

Making Cities Energy Efficient

Urban and Regional Planning adopting RES

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adopting RES**

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Abbreviations

AESOP	Association of European Planning Schools
ECTS	European Credit Transfer System
CHP	Combined heat and power, co-generation of heat and power
CPD	Continuing professional development
DC	District cooling
DH	District heating
DHC	District heating and cooling
EACI	Executive Agency for Competitiveness and Innovation
EE	Energy efficiency
HVAC	Heating, ventilation and air conditioning
IEA	International Energy Agency
IEE	Intelligent Energy Europe
IFME	International Federation for Municipal Engineering
NSG	National Steering Group
RES	Renewable Energy Systems

Fact sheet

Project title	Urban Planners with Renewable Energy Skills – UP-RES
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Project website	http://aaltopro.fi/up-res
Partners	Aalto University (Finland, project coordinator) AGFW-Projektgesellschaft für Rationalisierung, Information und Standardisierung mbH, (Germany) BRE, Building and Research Establishment Ltd. (U.K.) Debreceni Egyetem (Hungary) SaAS, Sabaté Associats, Arquitectura i Sostenibilitat (Spain) Technische Universität München (Germany) Universität Augsburg (Germany)
Main objectives	<ol style="list-style-type: none">1. To organise pilot training of urban planners to become familiar with RES in five countries2. To create training material to other universities and planning schools
Main results	36 short courses and 4 long courses with some 700 trainees Freely downloadable training material of ten modules in about 300 slides and explanatory texts in ten language versions such as English, Finnish, French, German, Hungarian, Italian, Polish, Romanian, Spanish and Swedish as well as six simple planning tools and 30 selected best practice cases in English.
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For the reader

This report summarises the outcomes of a 30 months duration continuing education project entitled 'Urban Planners with Renewable Energy Skills' (UP-RES). The project was carried out by a multi-disciplinary international consortium with the aim of informing planners and related professionals about energy-efficient and CO₂ reducing technologies, practices and systems that can be developed across urban areas to serve whole communities.

This report provides an overview of the key issues:

- The overall project approach to devising a training program based on preceding training needs analysis
- The key tasks involved in creating the training materials
- The marketing of the training as well as evaluation results
- Best practise examples of RES in urban planning.

The UP-RES project has focused on several major target groups. These include those groups directly involved in taking forward renewable energy projects for whom the UP-RES training was principally focused; those who wish to deliver such training programmes; and policy makers who are ultimately responsible for the decisions that govern how widely such technologies will be implemented. Each of these groups has its own perspective concerning renewable energy technologies so the report is structured accordingly:

- For professionals involved in implementation: Among those professions that are likely to become involved with renewable energy initiatives in urban areas are urban planners, architects, energy suppliers, developers, building owners, and consulting engineers. For these professionals chapters 3.2 (summary of training need analysis) and 4 (best practise examples) are most likely to appeal.
- For training experts and organisations: Training programmes that address the relevance of renewable energies in urban areas require a comprehensive set of materials. As an example of how to organise training courses and lessons learnt, chapter 3 might be interesting.
- For the generally interested: Renewable energies are becoming increasingly popular, and are of particular interest to students, researchers, policy makers, and decision makers. Therefore, the report offers some information about a choice of training materials and quotable best practises as well as undesired examples in chapter 4.

1 Foreword

More and more communities formulate climate protection, energy efficiency or renewable energy targets and think about a sustainable future-proof energy infrastructure for their citizens. The restrictions of available natural resources and the impact energy use has on both the local and global climate require a new approach to develop communities, to plan and manage land area. To successfully change the way energy production and consumption is organised in cities, a new generation of competences and tools is needed.

Spatial planners face a new and comprehensive challenge. Roughly three quarters of the European population live in cities. The building and construction sector represents more than 40% of all energy consumption and related emissions, transportation is another important source of pollution. But urban areas do not only feature the highest density of energy demands, they also dispose of the highest density of energy resources. Mapping these often hidden treasures such as industries producing waste heat, existing power stations, waste incineration and water treatment plants, nearby forests and agricultural activities, rivers and lakes provides a good basis for starting a debate, identifying synergies, and establishing partnerships.

Many projects for eco-cities and -districts, zero-energy buildings and new experiments of energy efficiency prove that spatial planning can substantially and positively influence on the uptake of renewable energies and energy efficiency measures. It is the key to a socially, economically and ecologically more sustainable future. Many encouraging examples show that economic benefits can be achieved through spatial planning that has incorporated climate change and energy efficiency related aspects.

The “energy transition” requires a change in the way we think our future and behaviour. It will only happen, if and when all actors in the value chain understand the need for change as well as the possibilities and tools at hand. Expertise in climate and energy is needed on all levels of spatial planning. While traditionally, energy supply and urban planning were perceived as separate domains of expertise, we need to provide new skills and tools to planners today with a view to creating smarter and more sustainable communities.

The fundamental idea of district heating is to use heat that otherwise would be wasted (surplus heat from electricity production, from industrial processes or waste incineration) or renewable energy sources (biomass, geothermal, solar) to provide comfort to buildings (space heating and cooling, warm water preparation) and heat to various processes (industrial processes, hospitals). Therefore, district heating and cooling (DHC) networks and combined heat and power plants are important infrastructures for any city concerned about

energy efficiency and aiming at expanding the use of renewable energy sources. A collective energy solution for the benefit of all requires local government and urban planners to take on a pivotal role. Specifically, upgrading of the public building stock should go hand in hand with the establishment of heating and cooling plans. A comprehensive approach to local energy supply and demand, and the development of eco-districts, will help to keep costs for the citizens at affordable levels.

Training of urban planners and regional planners to understand the basics of renewable energy and energy efficiency was carried out in five countries such as Finland, Germany, Hungary, Spain and United Kingdom in the framework of the UP-RES project. The report at hand was designed for urban planners in Europe, spatial planning schools in Europe (via AESOP), and for energy planners. Indeed, co-planning to be carried out together by urban and energy planners appeared to be the best approach to guide the spatial planning effort in the good direction.

The materials produced under this project have been made available to other planning schools in Europe to carry out similar training in their home countries. The training package can be downloaded: aaltopro.fi/up-res.

Together with the project Ecoheat4cities (www.ecoheat4cities.eu), the UP-RES project provides municipalities with a useful toolset to meet their climate and energy ambitions, while fostering the local economy and employment. Both projects were supported by the Intelligent Energy Europe programme. Both were also among the first projects initiated under the DHC+ Technology Platform (www.dhcplus.eu), which under the umbrella of Euroheat & Power aims at fostering innovation and knowledge transfer in the DHC sector.



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2 UP-RES: Background and Introduction

Climate change, often described as the toughest challenge ever faced by mankind, is mainly caused by CO₂ emissions from energy production based on the use of fossil fuels for different purposes including transportation, industry, generation of electricity, heating and cooling.

According to IEA 2010 statistics, almost half (46%) of all energy in the world is used for heating and cooling of buildings. Generally we may have assumed that heating is principally for the high latitudes, and cooling for the low latitudes. However, almost all year round cooling is needed in many buildings such as offices and commercial buildings even in the countries of Northern Europe, while many Southern Europe cities would benefit from better heating arrangements in winter. Selection of the primary sources of heating and cooling depends on several things: type, size, location and orientation of buildings. These are often determined in urban and regional planning.

Some 27 % of all global energy consumption is caused by transportation of goods and people. At the regional and local level, urban structures such as location of services and working places relative to residential areas influence transportation needs and energy consumption.

In existing urban areas, the introduction of energy efficiency (EE) measures and renewable energy systems (RES) face significant barriers because already existing infrastructure and legal mechanisms have to be taken into account. Moreover, any operation is on “open core”, as functions and fluxes have to be maintained, resulting in higher investment and therefore lower economic feasibility. While developing urban structures, the urban planner is the first to make decisions that influence how RES or EE can be implemented in the planned urban area. Even with relatively small adjustments in the urban plan, considerable opportunities for RES and EE may materialise. For instance, compact urban structure may enable: public and light transport to be prioritised over individual cars; biomass and waste heat to be used at large scale by means of district heating and cooling (DHC) networks; co-generation of heat and power (CHP) to maximize the overall EE; decentralised RES solutions to be integrated with other communal energy systems.

In order to ensure that RES and EE are included right from the beginning of the planning process, training of both urban and energy planners is needed. A new type of *co-planning* can be developed, which is more integral and effective than the traditional co-operation of urban and energy planners. For new urban settlements, the traditional co-operation is that a municipality creates a general location plan in which buildings can easily be built and connected to roads, and defines the physical dimensions of the buildings. The building code ensures the new buildings meet the EE norms. Thereafter,

the energy and water utilities connect the buildings to their infrastructure in the best way still possible. Nevertheless, such connections may come all too late to optimize the RES and EE! In the co-planning method, energy and urban planners will co-plan the development area together from the beginning.

Co-planning of urban and energy structures can reduce primary energy consumption and related emissions, even costs, as demonstrated by the pilot co-planning case in the city of Porvoo, Finland. Such new co-planning, to be carried out by urban planners (typically architects), and energy planners, (predominantly engineers), is challenging due to their different backgrounds. In order to facilitate co-planning, training of both urban and energy planners is needed. In order to provide the necessary technical capacities and to facilitate co-planning in the future, different forms of pilot training to introduce and improve energy skills of urban planners were carried out in five countries: Finland, Germany, Hungary, Spain and U.K..

In very few planning schools in the world, however, urban and regional planners are educated to understand energy, and RES and EE in particular. Based on the brief survey made in 2009 and confirmed by the training needs analysis carried out within the UP-RES project, only one such planning school was identified in North America (Canada) and three in Europe, namely in Germany (Stuttgart), Denmark (Aalborg) and Finland (Oulu). Today there are already more such universities. Such combined skills of energy and urban planning have become vital while fighting climate change: the urban planner is the first actor in the planning process, the plans of whom will either restrict or enable optimal RES and EE implementation later on.

We estimate that there are about 45 000 individuals in the EU working as urban planners, the background of the planners being variant. Most but not all of them are architects or civil engineers. The planners work in regional councils, city planning offices, consulting and construction companies, and research institutes, the overall organisation of planning depending on the country. In other words, neither the profession nor the planning process is uniform across the EU but characterised by significant variations. In Germany, for instance, the term “urban planner” is certified by each federal state (Bundesland) differently, whereas “urban planner” may not exist in Hungary as such. In Hungary no “urban planners” diploma is available, as urban planning is a set of regular and elective disciplines at faculties of architecture. Architects may specialise in this subject area and also undertake occasional further training. These mixed planning practices and professional backgrounds, and country-specific features, provide challenges when seeking to organise training programmes for planners.

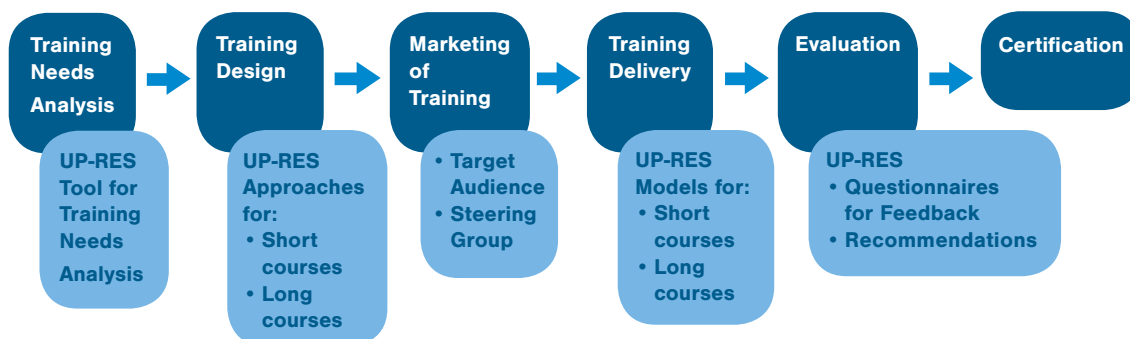
In the short and long courses of UP-RES project, about 800 individuals were trained to understand the basic links prevailing between urban and energy planning as well as the barriers faced and opportunities offered by RES and EE. The number 800 includes urban planners and other professionals strongly involved with urban planning. The share of urban planners alone is about 1% of the total of 45 000 in Europe.

3 UP-RES Training Concept

3.1 Training Design Process

The UP-RES training design process started with the analysis of training needs, then continued with the design of the training concept including selection of materials and methods. Finally the training programme for each country was carried out as a series of short or long courses or including both. In most countries the short course functioned as an introduction to the subject and for marketing the long course, whereas in UK the focus was exclusively on short courses, delivered all over the country.

Following the delivery of the training the courses were evaluated by the trainees and key stakeholders such as steering group, urban planning and energy sector organisations. The training courses were certified: nationally in Hungary, included as an eligible course for certifying urban planners in Finland, by the Chamber of Architects in Spain, by the Royal Institute of Architects in UK, and by the individual federal states (Bundesländer) in Germany. Any of these routes may be applicable in the other EU member states.



UP-RES Training Design and Delivery Tools and Products

Figure 1: Process of UP-RES training programme design

The various project stages are shown in Figure 1 and are described together with lessons learned in more detail in the following chapters.

3.2 Training Needs Analysis

3.2.1 Background for Training Needs Analysis

The project team recognised that there was hardly any training available on the topics of urban planning and energy, and yet there was substantial need for such training. Furthermore, details of the training needs were not clear: a more detailed understanding was required to make clear the competence needs and the national and local circumstances to be taken into account for the national training programmes.

The training requirements depend on the local circumstances, and the content should therefore be adjusted to the local needs and conditions. The awareness and established level of various RES components in the five countries differs as illustrated in Table 1 below.

Table 1: Extent of various types of RES applications in the partner countries.

RES	Initial	Scarce	Dense	Established
Solar	FI	HU, UK	DE, ES	
Wind	FI	HU	UK	DE, ES
Biomass	ES, UK	HU	DE	FI
Waste heat	ES, UK	FI, HU	DE	
District heating	ES, UK	HU	DE	FI
District cooling	HU, UK	FI, DE, ES		
	↓	↓	↓	↓
Focus of training:	Raising Awareness	Providing Knowledge	Developing Competence	Promoting Good Professional Practices

In Table 1 above DH and DC are considered to be a means of distributing the products of RES at large scale, also giving potential to CHP to use renewable fuels at the highest efficiency possible.

In terms of solar power, Finland, U.K. and Hungary are at an initial stage with close to zero share of electricity production, according to IEA 2009 statistics, whereas Germany (1% of electricity production) and Spain (2%) are much more developed.

Regarding wind power, Finland and Hungary are at a very initial stage with 0,4% and 0,9% of electricity production, according to IEA 2009 statistics, respectively, whereas Germany and Spain are highly developed, 7% and 13%, respectively. In U.K., wind power share is 2,5%, thus being in the middle of five partner countries.

Use of biomass in power and heat production is well-established in Finland and quite common in Germany and Hungary with 25%, 10% and 5% of the total production of heat and power, respectively. In both U.K. and Spain, biomass is a rather little used resource, according to IEA 2009.

Waste heat is used most in Germany with 10% of heat production, whereas the level is about 3% in Finland and Hungary. Regarding the low 3% waste share in Finland, however, in year 2012 almost 27% of all electricity supplied was based on CHP, the sort of waste heat of which covered about 70% of the DH supplies. Waste heat recovery is not yet encountered in Spain due to lack of developed heat networks, while in the U.K. heat from waste treatment is also commonly thrown away, despite notable examples of waste-to-heat plant supplying heat networks in Sheffield, Nottingham, and Lerwick (Shetland Island capital).

DH is at an initial stage in U.K. and Spain with very low penetration, although the UK market is stirring. In Hungary penetration remains quite low despite significant city schemes while in Germany 14% of the population is connected to DH. Among the project partner countries only Finland has a high penetration of DH (49% according to the District Heating and Cooling Country by Country Survey 2011 of Euroheat&Power).

District cooling is growing quickly, but the statistics are still incomplete. There are large cities with growing DC systems in Spain (Barcelona), Germany (Munich¹, Chemnitz²) and Finland (Helsinki³) already, but they are still rather individual examples with low national coverage.

The varied state of the DH market among partner countries meant that the technical focus had to be adjusted according to the potentials and needs of each individual country.

In terms of training provision, we state that if RES are at an initial state, training should focus first on raising awareness. Where such schemes are more familiar, the training could be at a deeper level, i.e. offering best available and reliable knowledge and developing competences to utilise certain energy

¹ Munich: <http://www.swm.de/geschaeftskunden/m-fernwaerme/m-fernkaelte.html>

² Chemnitz: <http://www.eins-energie.de/ueber-eins/netze/fernkaelte/>

³ Helsinki: www.helen.fi/en

sources. Finally, for established markets, the focus could be on promoting good professional practices. These different levels of focus do not overrule each other, but simply describe the starting point for development actions.

Training requirements are dictated more by the numerous links prevailing between a host of issues than explicit technological issues. These include an appreciation of living habits: current energy consumption patterns; existing and desired urban structures; types of energy sources used now or possibly in the future and consequent energy-related emissions; the economy; other environmental impacts. For this reason training needs are complex and require a comprehensive training approach.

3.2.2 Summary of Training Needs Analysis

The training need analysis was done through an on-line questionnaire survey that gathered more than 300 opinions from relevant stakeholders all over Europe, as well as through more than 30 direct interviews with heads of urban planning entities from the partner countries. The questionnaire was conceived by the consortium and implemented through the specific software EVASYS that allowed the systematic evaluation of answers.

Based on the training needs analysis carried out in the five countries, our conclusions are:

- The planning requirements of various types of RES in terms of spatial needs was considered vital. Such requirements relate to the location of sources, storage, distribution piping and roads, sizing and orientation of buildings
- Objective information about the economy and ecology of various energy sources is needed, as there is a lot of subjective advertisement on the market that is often contradictory. Definition of terms is important: density of communities, renewable and non-renewable energy, primary energy factors, energy efficiency indicators, etc.;
- Life-cycle impacts of energy consumption and construction materials on economy and climate change should be considered;
- Understanding of the causes and processes of emissions in different types of energy systems: power-alone production, various heating and cooling applications in either decentralised or centralised solutions, means of transportation; and,
- Feasible measures either in new construction or rehabilitation of existing building infrastructure in terms of strengthening RES use and EE achievements is needed.

3.3 Training Design

3.3.1 Short Courses

In the project we planned to have both short and long courses: the short courses would be introductions to the long programs; in the UK they would substitute the long programs entirely. Originally we planned to have three short courses in each country, each of duration three days.

However, following the training needs analysis and after discussions with target audience representatives, it became clear that the original plan should be adapted to meet the market requirements. Furthermore, at that time the European economic crisis had already started causing serious problems – organisations had cut their training budgets which put more pressure on training provision.

Finally, in all five countries, the partners organised short, 1–3 days courses or information sessions. These events were mainly targeted at local energy experts and urban planners, political decision makers and other organisations involved in urban and regional planning. The objective was to bring people together locally, introduce the UP-RES training approach, raise interest in and market the long training programs. The short courses also attracted trainees to participate in the long courses to come later. The interest in the topic was also raised during short course delivery. In the UK, for instance, 20 short courses in total were organized. The rise in awareness was noticed while running the courses as in the first 10 events there were an average of 5 delegates, whereas in the final 10 events there were an average of 14,4 delegates per course event.

During the courses, the links prevailing between urban and energy planning were introduced. The short courses were organised in United Kingdom, Finland, Germany, Hungary, and Spain, the latter in which furthermore different information sessions were organised. In total 36 short courses were carried out, together with six information sessions, in Hungary, UK, Finland, Spain and Germany. In UK and Finland the short courses had extensive regional coverage (figure 2).



Figure 2: Locations of short courses and information sessions in five countries (Source of maps: <http://europa.eu/abc/maps/>)

During the short courses it was realised that there is great interest on the topic in all partner countries – professionals need information, tools and other experts to plan energy-efficient cities. The short courses managed to bring people together from different professional backgrounds and promote interaction and sharing knowledge with each other. After the short courses the awareness of the importance of co-operation and co-planning started to rise.

There were some national characteristics in the lessons learnt. For instance in UK district heating basic awareness has increased, but knowledge of where to apply the technology successfully and how to proceed in the context of current

planning, regulatory and procurement framework is lacking. In Finland, on the other hand, DH is already at a mature stage, but the trainees needed more information on DHC, wind, solar and RES, and the renewable fuels for transportation. In Hungary the mutual interrelations of energy supply, environmental impact and urban climate raised the interest of the trainees. In Germany, the short courses seemed to be more attractive than the long course. In Spain, the main interest of the participants was on DHC and legislative and contractual issues to their implementation from the viewpoint of the municipalities. Especially practitioners experience and local case studies were required.

3.3.2 Long Training Programs

Design of long-term programs was done in parallel with running the short courses. The design was carried out at different levels: partners discussed together the most relevant contents and the objectives the training should cover. The national steering groups' suggestions were utilised. Thirdly, the training needs analysis provided national context to be taken into account. Finally, the discussions with the short course participants and their direct suggestions gave partners valuable information on training design.

Very early in the project it was recognised that, as the project deals with a completely new competence area, ideas should not be too fixed regarding what the training should cover. It was also understood that for the best results the courses should be interactive so that students would learn from real cases, utilise each other's experience and knowledge, and have the best available experts teaching them.

The UP-RES project focused on creating university level programs for urban and regional planners. As the universities are autonomous institutions there is variety in terms of degrees, courses and their outcomes. The Bologna agreement has unified and promoted transparency in the degree-based university level education within Europe. The European Credit Transfer System – ECTS⁴ has been determined as a tool for more transparent programs and degrees. Unifying course and learning outcome descriptions enables comparison, accumulation and transfer of credits, and European universities have been highly committed to adopt the ECTS system. However, for the university level continuing education and continuing professional development (CPD) education there is much more variety in the way CPD programs are described even though many CPD institutions have applied the ECTS system. The UP-RES project partners have described their own long pilot training programs using the ECTS system. This provides a common reference point for comparison.

In the following chapters the objectives and contents of the training courses as well as training methodologies are described.

3.3.3 Objectives of Training

The training objectives were set as follows. After the course trainees would be able to:

- Understand the relation of energy solutions and urban planning and their impact on emissions and costs;
- Make proposals on and assess energy solutions during the planning process; and,
- Make basic calculations on energy consumption and emissions to support decision making.

3.3.4 Modular Concept

As all partners were experienced in organising training, and as most had already used modular structures to design training, modules were chosen to be the structure for the training contents and objectives. In each module there were more detailed learning contents, but having a modular structure helped form the learning path for the courses. It also enabled the courses to be marketed.

Modules were commonly designed by the partners, and the content was selected in order to provide trainees with a general perspective to RES integrated urban planning and at the same time give enough practical understanding. The ten modules that were developed and their main approach is described below in Table 2.

Table 2: Energy in urban and regional planning training modules

M1	<p>SUSTAINABILITY CONCEPTS IN REGIONAL AND URBAN PLANNING: A HOLISTIC VISION</p> <p>The share of urbanisation is expected to rise to 70% by year 2050 from the current level of about 50%. Use of fossil fuels to cover the growing energy needs is still growing. Countries have set targets to reduce primary energy consumption and to increase the share of RES. Urban planning has a key role in achieving this.</p>
M2	<p>ENERGY. FORMS – TRANSFORMATION – MARKET OUTLOOK</p> <p>Energy is available in various forms such as fuels, electricity, heat, cooling, mechanical energy. Some energies are “good” due to low emissions and low primary energy factor but some others are “bad” for opposite reasons. This module covers how to assess various types of energy and how to convert from one to another. Calculation examples are given as well as simple tools are offered for public use.</p>

M3	<p>ENERGY DEMAND REDUCTION STRATEGIES: POTENTIAL IN URBAN PLANNING Strategies for reduction of energy consumption are presented from various cases, such as Freiburg and Porvoo. In both cities, urban planning including energy and emission issues has provided sustainable results in terms of reduced primary energy consumption, reduced emissions and even an improved overall economy.</p>
M4	<p>ENERGY DEMAND REDUCTION STRATEGIES: POTENTIAL IN NEW BUILDINGS AND REFURBISHMENT Building as the major consumer of heating, cooling and electricity is a vital point to focus on. Construction of new EE buildings is often less challenging than retrofitting existing ones, but the latter is dominant while influencing the energy consumption at the building level. What is the meaning of ‘zero-energy building’ and how can they be built, and how can existing buildings be refurbished to become as efficient as possible?</p>
M5	<p>ENERGY RESOURCES AND RENEWABLE ENERGY TECHNOLOGIES Solar panels (electricity) and collectors (heat) require solar radiation to function. Heat pumps can convert waste heat to useful energy (heating, cooling), biomass can be used to produce heat and power. The main applications are presented to give an idea of the opportunities offered and requirements set to urban planning.</p>
M6	<p>ENERGY DISTRIBUTION: DISTRICT HEATING AND COOLING DHC as a means to distribute heating and cooling and CHP and heat pumps to produce such products at high efficiency are presented here. Thanks to CHP and DH substantial savings in primary energy consumption can be achieved. An existing DHC network is a precondition for successful application of CHP, and that is the most efficient way to produce electricity and heat – efficiency can be as high as 95%. The DHC system, in order to be economically viable, requires compact urban structures.</p>
M7	<p>THE RIGHT SCALE FOR EVERY ENERGY CONCEPT: HEAT AND COOL DENSITY (DEMAND SIDE), POTENTIAL ON SUPPLY SIDE Some types of energy are variable, whereas some are steady. Some energy conversions require large scale to be economic, whereas some others can be economic even at the small scale. In urban planning, one has to be aware of the main features of the types of energy in order to improve sustainability of communities.</p>
M8	<p>NEW MANAGEMENT CONCEPTS IN THE ENERGY MARKET In order for RES concepts to materialise, certain financing/organising methods exist such as delivery and performance contracting, for instance. For the dissemination of RES and EE information, energy agencies have been established.</p>
M9	<p>ENERGY PLANNING Energy planning starts from the demand analysis and forecast. Various concepts can be considered to meet the demand at lowest cost, primary energy consumption and emissions. Urban structure, however, will determine the case with which concepts can be adopted.</p>
M10	<p>NEW TRANSPORT MODELS AND URBAN AND INTERURBAN MOBILITY Transportation covers about a quarter (27% in 2010) of primary energy consumption. Ways to reduce the transportation need through urban regional planning, comparison of various transportation media in terms of energy consumption and emissions, availability and future of renewable fuels for transportation have been discussed. Many cities such as Freiburg, Germany, have already been successful in developing public transportation and biking in a sustainable way.</p>

3.4 Marketing of Training

Marketing of the new type of cross-professional training, despite the general recognition of its need, presented challenges. This was mainly due to the novelty of the subject area, low training budget of public authorities to allocate funds for such long training at short (2-3 months) notice, and the European financial crisis. This hampered the training course marketing in Spain and Hungary, imposed limitations on human resources for taking up the long course due to the existing lean organisation of urban planning in Finland, and even to the short courses in UK, where many local authority personnel lost their jobs. Therefore, financial support from IEE was of vital importance for piloting the training in the five countries.

Marketing was targeted mainly at regional councils, city planning offices, consulting and construction companies and other public bodies involved with land use and energy planning. Letters, newspaper articles, posters, emails and individual phone calls were used in marketing and attracting participants to the course. Short courses were used in Germany, Hungary and Finland to attract participants to the long course, and information sessions were delivered in Spain. In Finland, for instance, about half of the long course trainees had earlier in Spring 2011 participated in the short course.

3.5 Long Course Training Delivery

3.5.1 Country Specific Training Delivery

Based on the differences between the countries in terms of urban planning practices and the technological needs, different approaches were taken in the five countries as well, including the following:

- In Finland, there was the 9 month program to urban and regional planners. The program consisted of 8 modules each of two days duration from fall 2011 to summer 2012. The 25 trained planners now work to adjust their plans to adopt new features that favour RES and EE. The trainees were from various different parts of the country. The training of 20 ECTS credits was organised by Aalto University in Helsinki metropolitan area.
- In Hungary, the long pilot course was organised as a normal university course by the University of Debrecen. The course lasted one academic year, the extent was as much as 60 ECTS with 16 participating students.

- In Germany, the one year lasting long course is underway in 2013 targeted at both urban and energy planners. The benefit of educating both professions together is expected to create mutual understanding in the way of thinking, terms and objectives, and working. All the training takes place in Frankfurt.
- In Spain, the long course was also of 9 months duration from fall 2011 to spring 2012 with 34 trainees, representing both public and private practitioners of urban planning. The course afternoon sessions lasting 3 hours, were delivered twice a week summing up a total of 150 face-to-face hours and additional home and project work. The course was delivered at the Chamber of Architects of Catalonia in Barcelona.
- In the United Kingdom, there were no such long courses, although discussions have been held with two universities who have already used some of the material for their masters courses.
- In the UK, 20 short courses were delivered, initially of duration three days, and then reducing to two days, each were organised in different cities across the country. To each course, planners, developers, energy and environmental experts, consulting engineers were invited to learn the main features of climate change oriented urban planning. Based on the outcome, the attending stakeholders were asked to select a real planning case in their city to which RE and EE could be incorporated.

In the five countries above, the pilot training with short and long courses covered about 800 experts, which can be considered a good start towards co-planning of energy and urban structures in the future.

3.5.2 Training Methods in the Long Training Programs

The teaching and learning methods in the programs were selected to ensure high quality learning for students. First, all partners recruited the best available experts to teach in the courses – these came not only from the universities, but also from research institutions, associations, municipalities, and companies. Having experts from different organisations brought a variety of viewpoints that enriched learning. Second, learning was facilitated with discussions and problem solving cases; in Finland and Spain there was always a nominated facilitator for each module and training day. His/her role was to raise questions, facilitate learning assignments, and to stimulate discussion. These facilitators had different professional backgrounds. Third, site visits and case studies were used to bring practical knowledge to the training. Fourth, students carried out several assignments that helped them to apply the knowledge. In addition to the above, some other training methods were used including lectures, discussions, distance learning, movies (as an introduction to the topic) and a project clinic exercise to help trainees carry out their project work, illustrated in figures 3 and 4 to follow.



Figures 3 and 4. Students and experts (photo below, right) discussing district heating and cooling network proposals for Barcelona elaborated in group work (Photo: C.Peters, SaAS).

In Table 3 below there is an example of the contents of a training module. It is a combination of delivered lectures, team work, and a site visit.

Table 3: Example of a two-day training module.

M5 ENERGY RESOURCES AND RENEWABLE ENERGY TECNOLOGIES	
Fasilitator: N.N.	
Time	<u>1st Day: Familiarization with RES</u>
9.00-9.15	Introduction to Module Topics
9.15-10.30	Presentation of RES technologies and applications
10.30-10.45	<i>Break</i>
10.45-12.00	Based on the presentation ,five groups of trainees search for information from Internet. One group specifically for solar electric, solar heat, wind, biomass and the fifth group for waste to energy.
12.00-12.45	<i>Break</i>
12.45-14.00	Five groups continue
14.00-14.15	<i>Break</i>
14.15-145.30	Presentation of the results of five group works
15.30-16.00	Conclusion
	<u>2nd Day: Rural Energy Supply</u>
9.00-10.30	Local economy: impacts of RES on rural economy and survival
10.30-10.45	<i>Break</i>
10.45-12.00	Off-grid village based on RES (Kempele, Finland)
12.00-12.45	<i>Break</i>
12.45-14.00	Agricultural waste to liquid fuel
14.00-14.15	<i>Break</i>
14.15-16.15	Excursion to a bio mass fuelled CHP plant

The figure 5 illustrates the trainees visiting the biomass fuelled CHP plant in Kerava, the last item of the 2nd day in Table 3.



Figure 5: Excursion of the urban planners to biomass fuelled CHP plant in Kerava, Finland (Photo: A. Nuorkivi, Aalto PRO).

3.6 Success Cases Experienced in Training

3.6.1 Project Work of Trainees in Finland

Urban structures are planned at several hierarchical levels such as, for instance, city, suburban, block and building level. At the city and suburban levels, selections are made which determine whether DHC will be an economic solution or not. At the block level, the economy of DHC and RES can be substantially improved by optimal location and orientation of the buildings. Finally, at the building and apartment levels, planning influences EE and applicability of solar sources.

As a part of the long course in Finland, the 25 trainees prepared a project study report in five teams each having about five members. Each team had an expert to tutor and guide the particular project case. The project case reports were collated into a publication. The publication comprises 159 pages in Finnish but with the executive summary in English.

The titles of the project work cases were:

1. Influencing energy and climate through urban and regional planning
2. Energy modes and efficiency for the different levels of urban planning, case Espoo
3. Metamorphosis of Talma district from the rural village to an energy efficiency city
4. Improving energy efficiency at suburban and building block level
5. Energy solutions for different types of areas

As part of the project case, a special project case clinic working method was devised to support the team in their learning. Five top experts in RES and urban planning participated in the clinic as facilitators. Each expert had a 30 minute round table discussion with each group around their own expertise topic with respect to project groups' case topics. The objective was to offer different viewpoints and consultation to the project cases. The day before the actual project clinic exercise, the project group participants had prepared questions for each expert. The prepared questions and given answers should help the group to progress with their project case.

All experts (E1 ...E5) had a different profile:

- E1: District heating and cooling
- E2: District heating and cooling and energy business management
- E3: Decision making processes in municipalities, management, urban planning
- E4: Energy systems and economics, research activities
- E5: Urban and regional planning, planning as expertise

As said, each group spent half an hour discussing the issues related to their own project work. At the end of the day, all participants had discussed with each top expert about the opportunities and barriers of integral RES and urban planning and implementation. They also made a summary of the discussions for their own use.

Based on the Finnish experience, recommendations were made for running a project clinic exercise:

- Select experts that have different profiles from each other: this enables rich communication and different approaches to the discussed topic;
- The size of clinic group discussing with the expert should not be too big, not too small either: optimal size is about 5 – 6 persons. This allows active participation for everyone;
- Make sure all participants prepare themselves for the clinic activity: specify the role of expert and expectations of him/her; allow students/clinic participants to prepare questions beforehand; communicate the objective of the exercise; and,
- Have someone facilitating the clinic activity: communicating the purpose and objectives, time management, group rotation, summarising outcomes.

Results of the project work case:

The project work clarified how RES and EE can be incorporated in urban planning at the various hierarchy levels of planning. Moreover, the project work provided new options of adopting RES and EE as well as measuring tools for six real planning cases in Finland, namely in the cities and towns (marked in the map) of

- Espoo in the district of Niipperinniitty,
- Sipoo in the district of Talma,
- Jyväskylä in the district of Kangas,
- Oulu in the district of Hiukkavaara,
- Mikkelä in the district of Riutta and
- Kuopio in the district of Julkula.

In such a way, UP-RES has had impact on real planning cases, and the trainees have been able to use their new abilities in the real working environment. Thus, the adopted training has resulted in practical outcomes.

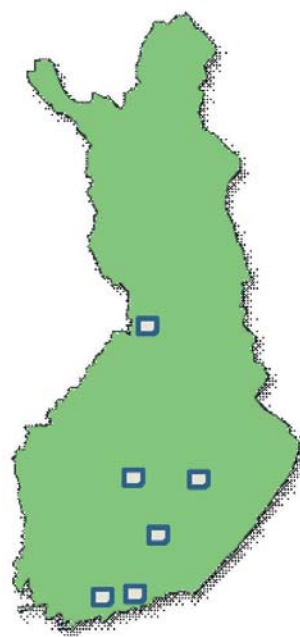


Figure 6:
Location of the six project cases on the map.

3.6.2 Advanced Planning Cases in Catalonia, Spain

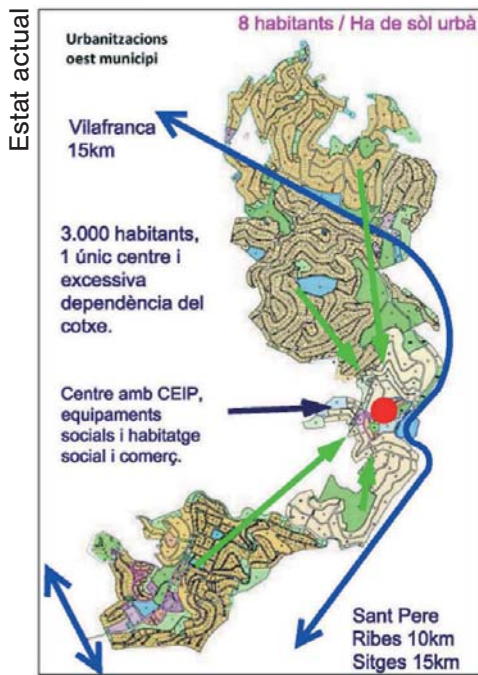
In Spain, four major project works were delivered in groups of three participants, focussing on the issues of energy renovation of buildings, sustainable urban planning and DHC. The fourth and final group-work was found to be particularly useful, as the participants themselves were asked to come up with real cases from their working environment. Compulsorily, the groups were to be established with at least one participant from public administration, and the aim was to improve an existing urban plan to implement district energy networks, small scale networks, or to focus on whatever seems to save most energy in the municipality. The results were highly satisfactory and interesting. Ambitious works were presented, where the acquired competences and aptitudes got obvious. In all cases, a detailed analysis of the existing urban fabric, the socio-economic context and the availability of RES was done. A part from some “conventional” DHC networks dimensioned and traced, the following examples can be remarked:



Example 1.

In the municipality of Sabadell, the participants belonging to the Municipal Social Housing Development Agency, focussed on the improvement of an urban development plan actually under review. The original plan was elaborated with their own participation years ago, so they had deep knowledge of the site and its specific requirements. The ideas and competences developed in the long course brought them to raise issues and concerns that were not at all a point of discussion previously. Their proposal of a review of the actual urban development plan modifies the foreseen road hierarchy and tracing, building uses and height, questions the privacy of the subsoil in view of the need of common infrastructure, and includes centralised low enthalpy heat production and distribution.

The feedback received from their Director who appointed the two senior experts to the long term course: “Before the long term course, I had to pull my staff towards ambitious goals and ideas, now they caught me up and even overtake!” Currently, the entity is looking for financing mechanisms to implement deep renovation pilot activities to promote energy efficient refurbishment in their neighbourhoods.



Example 2.

The energy diagnosis elaborated for the very low density municipality of Olivella, South of Barcelona, led the urban planning team to identify the private mobility to be the main issue to tackle, as no centralised thermal energy distribution would be feasible and incentives for improving the decentralised systems are already existing. Apart from energy efficiency improvement proposals especially for public lighting, the project team made an exhaustive analysis of the daily and weekly mobility scheme of the inhabitants and designed an economically attractive public transport system based on electric micro-busses and a fixed tariff scheme. The main objective is to avoid CO₂ emissions by reducing the private fossil fuel driven car park without diminishing tax income for the municipality, offering high mobility standards to the inhabitants.



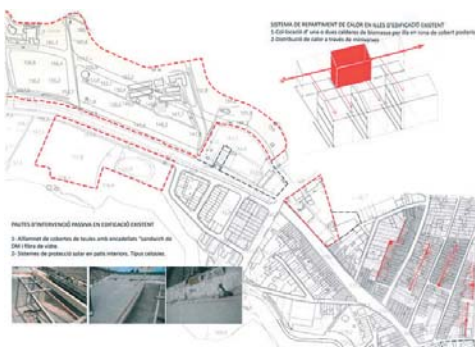
Example 3.

One project team focussed on centralised biomass fired CHP and DH in compact villages of Central Catalonia. The working group established links to half a dozen neighboured villages and analysed their heat demand but also the offer of biomass raw products within their own scope, coming from forest or agricultural exploitation of the more than 12000 ha belonging to the analysed cluster of villages. The results are a convincing plan they presented already during the long term course to the main stakeholders within the area and the project of a service company enhancing the management of the entire value chain, from raw materials up to the delivery of heat.



Example 4.

For Arenys de Munt, a coastal town North of Barcelona with 8500 inhabitants, two different types of district energy supply were proposed, one meeting the demand for a new urban development including several public buildings and a sports centre, the other consisting of a number of small scale networks in the existing urban fabric. Dimensioning is done and urban plots for implementing the production plants are reserved. The biomass supply is foreseen to be met through the neighbouring forest area Montnegre-Corredor.





Example 5.

For the small scale city of El Vendrell, with 38 000 inhabitants, that already started different actions to improve sustainability aspects within the municipality, three main interventions were proposed: To increase density, agricultural land foreseen for new urban developments is equalised to be maintained (A), several neighbourhood district energy networks are dimensioned, mainly in residential areas as more than half of space heating is actually delivered by mobile electric heaters and 75% of the dwellings are cooled (B), and a mobility plan is proposed for the dense historic city centre (C).

3.7 Evaluation

In general, the feedback of both the short and long pilot courses has been highly satisfactory, typically 4 out of 5 (highest).

Short course evaluation

The short courses were originally devised for the UK. This was as a result of advice that this approach would be better suited than a full Masters course, to the existing level of knowledge of planners in the UK. However, partners from the other project partner countries also realised that they could beneficially use the short course material as an introduction to and/or promotion for their long courses.

The short courses carried out in the UK received very favourable feedback from delegates. This feedback was received on returned comment sheets, and several of the comments were subsequently used as testimonial quotes for advertising further courses.

In two cases delegates attending one of the courses, but at a different local authority to their own, subsequently requested (and received) a training course to be delivered at their own local authority.

One concern that was noted in the early courses was that it had become very difficult for local authority personnel to have even three days out of the office. This was echoed in the other project partner countries. As a result of this feedback, and consulting with experts, the UK course material was re-examined and streamlined into a two day course with slightly longer days. A similar outcome arose in the other countries, who adapted the short course concept, and content to suit their own circumstances.

Long course evaluation

The courses followed a similar modular structure in all countries. In addition to the structure, there was similarity in terms of content even though national needs were carefully considered in training design. The Hungarian training was most extensive, 60 ECTS⁵, while the others were close to 20 ECTS.

The feedback was collected mainly with questionnaires after each module. In addition to the trainee feedback, also other evaluation information sources were used such as National Steering Groups (Spain and Finland) and training manager observations (Finland). The feedback collected during the training helped training organisers realise whether training is going in the desired direction and, if needed, make changes to the content and training methodology. It is recommended that there be several systematic methods to evaluate courses, during the course delivery as well as after the program has been completed. It is good to have flexibility in the training structure both in terms of content and learning methods. Flexibility makes it easier to make necessary improvements based on the participant feedback and trainer observations.

Based on the feedback results, the trainees were highly engaged in the training and satisfied with the contents and delivery methods. The original perception the UP-RES partners had on the need for this type of training program was proved and justified during the pilot training. Unfortunately, the European economic crisis imposed obstacles on the training implementation: the number of trainees was lower than expected, and the pricing of the programs became challenging. The crisis will probably challenge continuation of these programs in the near future as well.

The summarised recommendations will hopefully help others to learn from UP-RES experiences and know which aspects to consider when designing their own programs. The recommendations for the training delivery can be summarised as follows:

- Avoid heavy information sharing – promote discussions, different viewpoints, learning together, practicality. Make sure there are persons to facilitate learning.
- Ensure availability of training material prior to the training sessions and after the training. High quality material can be used as a “handbook” and reference material once training is complete.
- Encourage trainees to create an “alumni” network, facilitate communication with e-learning platform, if possible.

⁵ ECTS, European Credit Transfer and Accumulation System enables transparency of teaching and learning in higher education. It is a system to describe learning outcomes and related workload as credits. For further information: http://ec.europa.eu/education/lifelong-learning-policy/ects_en.htm

- Use actual cases whenever possible including projects described by the trainees themselves, focusing on their own municipalities or job context.
- Encourage trainees from different backgrounds to participate in the training: urban and regional planners, energy and infrastructure experts, geographers, and also politicians and non-technical decision-makers.
- Encourage trainees to give feedback during the training. Keep the training structure flexible to allow changes during delivery.

The course contents were selected based on discussions within the partnership and also on the national needs and results of the training needs analysis. Therefore, there was a national “taste” in the pilot training even though common elements were also included. Future training courses should respect local needs, thus recommendations on the contents can be questioned. Nevertheless, some suggestions can be given:

- Provide trainees with a general picture or an overview to the issue of urban planning and energy.
- Have a storyline in the training but keep it flexible.
- Have sufficient emphasis on urban refurbishment/revitalisation as urban development will focus on already existing, not new, urban areas due to the economic crisis.
- Although the implementation of DHC networks and CHP is considered to contain a high potential of energy savings and security in supply and facilitate an easier shift to RES, the weight of this issue should be considered.

The feedback and recommendations above are based on the questionnaire responses, discussions with the training participants, the NSG’s suggestions and the training managers’ observations. These training evaluation methods were the best available during the pilots. However, to measure the impact of the training, other methods should also be used such as interviews with trainees and their colleagues/superiors. It would be interesting to know the trainees’ perceptions of what has changed in their working practice as a result of the training: for example, have they been able to use and share with colleagues the knowledge and competences acquired during the training? Is there more discussion, co-operation and co-planning between different experts and organisations? Have some new needs appeared in terms of energy-efficient urban planning?

3.8 Certification of Training

Background for the certification

In order to have RES and EE publically and officially recognized as a new and essential part of urban planning, certification is needed.

Urban planning broadly varies amongst countries. In Germany, for instance, the requirements and qualification of “urban planner” is specified differently in the federal states (Bundesland), whereas in Hungary such a profession does not officially exist. In Finland, an urban planning professional title can be accredited as voluntary basis for a charge. The title can be given to a person with proven education, competences and experience of urban and regional planning. Therefore, no European level certification of urban planners exists at the moment, but national and university level practices prevail. Due to the differences in the prevailing the status of urban planning between European countries, different certification approaches have been applied.

UP-RES training was:

- Nationally certified with 60 ECTS in Hungary by the Office of Education of the Ministry of Human Resources;
- Included in to the qualification criteria of urban planners of FISE (Qualification of Professionals in Building, HVAC and Real Estate Sector in Finland) in Finland;
- Certified by the Catalan Chamber of Architects in Spain, quality labelled by the International Union of Architects Continuing Professional Development Program;
- Certified by the Chambers of Architects and Urban Planners of six federal states such as Baden-Württemberg, Hessen, Mecklenburg-Vorpommern, Nordrhein-Westfalen, Sachsen, Schleswig-Holstein in Germany; and,
- Certified by the Royal Institute of British Architects under the Continuing Professional Development (CPD) scheme in the UK.

Any of the mentioned approaches may be applicable in the other EU member states.

Finland

In Finland the relevant certification body of professions is FISE – *Organization for Qualification of Professionals in Building, HVAC and Real Estate Sector*. By fall 2012, there are about 300 urban and regional planners certified/qualified by FISE, which is 20 – 30% of the estimated total planner staff of a little more than a thousand planners working in Finland. In other words, urban planner certification is made on a voluntary basis. Therefore, having the UP-RES course included in the qualification criteria of urban planner certification of FISE is a step forward to institutionalising urban planners with RES skills.

The urban planner certification proceeds with FISE as follows:

- An individual submits a certification application to FISE
- The secretary of the Committee responsible for urban planning evaluates the application
- The secretary may request additional information from the applicant
- The secretary concludes evaluation according to the set criteria, which either rejects the application or meets the criteria (one-time UP-RES pilot course is not an adequate criterion for approval but a sequential row of courses is needed)
- The secretary recommends the Committee to approve the application.
- Later on, the Committee transfers the recommended application to the Board of FISE for final approval.
- After approval, a fee of about €400 needs to be paid by the applicant.

Germany

The German Chamber of Architects (BAK) is the union of the 16 State Chambers of Architects in Germany. It represents the interests of about 124 600 members at national and international levels to the politicians and the general public. The membership of BAK comprises:

Architects (operating in building construction):	87%	(108 402)
Landscape architects:	6%	(7 476)
Interior designers:	4%	(4 984)
Urban planners:	3%	(3 738)

For an entry in the list of urban planners of the Federal State Chambers a qualified education and a professional praxis of minimum two or three years is required. The „Leitfaden Berufqualifikation der Stadtplaner/innen“ (Guidelines for Professional Qualification of Urban Planners) of the BAK formulates qualitative and quantitative minimum requirements for the training content of urban planners.

Minimum requirements for university education as the basis for the entry are:

- project work in urban planning and urban design,
- urban planning related content (urban development, urban design, buildings and human settlement),
- theory and history of local and regional spatial and urban development,
- technical basics,
- ecological basics,
- basics of social science and economical basics,
- legal basics, instruments and processes,
- methods and techniques of presentation,
- process design and management.

The professional training requirements of urban planners have their legal basis in the professional tasks, which are mentioned in the laws of the chambers of architects. These professional tasks are

- designing, technical, economical, social and ecological urban and spatial planning, in particular the development of urban development plans,
- coordination, guidance, steering of planning and the implementation of projects, planning and processes,
- consulting, support and representation of the contractor in all matters relating planning and the implementation of projects,
- preparation of expert opinions.

Urban planners' work in different job positions and fields of activity:

- Planning according to the legal requirements (formal planning)
- Informal (local) planning
- Activities during the planning process (management, consulting and urban studies)

These Guidelines for Professional Qualification of Urban Planners do not mention energy issues explicitly.

The permission for an entry in the list of urban planners is based on the above defined qualitative and quantitative minimum requirements. The specific requirements for the advanced vocational training are defined by the federal state chambers of architects.

Hungary

Debrecen University has launched the formal accreditation procedure in 2010. The accreditation document (according to the legal procedure) consisted of the list of disciplines, the number of credits, the name of the responsible professor for each discipline, the aim of the programme, and the preconditions of participation. The capacity of the university regarding qualified teaching staff, laboratories and infrastructure had to be proven, too.

In addition to the Bologna system in Hungary, there is another type of accredited course: “Specialised Engineering in...”, actually “Urban Energy Engineering” – the accreditation of this training has been asked for. It can be joined after having qualified with a BSc diploma or MSc diploma in engineering – the difference appears on the diploma (specialisation after BSc or MSc), see the samples below.

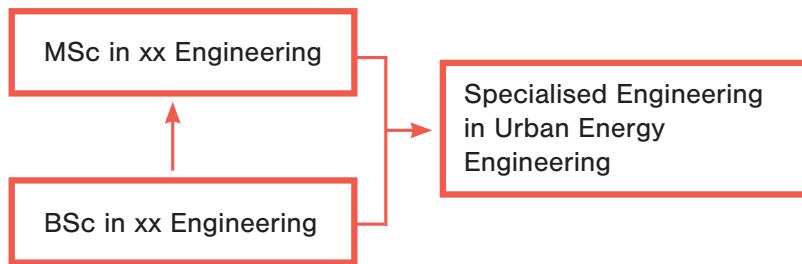


Figure 7: The ways for certification of urban energy engineering in Hungary (university of Debrecen).

The procedure is quite long and bureaucratic: first the senate of the Faculty discusses and approves the application documents, after that the senate of the University does the same. The application of the university is reviewed by the Office of Education of the Ministry of Human Resources as well as the Accreditation Committee of the Hungarian Academy of Sciences. The accreditation for the training is given provided that these authorities accept the need to launch the training in a new subject area, agree with the programme and check that the personnel and infrastructural conditions are adequate.

Since the approval of the ministerial bodies (Hungarian Accreditation Committee and Office of Education) has been received, and the approval to launch the training has been given, it means that the long term training is a normal postgraduate university training with 60 credits and entitled to the postgraduate diploma on “Urban Energy Engineering”.

At the same time the approval of the postgraduate course means that any other Hungarian university has the right to announce this course with the same programme provided they have qualified teaching staff and infrastructure. They have to apply only for the approval of the start (without consulting Debrecen University) since the programme is already approved. Nevertheless, they have to prove that they have adequate teaching personnel available. This means that they can appoint a professor or an associate professor with a scientific degree in each discipline, which is mentioned in the original application, and they have to follow the programme, which is approved in the accreditation document. This is not an easy task, because the number of disciplines a professor may be responsible for is limited. Therefore, there may be a problem if there is a smaller or less qualified teaching staff.



Figure 8: The diploma issued by the university of Debrecen in Hungary.

In the Figure above, there is the certification of the long course, acknowledged by the University of Debrecen.

Spain

In Spain, no professional accreditation or official distinction of urban planners currently exists, but various Universities teach urban planning and deliver corresponding diploma. The Ministry of Finance and Public Administration itself, for example, delivers through its CPD institution long term courses (300 hours in two years) to obtain the diploma of Urban Planner. Most of the urban planners are from an architecture background, and in this sense regional Chambers of Architects that are integrated in the Spanish Council of Chambers of Architects are considered a respected certification institution. Feedback from the National Steering Group of UP-RES and particularly representatives of the Catalan Association of Urban Planners affirmed that at a practitioner level, no certification is required, but CPD diploma and specialised trainings are considered. In this sense, the certification delivered by the Catalan Chamber of Architects can be seen as a high level accreditation.

United Kingdom

The UP-RES short courses delivered in the UK were accredited under the Royal Institute of British Architect (RIBA) Continuing Professional Development (CPD) scheme.

4 Best Practices

4.1 Criteria of Selection

Many cities all over the world have success stories to tell about how urban structures in which both use of RES and EE could exceed the traditional practice. Such stories demonstrate the practicability of how the theories and intentions can materialize in real life, and with measurable benefits. In the UP-RES project we collected about 300 ideas of such success stories from various parts of Europe, some 30 of which were considered as best practice and summarised. These practices were used as cases in the long training programs. The criteria for selecting the best practices were:

- High penetration of RES on the market already as the established practise
- Innovative introduction of RES in the land/building area subject to planning
- District heating and cooling distributing the products of RES
- CHP using RES (biomass)

Out of the 30 best practise cases selected, three cases from different countries are been introduced here.

4.2 Examples of Selected Best Practices

4.2.1 Co-planning in Porvoo – Finland

In the new way, the energy experts and the urban planners already start working together at the master planning stage. The impacts of various plans will be quantified in terms of energy consumption, investment and operation costs as well as emissions, which has not been the tradition in urban planning. The particular plan chosen for implementation, will be the one that offers the lowest lifecycle costs and emissions. In the city of Porvoo in Finland⁶, for instance, the new urban plan that was based on maximising the share of biomass fuelled CHP and DH appeared to be the best choice from the environmental point of view, and moreover, with the overall life-cycle costs much lower than the traditional plan would have caused. In other words, the new combined energy and urban planning was a win-win approach from both the environmental reduced emissions and the economic lowest cost points of view. This was highly appreciated by the local decision makers.

⁶ The Skaftkärr case in the city of Porvoo, Finland: <http://www.skaftkarr.fi/en>

In Porvoo, a new management approach was adopted for the planning of the new urban area, named Skaftkärr. At the initial stage of planning both the urban and energy planners were invited to work together. As the reference plan for their co-planning, the Skaftkärr plan from year 2007 was adopted, but assuming that passive energy houses would be used apart from those assumed in the plan of 2007. The reference plan was a suburban plan traditionally dominated by small houses to be located so that personal cars would need to be used. As heating sources in the reference plan, a combination of district heating, electricity and heat pumps was assumed.

Co-planning started with a few studies about how people live, move and what their expectations are. Co-operation among the urban and energy planners was not that simple in the beginning, but some time was needed for them to learn each others' way of work and thinking. A year was mentioned as a period of time that was needed to harmonise their co-operation.

Finally, the co-planning methodology provided four options to the urban scheme to be applied in Skaftkärr. All four options had primary energy consumption and emissions 30 – 70% lower than the reference plan.

The four options generated by the co-planning were as follows:

Features	Compared to reference plan
<p>Option 1</p> <ul style="list-style-type: none"> • A dense new area that is supported by the existing city structure. • The passive energy buildings are connected to the DH. • Effective public and light transport routes are created to the city centre. 	<ul style="list-style-type: none"> • Primary energy consumption 40% lower • CO₂ emissions 34% lower
<p>Option 2</p> <ul style="list-style-type: none"> • Effective small-house characterised option, where 50% of heat is based on DH and the balance of other 50% on ground water heat pumps. • Effective public and light transport routes are created to the city centre. 	<ul style="list-style-type: none"> • Primary energy consumption 36% lower • CO₂ emissions 31% lower
<p>Option 3</p> <ul style="list-style-type: none"> • A loose land use Option, where heat and power are produced inside the buildings 100% based on RES. • Passive energy houses. • Traffic as in the Reference Plan based on private cars and a little public transport. 	<ul style="list-style-type: none"> • Primary energy consumption 67% lower • CO₂ emissions 48% lower
<p>Option 4</p> <ul style="list-style-type: none"> • Community type land use Option, in which the focus was on reducing the need of transport and by locating working places and services in the area. • Effective public and light transport routes are created to the city centre. • Passive energy houses served 100% by solar heating. The area will supply solar heating to all citizens of Porvoo. 	<ul style="list-style-type: none"> • Primary energy consumption 45% lower • CO₂ emissions 62% lower

The life-cycle costs of the four options in terms of Euro per inhabitant during 30 years to come are presented in the next Figure. In three of four options the life cycle costs were lower than in Option 3. In the latter one, the investment costs of RE as well as the individual heat pumps using the electricity produced in the building itself became extremely high.

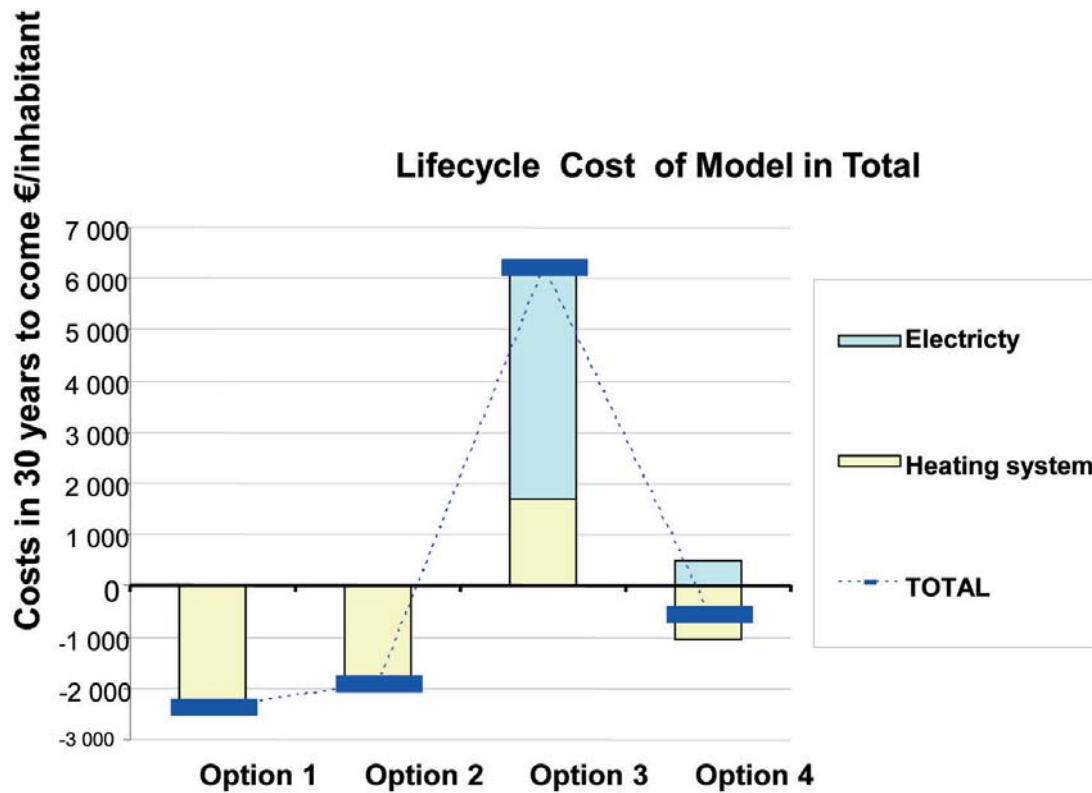


Figure 9: Life-cycle (30 years) costs per inhabitant of four planning options as incremental to the reference plan of year 2007 in Porvoo, Finland.

The final option selected for implementation was based on prioritising light and public transport (biking highway, for instance), using district heating in most buildings and enabling solar heating to be used later on. District heating as the primary source in Porvoo is a special case as 92% of the heat energy in Porvoo is from the co-generation of heat and power (CHP) plant, the fuel of which is 70% from biomass (wood chips).

The city management of Porvoo was happy with the results as well, as the infrastructure costs (streets, pipelines, etc.) were substantially reduced as well. The new co-planning approach in Porvoo was supported and monitored by the Finnish Ministry of Environment and the Finnish Innovation Fund – Sitra. The co-planning approach is currently expanding to other cities in Finland, sooner or later maybe to other cities in Europe as well. Such expansion, how-ever, will need training similar to that used in UP-RES pilot courses and adjusted to local conditions and country specific differences.

4.2.2 RES Expansion and Public Transport in Freiburg – Germany

In Germany the city of Freiburg devoted great efforts to the integration of renewable energies and the improvement of public transportation. Freiburg is situated in the South of Germany near to the French and Swiss borders. Freiburg has 220 000 inhabitants and supplies 130 000 jobs within its borders. The traffic situation is highly influenced by 54 000 in-commuters and 16 000 out-commuters. In 2010 the number of guest nights in Freiburg accumulated to 1,29 million.

In order to satisfy the resulting transportation demand and reduce CO₂ emissions, Freiburg developed a strategy which comprises 63 measurements in the following fields:

1. Municipal development planning: optimising overall layout, avoiding over-shading, and building orientation and roof inclination in order to maximise solar contribution as well as introducing new energy efficiency standards to buildings;
2. Municipal buildings and facilities: pilot energy efficiency projects and solar panels on public roofs, building modernisation to reach passive house standards;
3. Mobility: Extension of public transport network to cover all citizens with not more than 500 m walking distance;
4. Internal organisation and communication: Exhibition on low energy building and refurbishment; and,
5. Supply – disposal: Development of district heating and micro-scale CHP.

Achievements in renewable energy integration are quite impressive as is shown in the figure. The installed capacity of solar energy, biomass, wind and small hydropower plants accrued to 42,8 MW in 2010.

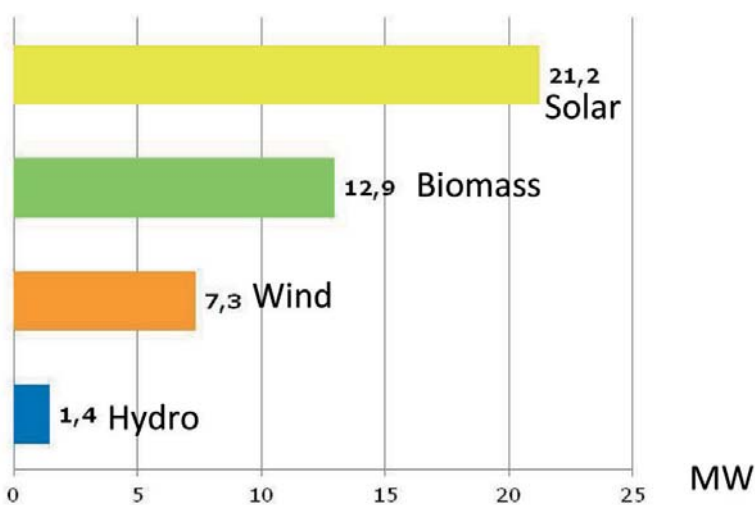


Figure 10: Installed capacity of renewable energy sources in Freiburg by source of generation.

Another approach to avoiding CO₂ emissions is by an expansion of public transport. This leads to a substitution of private transport and therefore to a higher efficiency. Local public transportation in Freiburg comprises trams and buses. There is a 36,4 km railroad network for 83 tram vehicles. The interval between arrival and departure of trains is 7,5 minutes during the day. 70 % of all public transport passengers use tramway services. The remaining 30 % are transported by 73 buses which operate on the 274,3 km long network. The figure shows the existing and future public transport network and marks the area in which inhabitants are living within 500 m walking distance⁷.

Achievements of the public transport (VAG Freiburg) are, for instance:

- In 2010 some 74,4 million passengers travelled in VAG's trams and buses. On average, that meant 200 000 passengers a day who saved the environment from exhaust emissions and traffic noise. This is an astounding number for a city with a population of 220 000.
- The backbone of the network is based on four tram lines providing services every seven and a half minutes. Optimally coordinated with the tram service are 26 bus lines taking passengers from the most important interchange points to surrounding areas
- In a few years to come, thanks to intensive use of public transport and optimised routes, public transport will no longer need subsidies but it will cover its costs by means of the ticket sales revenues only. This is exceptional for public transport companies in German cities.

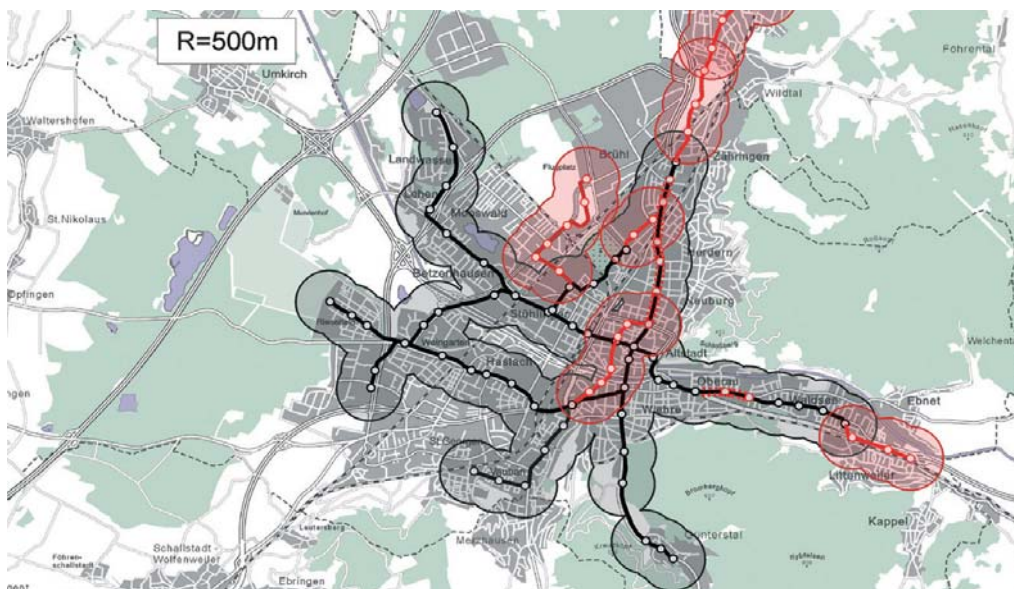


Figure 11: Extension of public transport network (red) to be reachable by the inhabitants living within less than 500m walking radius. (Sources: Innovation Academy e.V., Freiburg and City of Freiburg)

⁷ Innovation Academy e.V., Freiburg and VAG Freiburg

Other CO₂ reduction strategy achievements in mobility:

- In Rieselfeld of Freiburg, thanks to improved public transport, the car density is as low as 28,5 cars/inhabitant compared to the average of 35 in Freiburg.
- The bicycle parking house for some 1000 bikes was built near to the main railway station in 1999. It is in constant use, integrate rail transport with biking.
- Additionally, a city biking system and extensive biking routes reduce the need of private cars. An example is given in Figure 12.



Figure 12: Cars do not have access to the bridge that is dedicated for bikes in the middle and for pedestrians on the sides. (Photo: A. Nuorkivi, Aalto PRO)

4.2.3 District Heating and Cooling in “22@”, Barcelona – Spain

The 22@ DHC network was approved within the Barcelona Plan for energy improvements in 2002, as part of a concept of re-centralizing energy generation introducing energy efficiency and renewable energies along with a better management and control, especially concerning cooling demand. The urban transformation of a former manufacturing industrial area out of use and under heavy degradation in the North-East of the city into a technological innovation area called 22@ and the celebration of the Forum of the Cultures in 2004 gave the impetus to the construction of this DHC network, implemented in the following years and under continuous expansion within the Ildefons Cerdà urban grid of Barcelona, under minimal impact prescriptions.

The distribution network supplies currently over 70 large buildings of all types, from business parks, universities, social housing, health centres or hotels, to shopping malls, catering establishments or office buildings. The particularity is that the main energy supplied is cooling, with a contracted power of over 73 MW of cooling and 51 MW of heat along a network of over 14 km. The 4 parallel tubs network (2 for DH – supply 90°C return 60°C, and 2 for DC – supply 5°C, return 14°C) is under streets or in underground service galleries and works with variable flow (water is pumped from the plant according to demand) and constant volume (closed circuit). The network has a leakage detection system based on the variation

The three innovative efficiency factors of the energy generation plant under the Forum area are:

- Production of all the heat and most of the cooling from the steam generated in the combustion of urban solid waste coming from the nearby treatment plant,
- Use of a cooling system using sea water for the chillers, resulting in high yields without the use of cooling towers,
- Availability of a cold water storage tank of 5 000 m³ of capacity.

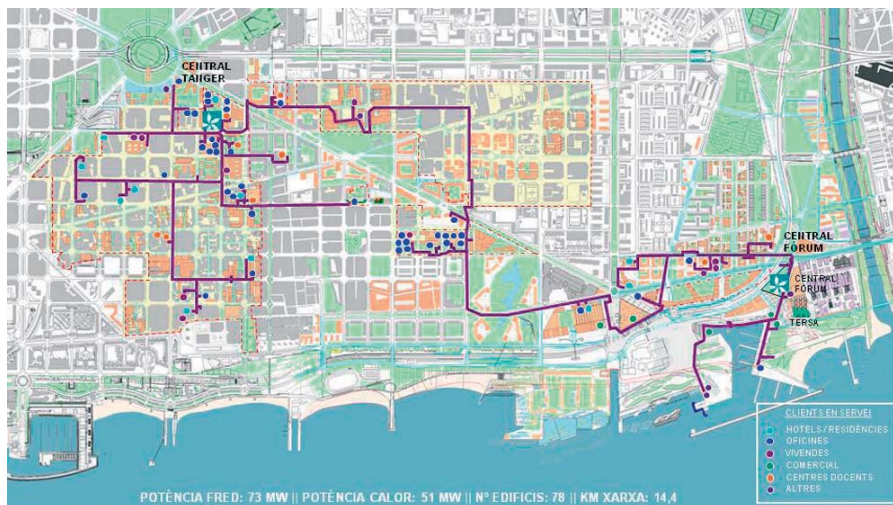


Figure 13: Energy distribution scheme and production plant with absorption chillers in Barcelona. (Source: Districlima, S.A.)

A second pick up and pumping plant, located in the heart of the Media cluster of the innovation district 22@, was inaugurated in 2012 to ensure supply in periods of higher demand and operate if needed in case of any eventuality. This plant counts on an advanced ice storage system with a total capacity of 80 MWh which allows the production of cooling energy during periods of low demand – and lower electric cost – in order to be distributed later on during periods of high demand.

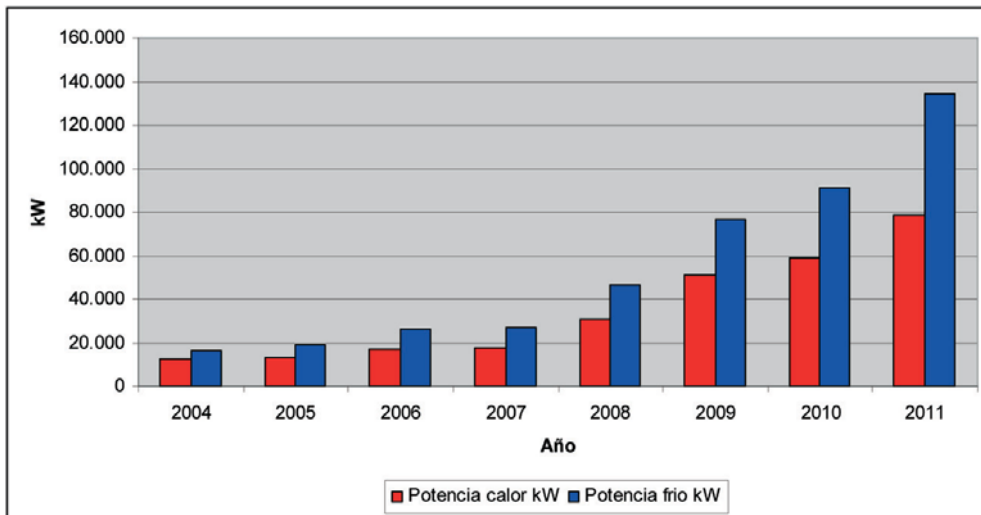


Figure 14: Evolution of installed power

The Districlima project implies a reduction of over 62% in use of fossil fuel and an annual saving of more than 17 000 tons of CO₂ emitted into the atmosphere, compared to decentralized thermal energy production. This numbers are based on the high Cooling Energy Efficiency Ratio of 5,2 achieved by the system in production and distribution, and an outstanding Heating Energy Coefficient of Performance of 11,7 due to the revalorization of waste heat.

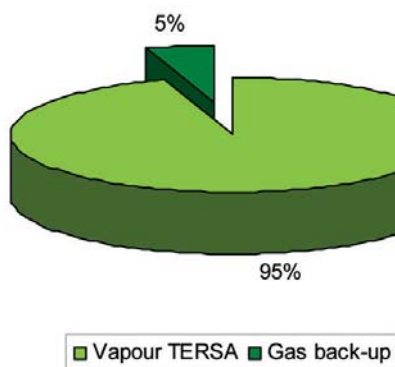


Figure 15: Energy use for heat production 2010
(Source: Districlima, S.A.)

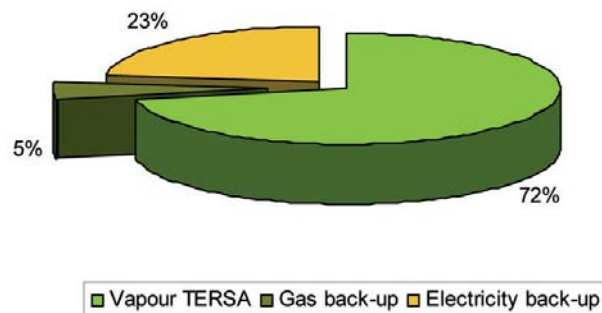


Figure 16: Energy use for cold production

On demand side, the city of Barcelona promoted energy efficient buildings to be then connected to the DHC network. One example is the social housing apartment block designed by Sabaté associates Arquitectura i Sostenibilitat (SaAS), Barcelona, with 95 flats (12 600 m² gross floor area). This building is the first social housing block that achieved an "A" rating according to the Energy Performance in Buildings Directive (3,8 kgCO₂/m²·a) in Barcelona. Its main features are continuous thermal insulation of the building envelope with U-values inferior to 0,3 W/m²·K (more than 50% below legal requirements), wooden windows with reduced thermal transmittance, exterior movable wooden blinds that allow take advantage of solar gains in winter but allow individual shadowing in summer, as well as a ventilated façade avoiding overheating in summer. The main advantages for the developer are the savings due to the absence of a gas installation, the reduction in space required for installations (both in the basement and on the roof), the reduction of noise due to the (lack of) installations and particularly the reduction of maintenance compared to individual heating systems. An energy service company provides the end users with an integral service including contracting, metering, invoicing, maintaining and running of a 24 hours service, and provides Districlima with a single customer and point of contact in the building.



Figure 17: Some 95 apartments connected to district energy in Barcelona Innovation District 22@. (Source: SaAS)

Lessons to learn:

- Use of waste energy (vapor from the incineration plant)
- Refrigeration with nearby sea water
- Professional and highly specialized technical team
- Predictive and proactive maintenance
- Correct demand planning
- DHC network implementation in existing city can be successful if well planned
- Flexible solutions in urban planning to promote private initiative and investment: Previous public investment in infrastructures and investment return through connection rights.

4.2.4 Advanced Energy Efficiency in Buildings in Slough – United Kingdom

The Greenwatt Way Zero Carbon Homes project in Slough comprises a development of ten dwellings (eight houses and two flats). The aim was for the development, which was fully funded by Scottish and Southern Energy (SSE), to achieve the highest level (zero carbon) of the Code for Sustainable Homes.

The buildings were monitored with the specific aim of determining their actual energy performance, and how this related to their intended (zero carbon) performance. Previous experience with such buildings has often been disappointing and the idea here was to find out with a fully monitored scheme. The dwellings would be fully occupied with the exception of one house used for meetings and research work. Hence the results would help to provide information not only about performance but also about customer opinions and requirements.

The development features two main types of construction: masonry block that is traditional in the UK, and timber-frame panels manufactured off-site. The dwellings were designed to incorporate high levels of thermal insulation and air tightness, such that both the level of insulation and the air exchange rate values were well below that stipulated in current building regulations. Windows are triple-glazed and floor and roof U-values are $0.10 \text{ W/M}^2/\text{K}$. Great attention was devoted to achieving this in each of the building elements, one of the most challenging of which was eliminating thermal bridging.



Figure 18: Greenwatt Way development, Slough, UK

The development is equipped with a range of renewable energy technologies, including ground source and air source heat pumps, biomass boiler, and solar thermal panels. Heat is distributed to the dwellings through a pre-insulated twin-pipe mini-district heating system. The dwellings are also equipped with mechanical ventilation heat recovery.

At the heart of the system is a carefully configured 8m³ stratifying thermal store with connections devised to get the best out of the system. This results in much greater system flexibility and higher efficiency of renewable heating plant operation. Instead of running the plant when there is a heat demand, the thermal store enables plant to run when it is most efficient to do so, (eg during the day for the solar thermal, and during the afternoon for the air source heat pump). In particular, the store is the key to obtaining high efficiency performance of the heat pumps, and the system as a whole is a good example of combining a heat network with heat pumps.

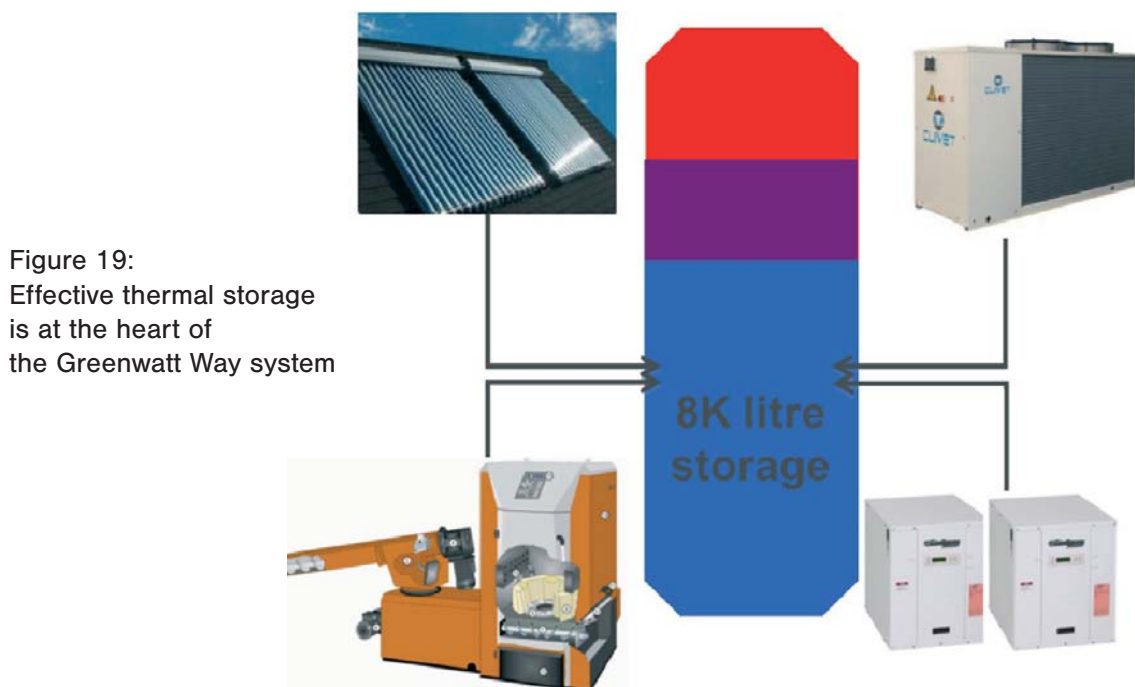


Figure 19:
Effective thermal storage
is at the heart of
the Greenwatt Way system

The heat pumps and the biomass boiler can be individually ‘plugged in’ to the system so that each technology could be individually tested. Each of these also works in tandem with the solar thermal panels. Obtaining optimal performance from a system that integrates more than one renewable energy technology and a thermal store requires a carefully devised control strategy.

The Greenwatt Way heating system is innovative in that it has been devised to operate at a very low supply temperature of 55°C with a return temperature of 25°C to 30°C. In general, operating at low temperatures enables the more efficient and extensive use of renewable and residual heat sources, and to incur smaller heat losses. The scheme as a project has allowed investigations to take place about how best to integrate the different renewable energy technologies. The scheme as actual lived-in dwellings has provided a comfortable living environment for residents.



Figure 20: Inside the plant room at the Greenwatt Way system

4.3 Indicators of Less Successful Practices

Unfortunately, our societies already have structures that support neither RES nor EE development. Below is a list of non-desirable planning outcomes. We have provided the list here as a reminder of high energy consumption and high emission production.

- Suburban communities where the family needs to have more than one car in order to manage day to day routines for work, shopping and hobbies, increasing fuel consumption, and emissions;

- Shopping malls located far from the urban centres, which require personal cars, increasing fuel consumption and emissions;
- Buildings that are located far from each other, far from the street where the DHC network could exist, and are relatively small, which makes the DHC system uneconomic. Thus centralised RES will not be an option anymore;
- Individual heat pumps installed in the potential DHC distribution area with potential CHP energy supply may increase the primary energy consumption, not reduce as desired;
- Buildings casting shadows on other buildings, preventing solar power and heating to be applied to the overshadowed buildings
- Biomass combustion in individual buildings happens at low efficiency, probably only at 20–30% efficiency, may be the main reason for particle emissions in a neighbourhood, and has much higher primary energy consumption and emissions than centralised combustion at an efficiency of 80% and above;
- Electric heating usually has a much higher primary energy factor than the heating modes based on fuel or DHC with CHP. Electric heating, however, may be supported by the planner without purpose by neglecting water circulation in radiators and floors of the buildings;
- Buildings with north-south direction may not get as much solar energy as the ones with east-west direction;
- Individual cooling systems in buildings often have primary energy factor and specific emissions higher than centralised cooling systems have. The centralised systems (district cooling) may use waste heat to drive absorption chillers and the cold sea/river/lake water to provide free cooling with low emissions.

5 Guidelines and Policies Requiring RES

European Union

The urban planner, wherever working, is bound to obey the prevailing guidelines, laws, regulations and policies set for his/her work. In Europe, the planning processes belong to various authorities, as well as the supra national (European), the national and the regional planning level. Thereby, each planning level has its own task and competence, which can be seen as a top-down approach.

European Planning: The European planning level, especially EUREK, sets the general framework, the parameters of the agenda and takes care of coordination of the different administration divisions, which belong to regional and urban planning. The legal status of EUREK is advisory rather than obligatory.

Table 4: Requirements of RES inclusion in urban and regional planning on the European level.

European level Directive/law/ act(regulation)/...	Where to find	Contents
Directive 2009/28/EC (EE RL = Renewable Energy Directive)	Article 13, (3)	<ul style="list-style-type: none"> • Directive on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC • Member States shall recommend to all actors, in particular local and regional administrative bodies, to ensure that equipment and systems for the use of electricity, heating and cooling from renewable energy sources and for district heating and cooling are installed when planning, designing, building and renovating industrial or residential areas • Member States shall, in particular, encourage local and regional administrative bodies to include heating and cooling from renewable energy sources in the planning of city infrastructure, where appropriate
EU-Initiative JESSICA		<ul style="list-style-type: none"> • Innovative financial instrument in integrated urban development • Possibility for recipients of EFRE-subsidies in the funding period 2007–2013 to contribute structural funds into revolving urban development funds, also with the involvement of private investors

Finland

In Finland, there are three regulations that stipulate the land use and urban planning, named from the latest to oldest, as follows:

- Strategic control of land use, Ministry of Environment, 2010
- Competitiveness, welfare and eco-efficiency - Perspectives for spatial structure and land use in Finland, Ministry of Environment, 2006
- Land Use and Building Act (132/1999, amendment 222/2003 included)

The newer the regulation, the more energy and emissions are included in the requirements for urban and regional planning. Energy and emissions issues are included, but the specific types of RES are not explicitly mentioned, except for biomass and wind mentioned in the 2010 regulation.

Germany

National (Federal) Planning: In Germany, the National planning has been amended in 2008 into a law (ROG) which implements the established targets and principles of the federal planning, but it also authorises the states to differ in specific topics. Furthermore, the German planning reinforces climate change, energy planning, and the European agenda (see above).

Regional Planning: In Germany, each state is responsible for implementing the federal framework in to binding laws and plans. In Bavaria for example, there are 18 regional planning authorities which specify the Bavarian state plan (LEP) and convert them into obligatory administration.

Local (urban) Planning: The Federal laws (BauGB) allow the municipalities to create their own local plans, in order to govern, guide and organise urban planning. The most important legal tool is the land use plan (*Ger.*: Bauleitplanung, Flächennutzungsplan), which concretises the sectoral planning, e.g. housing, traffic, or energy, and makes it mandatory.

Hungary

In Hungary the general concepts of urban design are included in ministerial regulation. The municipalities are (or were) free to develop their local plans. In the near future this task may be shared between local authorities and the newly organised county state offices.

No guidelines are available which would include urban planning and RES.

Spain

There are two sets of guidelines providing instructions for urban planning in Spain.

First, ICAEN (Institut Català d’Energia) has issued the Basic guide of DH and DC in October 2010⁸. The guide contains a historical review of the technology, types and characteristics of DHC networks, energy sources, benefits of DHC, energy efficiency of DHC, planning process for DHC implementation as well as obstacles to and solutions for DHC development. Moreover, the guide presents eight best practice case studies of DHC.

The objective of the guide is to encourage, promote and disseminate DHC technology, and to provide advice to potential developers about type of facilities, based on a methodology that establishes the criteria to consider when planning DHC networks.

Second, both the Ministry of industry, tourism and commerce and IDAE (Institute for energy diversity and savings) IDAE have published another guide titled “Energy efficient urban planning guide⁹” in year 2007.

The main objective of the second guide is to propose measures and criteria for urban planners to drive the construction sector towards high energy efficiency and to improve sustainability. The guide contains useful reference material on sustainability, land management process, energy efficiency in the urban planning process, and recommendations for sustainable urban planning.

United Kingdom

During the delivery of the courses in the UK over a period of about 18 months, the planning policies changed in the U.K. Therefore, the presentations had been updated as well. This was done on two occasions. Additionally, a bespoke version was produced for Glasgow course, because Scotland has its own planning policies. A similar adaptation was carried out for courses in Wales, which also has its own distinct planning policies. One of the early courses was in Swansea, and a further request arose from Bridgend as one of the very last of the courses, where the updated bespoke version was produced for Bridgend as Wales has its own planning policies that had changed since the earlier Welsh event in Swansea.

⁸ Guia bàsica de xarxes de districte de calor i fred, 79 pages

⁹ Guía del planeamiento urbanístico energéticamente eficiente, 95 pages

6 Parallel Projects in EU

Kiito

The EcoHeat4Cities project was initiated by DHC+, the District Heating Cooling Research Platform administered by Euroheat&Power, and is supported by the IEE as well as UP-RES. The aim of the project is to support the implementation of the new Renewable Energy Sources Directive (RES Directive). The directive promotes the use of renewable energy sources, including biomass, hydro, wind and solar power) while also reducing (primary) energy consumption. In particular, it focuses on the need to expand and strengthen existing infrastructures that make the integration of renewable energies possible, and to remove non-technological barriers to their implementation.

Ecoheat4cities addresses the non-technological barriers through promoting municipal and public acceptance of district heating and cooling systems by establishing a voluntary green energy (heating and cooling) labelling scheme. The scheme aims to encourage local politicians, citizens and potential investors to make renewable energy and energy efficiency based choices, by providing them with the information they need. Labels are crucial drivers for market transformation, orienting consumers' choices towards more energy efficient appliances and thus realizing the potential of available technologies. More information is available on the project website www.ecoheat4cities.eu

A presentation of the UP-RES project was given at the EcoHeat4Cities project meeting in November 29, 2011 in Brussels.

ENEF

Central Baltic Co-operation in Energy Efficiency and Feasibility of Urban Planning (ENEF) is part of the Central Baltic Interreg IV A Program 2007–2013.

The ENEF project aims to identify measures that would improve EE of new buildings and especially of those to be retrofitted. Such measures should be feasible to implement. The urban dimension covers housing, commercial and mixed areas, individual buildings in urban context as well as urban renewal, renovation and upgrading of neighbourhoods.

The ENEF partner countries are Estonia, Latvia, Sweden and Finland.

The ENEF project has used UP-RES materials and the Finnish UP-RES project personnel to develop materials. UP-RES project representatives have participated in the project meetings in Tallinn and Riga at ENEF project costs.

ENERGYCITY

In Debrecen there was a common workshop with the ENERGYCITY project and the proceedings consist of mainly the papers from UPRES and ENERGYCITY. ENERGYCITY encompasses first of all the renewable potential of settlements, using GIS methods, airborne photography with high resolution cameras in visible and infrared intervals; the special aircraft of a consortium member have made flights over some consortium member cities proving that the method is usable and providing practical data on the cities investigated (e.g. Southwest and Northeast districts of Budapest).

PATRES – Public Administration Training and Coaching on Renewable Energy Systems

The IEE – PATRES project's main objective is to support local authorities, suppliers, utilities and social housing blocks administrators to implement obligations and policies for achieving minimum legal contribution regarding the use of renewable energy sources and regulations for new construction or rehabilitation or construction of infrastructure procurement standards, to increase the use of RES in the member states. Therefore, a training program was set up in each of the seven countries involved in the project and a set of best practices was selected based on analysis of previous projects that were funded by the European Commission, which are published on an online database.

A comprehensive training program has been developed and held between January 2011 and January 2012, common to all partners of this program. Reference materials was presented during training courses. The courses were tailored to specific needs of respective countries with the support of the National Consultative Groups, which included representatives from the three target groups of the project.

At the end of the training courses, a joint international conference was held in Rijeka (Croatia) in 2012, where the authorities invited teachers in the RES domain. The conference also included a brokerage event to encourage participants to interact between various training courses, conducted in all the partner countries of PATRES.

After that 28 pilot actions were selected, each including more than one beneficiary, from different countries. Examples of such actions were pilot case studies, compulsory introduction of RES regulations and standards in the building sector, another example was the improvement of regulations on the introduction of RES in public procurement. The selected pilot actions improved the expert partners' experience as well as visits and meetings which we organized in order to get knowledge of the best practices.

A final conference will be organised in Bucharest in 2013 to present the results of the project, the best pilot actions and a guide that will summarize the experience gained within the project. PATRES program will then be disseminated to all partner countries, with support from national and regional authorities.

7 Future

Many schools of spatial planners in Europe have already recognized the need of having RES included in the curricula of urban planners. Such indication have been obtained, for instance, from Austria (Graz, Vienna), Bulgaria (Sofia), Denmark (Aalborg), Finland (Tampere), Germany (Hamburg, Erfurt, Dortmund, Stuttgart), Iceland (Reykjavik), Italy (Trento, Trieste, Florence, Milan, Naples, Venice), Kosovo (Pristina), Poland (Gdansk), Sweden (Lindköping), Turkey (Ankara), and UK (UCL, Brunel).

In the partner countries the training is committed to continue as follows:

- Finland: The second course to train urban planners with RES in Finland will start in April 2013 to those currently unemployed. It is expected that passing the course successfully would provide added value on the labour market. The course is financially supported by the Government.
- Hungary: The second academic course of Specialised Engineering in Urban Energy is going on in the academic year 2012/2013 in Debrecen and will be announced regularly in the future. The newly accredited M.Sc. course on Urban Systems (2 academic years, 120 ECTS credits) has been launched in 2012 September with 23 enrolled students.
- Germany: As the short courses have been welcome on the market, such courses will continue in Germany under AGFW management.
- In Spain, due to the continuous economic crisis, not a sufficient number of participants could be found for running the long term course in a second edition, even though a tremendous marketing effort with posters, mass mailing, individual telephone follow-up was done, and the course duration was reduced to 120 hours to achieve lower subscription fees. Instead of, one two days short course was implemented successfully in the city of Girona and an agreement was made with the Province of Girona to sponsor 50% of the subscription fee for public employees if participating in single modules of the overall course. The first three modules will be implemented in summer 2013: M1 – An integrated vision. Sustainability in regional and urban planning, May 2013; M3 – Buildings. Energy demand reduction strategies in new buildings and refurbishment, June 2013; M5 – Urban planning. Energy demand reduction strategies in the urban metabolism, September–October. In several other Spanish cities, namely Bilbao, Valencia, Málaga and Sevilla, short courses are planned for being implemented during the year in collaboration with the regional energy agencies (Basque Country and Valencia) or municipalities (Málaga).

- United Kingdom: Twenty short courses have been delivered in the UK covering most of the country. It is likely that more courses will be arranged, pending local authority demand. Reaction to the courses was so positive that this is a very likely outcome. There has also been interest from several UK universities to use the UP-RES materials in their courses. This has already been carried out at two universities: University College London (UCL) and Brunel University. Discussions are proceeding about extending this in future courses.

European level certification of urban planners still lie in the future. However, the AESOP Expert Pool (AESOP EP¹⁰) is a recently established instrument of AESOP supporting quality policy. AESOP EP consists of a number of experts from various parts of Europe and various areas of planning.

AESOP EP will neither issue certificates nor quality marks as according to AESOP the urban planning sector is too diverse. At present, the planning schools may have their focus either on design, engineering, social, sciences, or political economy, for instance.

Instead of certificates, AESOP EP will issue reports with recommendations about how teaching could be organised, how the scope could be improved and how the quality could be controlled.

We suggest that RES issues should become one of the topics which the AESOP EP should include in their working scope while evaluating training scope and contents. AESOP EP should also provide guidance to their member schools. This could be the most realistic and systemic way to include RES in the education of existing and new urban planners in Europe.

¹⁰ <http://www.aesop-planning.eu/uploads/experts-pool/aesop-experts-pool-report-final-web.pdf>

8 Conclusions

The urban planner is the first actor to influence the sustainability of the community in terms of primary energy consumption and emissions. Therefore, he/she should be aware of the basic features of energy and related emissions caused by electrification, heating, cooling and transportation inside the community and transportation out and inwards the community.

The issue of climate change has set new requirements for urban and regional planning that only can be addressed by co-planning of urban and energy planners together. To be successful, such co-planning requires new skills and attitudes from both urban and energy planners.

The UP-RES project has implemented pilot training of urban planners in five countries, and provided material and information to the planning schools and energy utilities in other countries to replicate the training. The training, however, needs to be adjusted to local circumstances as the urban planning concept varies a lot between the countries, and so does the availability of various types of RES.

Having 800 planners and other disciplines involved with urban planning trained by UP-RES, much work remains to be done. In order to address those not trained yet, a couple of measures were taken as follows:

- The training material has been summarised in 3 000 slides arranged in 10 training modules. This is available in 10 European language versions including English, Finnish, French, German, Hungarian, Italian, Polish, Romanian, Spanish and Swedish. Those 10 languages cover about 85% of the population of the EU. In addition to the slides, the training material contains 30 best practice cases of integral urban and energy planning (co-planning) from various parts of Europe.
- The material is downloadable from the link: aaltopro.fi/up-res
- Moreover, presentations in conferences have been given and articles in professional magazines published in order to share the key findings and outcomes of the pilot training with the energy and urban planning audience.

Mobilising the training in a new environment may face some barriers, as experienced by the UP-RES partners already. Such barriers were, for instance:

- Novelty of energy training of urban planners. Care is needed to properly target the material: too much emphasis on energy engineering with data, mathematical formulas, numerical analyses will confound those who are accustomed to the architectural tradition of visual and behavioural features. Therefore, the trainees were a little worried about the content at the beginning of the course;
- Resistance to adopt a new way of approaching urban planning may be faced, as energy strategy analysis can be considered as a disturbance to the traditional urban planning. Therefore, the management does not always support such a new training approach;
- Typically, the urban planning organisations have low budgets to finance the participation of an individual in the new type of training;
- Urban planning organisations have relatively lean organisations with small number of staff, so that it may be difficult to allow an individual to participate in the long training course. Therefore, it may not be possible to release an individual without compromising the mandatory work.

Nevertheless, co-planning carried out jointly by urban and energy planners may have a substantial financial return, as experienced in the best practice case of Porvoo, for instance. By means of co-planning, the win-win situation was achieved as the primary energy consumption, flue gas emissions and even the total costs during the 30 year period fell. Learning from each other while initiating the new co-planning approach took some time, about a year, but was vital to the positive outcome.

The time has come for awareness of climate change, and there is no return to the old practise that neglected energy and emission issues in urban and regional planning. The new approach of co-planning of urban structures and energy systems is the new best practise to be recommended to other cities, regions and countries in Europe.

Partner Contacts

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