiency and renewable energy technologies. For example, energy management support has been provided to private sector companies, education on sustainable energy and energy management training has been available, and activities have been carried out to raise public awareness of energy/environment issues.

Energy in Rajkot

In India, as industrialisation and the standard of living has increased, energy demand has been increasing rapidly, e.g. from 8 000 petajoules (PJ) in 1984, to over 12 000 PJ in 1994 (Rajkot Municipal Corporation, 2003). However, the role of renewable energy in contributing to meeting energy demand is recognised within India, for example with there being a separate Ministry of Non-conventional Energy Sources which has been concerned with research, development and demonstration in the past but has been becoming more involved with the commercialisation of renewable energy. Grid connected renewable energy provides 1% of total electricity generation capacity in India (Rajkot Municipal Corporation, 2003). Climate change has begun to be included in national government policy, and energy efficiency and renewable energy are recognised as part of development activities in India.

Gujarat has an energy development agency which runs a number of subsidy programmes for renewable energy and energy conservation, for example for a range of solar energy technologies and for energy audit studies in industry.

Rajkot is located in the Gujarat, in the west of India. Rajkot has a population of about 1 million, and covers an area of about 105 km². Total annual per capita power consumption in the Gujarat is 952 kWh (2001-02) (Rajkot Municipal Corporation, 2004a). There are a range of industries in Rajkot including the production of diesel engines and machine tools, foundries, engineering and automotive industry, and jewellery manufacture (Rajkot Municipal Corporation, 2003). Also, there is a significant amount of agriculture in the Rajkot area, and there are many shops and commercial establishments in the city.

Rajkot Municipal Corporation is the local government for Rajkot and is concerned with infrastructure in the city, while

electricity supply is the responsibility of Gujarat State Electricity Board. The main area of electricity consumption in Rajkot is for industry (just over 50%), with a third being for residential, and just over 10% being for commercial uses (Rajkot Municipal Corporation, 2004a). The Rajkot Municipal Corporation purchases electricity for use in streetlighting, water supply and drainage pumping stations, gardens, crematoria and Corporation buildings (Rajkot Municipal Corporation, 2003).

In meeting increasing energy supply in Rajkot there is scope for renewable energy and also for energy efficiency. For example, potential difficulties of increasing energy supply without understanding the need for energy conservation to meet that supply are that energy will be used inefficiently, leading to excessive energy resource use and related emissions and higher than necessary energy costs for the consumer. Rajkot Municipal Corporation, recognising the increasing need for the efficient use of energy, have regarded the project as an opportunity to promote sustainable energy helping to reduce local pollution by raising public awareness and social networking (Rajkot Municipal Corporation, 2004a).

Key energy technologies identified in each town

It was intended to focus on a limited number of locally appropriate renewable energy technologies throughout the project and in the workshops to be held in each town. Information that had been obtained on the local potential for different renewable energy technologies, local knowledge, and information obtained from discussions with potential workshop participants has helped in the selection of energy technologies to be considered in participatory local workshops.

LEICESTER

The technologies on which to focus in Leicester were selected with help of consultation with potential workshop participants, discussions, and the use of previous research (e.g. Land Use Consultants and IT Power, 2001).

A renewable energy technology with a relatively large resource potential in Leicester and its surrounding area is solar energy, in the form of passive solar design techniques, and solar water heating panels and solar photovoltaics. There are some examples of the use of solar energy technologies in Leicester (e.g. the use of natural ventilation at De Montfort University's Queens Building, the use of solar water heaters on some of Leicester City Council's office buildings) and elsewhere in the East Midlands. However, there is considerable potential for the further uptake of the technologies, such as the increased use of passive solar techniques in new housing and in new non-domestic buildings and those undergoing major refurbishment.

There is a relatively large potential for biomass energy in the region. Some use is made of biomass energy in the East Midlands region, for example some wood is used to contribute to heating in housing and there has been an anaerobic digestion scheme operating at a sewage treatment works at Wanlip near Leicester. There is the scope for further promoting the uptake of energy from biomass, locally.

Although currently there is little use of wind energy in the city of Leicester and the potential for this technology in the city environment is limited there is some potential in the wider East Midlands, for example for the application of small scale wind turbines at acceptable locations. It is considered there is some potential for further promoting the technology locally.

While there is 'negligible' potential for hydro-electric power in Leicestershire (Land Use Consultants and IT Power, 2001) there is larger potential elsewhere in the region, in Derbyshire and Nottinghamshire. There is the potential for promoting small scale hydroelectric power, particularly in these areas.

The energy technologies selected for consideration in the project and workshop for Leicester, were:

- passive and active solar energy,
- biomass energy,
- wind energy,
- micro hydro-electric energy.

Solar and biomass energy were technologies identified as being particularly relevant locally in Vila Nova de Gaia and Rajkot also.

VILA NOVA DE GAIA

The potential for different renewable energy technologies in Vila Nova de Gaia has been investigated in a recent European Commission funded OptiRES project. It is considered that renewable energies with particular potential in Gaia are solar energy and biomass energy.

Portugal is one of the European countries with the highest potential for solar energy, most of it still unexploited. It was estimated that around 1,000m² of solar thermal systems, mostly for domestic water heating, were operational in Gaia in 2000. This is regarded as being a very small amount considering the significant potential for this technology.

Within Europe, Portugal is one of the countries with higher annual solar radiation and a large number of sunlight hours setting the right conditions for the use of photovoltaic systems. There have generally only been small scale applications of photovoltaics, with very few photovoltaic systems being connected to the grid.

It has been considered that there is some local potential for the use of micro combined heat and power, for example for public buildings and sports halls with a high demand for heat and electricity or which can be supplied by the same power plant in a district heating scheme.

Portugal has a large potential for energy production using biomass. Biomass for heat and electricity production can be collected from woodlands, public gardens and parks and wood waste from paper and furniture industries. In Gaia there is a significant amount of biomass use for space heating, though it is hard to quantify it precisely because transactions of biomass for domestic use are carried out away from the marketplaces. Biofuels (such as biodiesel and bioethanol) also have a great unexplored potential for fuel and electricity production, (ENERGAIA, 2003).

The technologies that have been selected for consideration in the workshop in the project are as follows:

- solar water heating,
- solar photovoltaic,
- energy from biomass and waste (wood, biodiesel and biogas),
- micro combined heat and power.

RAJKOT

There is considerable potential for solar energy, tidal energy, wind energy, and biomass energy in the state of Gujarat, as shown by figures from the Gujarat Energy Development Agency (Rajkot Municipal Corporation, 2003). Given Rajkot's inland location it was considered that solar energy and biomass energy were particularly relevant energy technologies and so it was decided that these would be focussed on in the workshop.

Local energy workshops

The workshops which were held in each partner town were based on the approach used in a previous European Commission funded SIREN project. The SIREN project included the selection of new/renewable energy research and development projects, and the development of four future scenarios in partner cities, based on the European Awareness Scenario Workshop approach. It involved a scenario workshop in each of the partner cities involving four role groups (e.g. 6-8 people per group) looking at the development of a future vision, and theme groups concerned with the development of ideas to support the technologies and contribute to the agreed future vision (Bilderbeek, 2002). While the project has been based on this approach it is recognised that it is necessary to adapt the workshop to ensure its relevance to the local situation, for example to account for the local cultural context.

In this project a local energy seminar/workshop involving a range of organisations and individuals has been held in each partner city, with actions being identified to improve the management of energy at the local level, such as raising awareness and ensuring easy access to information.

As part of the preparation for the workshops case studies and training material were developed to help with raising awareness of the potential for different energy technologies at the local level.

CASE STUDY AND TRAINING MATERIAL DEVELOPMENT

Some existing case study, information and training material has been exchanged between the partners in the project, including a renewable energy toolkit and an energy education pack for schools, which has been built on by the partners in this project and made relevant to the local contexts.

In Leicester, background information on renewable energy and case studies showing applications of renewable energy have been made available for participants at the workshop. This has included the use of a renewable energy toolkit (developed in a previous EC ALTENER funded ENTHUSE project (www.enthuse.info)). This contained information on renewable energy (e.g. policy and financing), a renewable energy matrix (which enables organisations to identify stages they can progress through in order to have a

good management approach to renewable energy), and case studies showing the application of different renewable energy technologies. Also a brief local future renewable energy vision, based on existing local and regional energy strategies was drawn up for the workshop participants. Additionally, information on renewable energy was available through the East Midlands Community Renewables Initiative webpages, which have been managed by the Agency.

In Vila Nova de Gaia, ENERGAIA have used the ENTHUSE toolkit to help with the preparation of case studies and training material for their town's local energy workshop. For example, the toolkit's renewable energy matrix has been adapted for Portugal and renewable energy case studies have been prepared and made available over the internet. Some consideration has been given to local renewable energy scenarios/strategy.

In Rajkot, Rajkot Municipal Corporation have published an educational pack for schools on renewable energy in English and the local language (Gujarati), with the intention of distributing the packs to schools in the city. Also, the ENTHUSE toolkit has been translated to Gujarati, and can be accessed in the municipal library. Some other energy information booklets have been produced, providing information on renewable energy and electricity to help with raising general awareness and promoting renewable energy. Some case studies on renewable energy have been prepared.

LEICESTER WORKSHOP

The Leicester workshop, held in March 2004, considered a local future vision for renewable energy and identified actions to support renewable energy locally and help with the implementation of local renewable energy technologies and projects. About 40 delegates attended the event, including the Leader of the City Council and other Councillors and officers from Leicester City Council, business representatives, representatives from the local community, and renewable energy experts. Delegates were provided with an information pack containing a local renewable energy vision, information on the workshop, and an ENTHUSE renewable energy toolkit, with renewable energy case studies.

Some background presentations were delivered on climate change and renewable energy and presentations were given by the project partners from Rajkot and Vila Nova de Gaia. In the first part of the participatory workshop separate workshop groups (local government/policy, business/economics, renewable energy technology experts, community/local residents) discussed different aspects of renewable energy, obstacles and opportunities. In the second part of the workshop, four groups discussed a different energy technology (solar energy, biomass energy, micro-hydro electric energy, and wind energy), considering advantages/disadvantages, obstacles and actions that can be taken to support the technology.

VILA NOVA DE GAIA WORKSHOP

Gaia's energy seminar was held in June 2004, arranged by ENERGAIA, and based on the format used in the Leicester workshop. The workshop has aimed to involve local groups in discussing renewable energy issues appropriate to Vila Nova de Gaia, considering obstacles and actions to be taken to support different renewable energy technologies.

Delegates, including representatives from various groups were invited to the seminar. 43 people attended the seminar, including the Vice President of Gaia municipality, representatives of the national energy agency, researchers, teachers, local businesses, and technology providers. An information pack was provided to participants, which included a number of case studies on renewable energy technologies, and a copy of the energy plan for Vila Nova de Gaia (Ferreira et. al., 2004).

Initially some introductory presentations on Vila Nova de Gaia and renewable energy set the context for the workshop. This was followed by two workshop group discussion sessions. The first of these involved four separate groups (e.g. politicians, residents, businesses, and technicians) discussing barriers and solutions to renewable energy while the second session involved four groups (solar thermal, solar photovoltaic, energy from biomass and waste, and micro-combined heat and power) discussing the individual technologies. A study tour to a local energy project, a landfill gas power plant, took place, demonstrating the practical application of renewable energy.

RAJKOT SEMINAR

The aim of the local energy seminar in Rajkot, held in June 2004, has been to raise awareness in the local area of opportunities for renewable energy locally, particularly for biomass and solar energy.

Among the hundred or so delegates attending the event were Councillors and officers from Rajkot Municipal Corporation (including the Commissioner and Mayor of Rajkot), representatives of local renewable energy organisations, and the media. An information pack was provided to delegates giving background information on the project and the context for the seminar and some information on renewable energy. A range of presentations were delivered including ones related to climate change and the importance of renewable energy and opportunities for renewable energy in Rajkot, and also local energy management in Leicester. A renewable energy display was provided, and there was considerable coverage of the seminar in the media, helping to raise awareness of opportunities for renewable energy in India.

In the seminar, various renewable energy technologies and their potential were discussed. A greater understanding of renewable energy was obtained and it was concluded that a greater involvement of the community was required.

Outcomes of the workshops

In the workshops, obstacles to the selected energy technologies have been identified in the partner towns and actions to support the uptake of energy technologies have been identified. A common obstacle that was recognised for renewable energy was a lack of awareness. Other frequently occurring comments were there was a need for funding for renewable energy technologies, there was a lack of education and insufficient knowledge of benefits of the technologies. The importance of communication was a common theme arising from the workshops.

LEICESTER

Vision development

The potential for renewable energy in the East Midlands has been studied previously (e.g. Land Use Consultants and IT Power, 2001) and a number of local strategies (e.g. Leicester Environment Partnership and Leicester Partnership, 2003, and East Midlands Regional Assembly, 2004) and climate change and renewable energy-related targets have been developed. For example, in Leicester there is a 2010 'vision' for 20% of city-wide electricity consumption to be met by electricity from renewable energy sources, and there is a target to reduce Leicester's energy consumption by 50% of 1990 levels by 2025. Information on key local and regional targets for renewable energy was made available at the workshop. The workshop discussions have identified a number of options for achieving further progress to the existing targets.

Obstacles and actions for energy technologies

The workshop groups considered actions to contribute to meeting local energy targets. Points highlighted in the Leicester workshop included the need for better communication of the benefits of renewable energy and the importance of education on renewable energy. Actions identified in the workshop included raising awareness and ensuring easy access to information. Further details of discussions of individual groups are given below.

The existence of a number of targets for renewable energy/emissions at local, regional and national levels, and strategies (for climate change, environment, and energy) was recognised by the local government/policy group at the Leicester workshop. In Leicester, it was felt that a number of relevant policies had been established but that there was a need for greater communication of the benefits of renewable energy. The role for public involvement in renewable energy was highlighted. For example, it was felt there was a need to encourage greater public involvement in policy relevant to energy, to give the public more ownership of solutions, and to translate policy into actions which benefit individuals. The group mentioned there was a need to make it simpler to implement renewable energy for people who know what to do and there was a role for a 'one stop shop' to help people to implement renewable energy.

Energy management in businesses is able to limit their energy costs, for example through energy efficiency improvements. However, the 'business/economics' group pointed out that currently renewable energy was perceived as a 'green' issue rather than a business one, and that there was a lack of knowledge about what is available. It was felt that with regards to energy it is easiest for people to continue to do what they have always done. It was commented that there was a funding problem at the moment, with there being a lack of funding and complications in finding funding. A need for financial incentives for renewable energy (e.g. grants, low cost loans, tax incentives) was highlighted. A need for more education on renewable energy was recognised, aimed particularly at younger people, with a greater incorporation of renewable energy in courses at colleges and universities. Again, it was felt to be important to promote the benefits of renewable energy more, that additional mar-

keting was needed, and that there was a need to sell the concept of lifecycle costs. Other ways of supporting the uptake of renewable energy were considered to be for local and national government to set an example, and for regulations (e.g. planning-related ones) to give more encouragement for renewable energy.

In the 'residents/society' group, it was recognised that ideas and enthusiasm for renewable exist, but a number of actions can be taken to support the uptake of renewable energy technologies by individuals. For example, it was expressed that there was a need for education for adults and children, for information to be easily accessible (as with a 'one stop shop'), and for impartial, readily understandable information to be available. It was felt that community groups can have to face a lot of bureaucracy and simpler administration and easier bidding processes for grants are needed.

The renewable energy experts/technology group perceived that there was currently a general ignorance of, or apprehension about, new technologies. There were a number of suggestions for actions to support renewable energy, and it was felt that fiscal incentives, tax breaks, and economic incentives (e.g. local authority grants) could help. Also, it was mentioned that there was a need to raise awareness of technologies with developers. It was felt there was a role for targets for renewable energy in all new developments and a need for statutory requirements and legislation for new developments in relation to environmental impact. Again, it was mentioned that marketing of renewable energy needed to look at lifecycle costs. It was felt that any political inertia needed to be changed into action.

Biomass energy

A number of possible actions were identified to support the uptake of biomass energy in the region. It was felt there was the potential to provide further education on the benefits of using biomass energy and to work to increase knowledge on the different technologies. It was felt there was a need to filter knowledge known within industry down to the consumer, and again the potential role of a 'one stop shop' in making information more available was pointed out. The importance of the quality of supply of biomass was mentioned and it was considered that there was the need to ensure certain standards of quality were met. It was felt that there was a need for networks to support the technology, for example involving communities, farmers, and experts.

Solar energy

The discussion on solar energy identified obstacles for the uptake of the technology, including planning issues, and a need for a reduction in the price of solar systems. Potential actions that were identified included the provision of training for operatives, more financial incentives for the technology, education, a maintained commitment by Government, and a positive lead being provided by Government, planners, builders and consumers.

Micro-hydroelectric energy

Obstacles for renewable energy that were identified included low energy prices, and the additional cost of renewables. Possible actions which could support hydropower develop-

ment were considered to be the development of partnerships between developers and power companies, with perhaps the developer obtaining a share of the benefits from a hydroelectric development. Other actions included streamlining of bureaucracy facing scheme developers, establishing fully funded pilot schemes, and ensuring funding is readily available.

Wind energy

From the workshop group's discussion, obstacles identified for wind energy include objections to wind energy plans from different groups (e.g. wildlife groups), the current economics for wind energy, and the greater relevance of existing technologies for use in rural rather than urban areas. It was considered that the involvement of the local community in a partnership project can help to establish a wind energy development in an urban area. (This can help to increase the acceptability of the development.) It was felt there was a need for more investigation of new technologies for urban areas.

VILA NOVA DE GAIA

Vision development, obstacles and actions for energy technologies

Through the participation of a range of groups in the workshop it has been possible to obtain suggestions of the major limiting factors for the expansion of renewable energy, to identify key objectives for the promotion of renewable energy in Gaia, and to generate acceptable ideas for actions.

The workshop participants recognised that there is a large unexploited potential for renewable energy (particularly solar energy) in Gaia. It has been clear that there is perceived to be a lack of awareness and information about renewable energy, which can generate confusion and distrust.

A number of barriers were recognised for the expansion of renewable energy in Gaia (many of which are relevant also to energy efficiency). For example, the high initial investment cost usually connected with renewable energy projects is regarded as a problem by the general public and the local authority. There is a general lack of information about the economic and environmental benefits of renewable energy technologies. Currently renewable energy is seen as a very low profile subject in the local community, as well as countrywide. Additionally there is very little information on Government subsidies and incentives for the investment in renewable energy both in the public and the private sectors. Cross incentives in the national energy policy were also viewed to be a problem for the promotion of renewable energy (e.g. a higher rate of VAT for solar energy technologies compared to natural gas). It was felt that some legislation favoured non-optimal technical solutions. It was considered that policy makers and businesses, in general, tend to take 'business as usual' actions, where innovation is required. The development of renewable energy requires a strong need for planning, strategic thinking, a long term vision of policy makers (national and local) and public participation. The groups suggested that there is lack of professional training on (renewable) energy issues. There is also the need for objective and impartial advice and information about renew-

able energy at different levels, for example for professionals, policy makers and the general public.

Key objectives for the promotion of renewable energy locally were identified. It was considered to be important to develop a municipal strategic plan for reducing greenhouse gases, which would include specific targets for local renewable energy projects (possibly based on national targets). This plan should also include a communication plan for raising awareness targeting specific groups (politicians, architects, designers, planners, developers, builders, etc). The broad dissemination of the results of renewable energy projects (e.g. as case studies) was felt to be important, for example using the range of media available. The municipality should be a good example to promote renewable energy (e.g. specific targets could be set, such as the installation of solar water collectors in all the municipal buildings that have hot water requirements). Another objective would be to increase the municipality investment in environmental education, in particular aiming for sustainable energy use in schools. It was felt that this should follow a hands-on approach, presenting real examples of renewable energy technology applications.

Actions to support renewable energy projects in Gaia were discussed, particularly considering the role of the local energy agency and the local authority. For example, it was felt that the municipality should create the conditions for enhancing the role of the local energy agency, ENERGAIA, in the promotion of local renewable energy projects. It was considered that ENERGAIA should focus its activities in:

- delivering impartial advice and information to local actors;
- supporting project promoters in every step of the implementation of specific renewable energy projects;
- creating an advice centre open to the public;
- supporting the eco-schools in Gaia;
- implementing demonstration projects in public buildings and schools (e.g. solar water heating, biomass space heating and small scale photovoltaic installations).

A possible action which was suggested was to include in the municipal regulation a requirement for the pre-installation of energy water heating systems in domestic buildings. It was suggested that training courses on sustainable energy be promoted for municipal officials (planners, architects, engineers, etc). It was felt there was scope to engage in public and private partnerships, especially with financing institutions and technology providers, in order to develop innovative financing schemes for renewable energy projects (3rd party financing, contracting, etc). It was considered that public seminars should be organised and information technologies used in order to provide more relevant and objective information on renewable energy technologies, incentives, financing, schemes and opportunities for renewable energy projects. A further action would be to lobby governmental institutions for more integrated legislation and regulations.

Details of specific actions which have been identified for the individual energy technologies considered, are given below.

Solar thermal energy and solar photovoltaic

It was felt that the number of renewable energy demonstration projects in Gaia should be increased. Specifically, it was suggested that by the end of 2005 solar water heating projects should be completed in Granja municipal swimming pool, in Teixeira Lopes school, and in a municipal sports hall. It was suggested that small-scale photovoltaic systems should be installed in 3 Gaia schools. It was considered to be important to monitor and disseminate results. Another action could be to lobby for a reduction in bureaucracy facing potential scheme developers.

Energy from biomass and waste

Actions were identified for different forms of biomass energy. It was recommended that the installation of an anaerobic digestion plant for biogas/energy production should be promoted, and that the feasibility of using cooking oil to help fuel municipal vehicles should be investigated. It was considered that more information was needed about the benefits of biomass use for space heating.

Micro combined heat and power (CHP) generation

An action that was suggested was to investigate the possibility of using biogas in a micro-CHP plant for space and water heating in a local swimming pool (Maravedi), with the electricity produced being exported to the grid.

RAJKOT

Vision development, obstacles and actions for energy technologies

The Rajkot workshop has raised local awareness of various renewable energy technologies and their relative potential, allowed a common understanding of the project to be developed, and has enabled actions for the local authority to be highlighted. The project approach has the potential to enable local authorities to identify key action areas for energy efficiency and renewable energy technologies. The following key action areas for RMC have identified for renewable energy (Rajkot Municipal Corporation, 2004b):

- electricity generation from renewable energy sources,
- commercialisation of renewable energy technologies,
- enhanced and efficient use of renewable energy for rural development,
- creation of an energy literate public.

Problems of public awareness and communication were noted. It was felt that although there have been incentives for renewable energy it has not yet been able to reach the general population. It was considered that there was a need for much greater involvement of the community in renewable energy (Rajkot Municipal Corporation, 2004b)

It was recognised that there were a number of incentives for promoting renewable energy available via state and government agencies. It is intended that renewable energy, particularly solar and biomass energy, will be promoted through private sector and community participation (Rajkot Municipal Corporation, 2004b). It was intended that a general awareness campaign would be started to promote renewable

energy to the public, with the involvement of other organisations.

Outcomes from the project partnership, workshop follow up activities and actions to support energy management in the partner towns

FOLLOW UP ACTIVITIES AND ACTIONS TO SUPPORT LOCAL ENERGY MANAGEMENT

In the project, it has been intended to provide support for specific local energy management projects.

Leicester

Since the workshop, results of the workshop groups have been provided to the Leicester City Council environment team and the East Midlands Regional Assembly to help with the implementation of the Leicester climate change strategy and the East Midlands regional energy strategy respectively. There is the potential for the outcomes of the Leicester workshop to be used to contribute to the development of a specific climate change action plan for Leicester.

Support has been provided for specific local/regional renewable energy projects (including some of those represented at the workshop), for example including a local community project planning to use solar energy, and a proposed wind energy scheme planned to be developed working closely with the local community.

The Leicester Energy Agency has been providing ongoing support with renewable energy (particularly information and advice) for local businesses, community groups and residents, working with the East Midlands Community Renewables Initiative which has been based at the Agency. It is intended to continue to provide local support with renewable energy where possible, complementing comments in the workshop relating to a 'one stop shop'. Support is also provided with energy efficiency, working with the Leicestershire and Northamptonshire Energy Efficiency Advice Centre, based at the Leicester Energy Efficiency Centre, providing advice, information and raising awareness.

The workshop and project have complemented and supported local energy management work in Leicester. The City Council has continued to work to manage its own energy consumption and establish renewable energy demonstration projects on its buildings.

The initial cost of renewable technologies and the need for financial assistance for the technologies was mentioned in the workshop. The Agency has carried out work to try to obtain financial incentives for renewable energy and energy efficiency improvements in regeneration areas in Leicester.

A range of information on energy efficiency has been available to provide to local businesses. However, additional research has been carried out into attitudes of local businesses to renewable energy which it has been intended to use to develop a renewable energy factsheet for businesses, so helping to address an issue identified by the business group in the workshop, that of there being a lack of knowledge about available renewable energies.

Vila Nova de Gaia

ENERGAIA have been investigating local renewable energy and energy efficiency projects. They have been following up contacts and project ideas from the local energy workshop.

Help has been provided to implement renewable energy projects, including specific solar energy projects. For example, investigation is to be carried out of the potential for photovoltaics with a local water company which is interested in photovoltaics, with the image side being important for the company. An assessment of the technical and economic potential for the installation of photovoltaic systems was carried out for 12 locations (water treatment and pumping stations). The grid connection process and electricity exporting licensing for the installation of photovoltaic systems in 6 locations with the highest potential has been underway.

Also, support has been provided with implementing a highly visible solar thermal energy project at a Granja municipal swimming pool (about 219 m² of solar collectors, producing 202 MWh/year and saving 93 tonnes of carbon dioxide equivalent), which has been recently completed. The workshop helped to increase interest in the project. The project has been designed so that there was no initial investment, with the costs being paid for over 10 years through a third party financing scheme.

At the workshop it was recognised that there was a lack of information on renewable energy and there was a need for real examples, and for renewable energy information to be easily accessible. ENERGAIA has been developing energy information material for different target audience, and to be available in several media. Information and communication technologies will be extensively used in the dissemination of information aiming to overcome the non-technical barriers on renewable energy technologies in Gaia municipality.

Rajkot

Following the seminar, Rajkot Municipal Corporation arranged a public exhibition on renewable energy, which raised public awareness of renewable energy applications and provided support for local renewable energy businesses. A large number of people, including school children, visited the exhibition and there was media coverage of the event. The exhibition provided an opportunity to increase public awareness of a new development control regulation which is being introduced and requires a solar water heater to be used in all new housing developments.

Rajkot Municipal Corporation have been exploring ways of raising awareness of renewable energy and have been investigating opportunities for renewable energy demonstration projects within the local authority. For example, they have been interested in working with the private sector to install some solar powered street lights in the place of existing streetlighting.

The Municipal Corporation have developed plans to establish an Energy Park, helping to raise public awareness on energy. Also, they have been intending to increase awareness of renewable energy by promoting renewable energy in industries and public places, and running a school awareness program. Rajkot Municipal Corporation is acting as an information centre for the public, to promote renewable energy.

When new building byelaws were being considered at state level in Gujarat consideration was given to the climate change issue. Since March 2004, the General Development Control Regulation has made it necessary to install a solar water heating system in new buildings in Municipal Corporations in Gujarat. Rajkot Municipal Corporation have recognised the potential for encouraging renewable energy through ensuring enforcement of this regulation and applied to the Government Ministry for Non conventional Energy Sources for financial assistance to help with building technical capacity to ensure compliance with the renewable energy regulation (RMC, 2004b).

PARTNERSHIPS AND EXCHANGES OF EXPERIENCE

Key success factors for the partnership approach in the project are considered to have included a strong commitment to the aims and objectives of the project by the project partners, and agreement by the project partners with the methodology followed, based on the approach used in a previous SIREN project. Also, the motivation for activities in each town and between the partners provided by European Commission funding for the project, the benefits of the project in each partner area and exchanges of experience have been important for the operation of the partnership. It has been found that following a common approach in each local area has assisted the working of the partnership, helping exchanges and comparisons between the partners.

Each partner has been able to learn from the experience in the other partners' areas. Experience and knowledge has been exchanged between the partners in a number of ways, for example, through presentations, the exchange of publications, the use of a common methodology, participation in local workshops, discussions between the partners, site visits to local sustainable energy projects, and meetings with local energy technology businesses.

FUTURE DEVELOPMENTS

Future developments to build on this specific project have been under consideration. For example, in the project, particularly from the seminar/workshops, there are a number of potential local actions that have been identified in each partner city which it has been intended to follow up. Further attention is to be given to follow up actions to support the implementation of project outcomes.

There is the potential for a related partnership approach, helping to build capacity and exchange experience and knowledge, information and ideas, to be used with projects in other energy/environment areas, including energy efficiency.

There is scope for related partnership working between local and regional areas in different countries in the energy and environment field, for example between the European Union and Asia, within the European Union with New Member States, as well as with other countries. In addition, there is the potential for exploring further more local partnerships within individual countries and regions, which can help to develop the knowledge and skills of the participants through the exchange of expertise.

Also, the approach has the potential to be relevant to the utilisation of opportunities for improving energy efficiency

arising from the Joint Implementation and the Clean Development Mechanism under the Kyoto protocol.

Conclusions

The workshop approach in the project enabled key local stakeholders, such as local political decision makers, business representatives, residents and technology experts, to participate in the development of strategies and the identification of policy measures to support the implementation of renewable energy or energy efficiency technologies at the local level. The workshops have raised energy awareness locally, helped to identify obstacles to renewable energy at the local level and actions to support the uptake of renewable energy/energy efficiency technologies.

The partnership approach used in the project has shown the potential for the transfer of knowledge, ideas and experience in local energy management between local authorities and local energy agencies in Europe and a local authority in Asia. The project has enabled support to be provided for implementing specific energy technologies at the local level.

For an effective partnership of this kind it is considered that it is important that there is a strong commitment to the aims and approach of the project from the project partners, and that are clear benefits from the project in each partner town.

There is the potential to replicate the approach for energy efficiency technologies and for it to be used in other local/regional areas. There is the possibility of exploring further related partnerships in the energy/environment field at the local level between European countries and developing countries, and also more local partnerships within individual countries and regions.

References

- Bilderbeek, R., 2002, Scenarios: designing, shaping the future. SiREN 2002 Renewables for Urban Sustainable Development, Brussels, June 21st 2002 (<http://www.tech-road.com/siren>)
- Conselho de Ministros, 2004, Programa de Actuação para reduzir a dependência de Portugal face ao Petróleo. Resolução do Conselho de Ministros aprovada em 4 de Novembro de 2004, Lisboa.
- DTI, 2003, Energy White Paper. Our energy future-creating a low carbon economy, TSO.
- East Midlands Regional Assembly, 2004, The East Midlands Energy Challenge, EMRA.
- Energia, 2000, Matriz Energética de Vila Nova de Gaia, Energia, Gaia.
- Energia, 2003, Asia Pro Eco Background report for Vila Nova de Gaia. September 2003.
- Ferreira, V. Castanheira, L. Gouveia, J. B. e Estrela, A., 2004, Plano de Acção para o Desenvolvimento das Energias Renováveis - Caso do Município de Vila Nova de Gaia, Simpósio sobre Energias Renováveis em Portugal EN-ER'04, Figueira da Foz.
- Fleming, P.D. and Webber, P.H., 2004, Local and regional greenhouse gas management, *Energy Policy*, 32 (6): 761-771.

Land Use Consultants and IT Power, 2001, Viewpoints on sustainable energy in the East Midlands: A study of current energy projects and future prospects. Final Report, Land Use Consultants, London.

Leicester City Council, 1994, The Leicester Energy Strategy, Leicester City Council, Leicester.

Leicester Environment Partnership and Leicester Partnership, 2003. City of Leicester. Climate Change Strategy, Leicester City Council, Leicester.

Rajkot Municipal Corporation, 2003, Background Report. Asia Pro Eco Programme.

Rajkot Municipal Corporation, 2004a, Asia Pro Eco Programme – Rajkot. Partnership Support for Renewable Energy between European and Asian Town, Brussels, November 15th 2004.

Rajkot Municipal Corporation, 2004b, Proceedings of the Rajkot Renewable Energy Seminar. Sunday 6th of June 2004.

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