



# CONCERTO

A CITIES' GUIDE TO  
A SUSTAINABLE BUILT  
ENVIRONMENT



CONCERTO  
is co-funded by  
the European  
Commission





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COMMISSION

# EDITORIAL

Cities across Europe are home to 80% of the EU's citizens. They are the drivers of economic, social and environmental change. They are also key to tackle the problems of quality of life, climate change, and a smooth transition towards a low-carbon economy. They must find ways to expand and ensure the quality of life of their citizens while moving away from fossil fuels to more renewable energy sources and to more efficient and smarter energy systems. The EU energy and climate change policy and the European 2020 agenda will succeed only if local governments and municipalities take up the fight, and commit to becoming more sustainable, more efficient and better places to live.

There is without doubt great motivation and considerable action being undertaken locally. This local action is being matched at European level. The CONCERTO initiative deserves particular mention for proving that cities can, given the right planning, be transformed into pioneers in the world of energy efficiency and sustainability. The results so far have been very encouraging: CONCERTO cities have shown that through innovative tech-

nologies and an integrated approach, existing buildings can cut its CO<sub>2</sub> emissions by up to 50%, at acceptable costs.

The CONCERTO initiative has been but a beginning: a footstep in the right direction. It has been a platform in which communities have been able to share their experience and implement technologies which lead to sustainable outcomes. The next step is to take CONCERTO to new and exciting heights via the launch of the Smart Cities initiative in 2011. This initiative will incorporate innovative and highly efficient public-private partnerships between European industry and municipalities in order to increase sustainability into all aspects of urban planning, buildings and transport, for entire cities. Let us all together ensure that Europe's cities of tomorrow will be more attractive, more efficient and better places to live.

I take the opportunity to congratulate all CONCERTO Communities for their achievements.

I sincerely hope this guide provides a wealth of information to anybody hoping to learn more about putting into practice innovation, energy efficiency, and renewable energy in cities.

**Günther H. Oettinger**

European Commissioner for Energy



**Günther H. Oettinger**  
European Commissioner for Energy

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# A MAP OF CONCERTO COMMUNITIES

**In Alphabetical order:**

- Ajaccio

Alessandria

Almere

Amsterdam

Apeldoorn

Birstonas

Cerdanyola del Vallès

Cernier

Dale

Delft

Dundalk

Falkenberg

Galanta

Geneva

Grenoble

Hannover

Hartberg

Heerlen

Hilleroð

Helsingborg

Helsingør

Høje-Taastrup

Hvar

Kortrijk

Lambeth (London)

Lapua

Lyon

Måbjerg

Milton Keynes

Mödling

Montieri

Mórahalom

Nantes

Neckarsulm

Neuchâtel

Óbuda (Budapest)

Ostfildern (Stuttgart)

Redange

Salburua
- Salzburg

Serve region

Sofia

Stenløse

Stubice

Szentendre

Torino

Trondheim

Tudela

Tulln

Valby

Växjö

Viladecans

Weilerbach

Weiz-Gleisdorf

Zaragoza

Zagorje

Zlín





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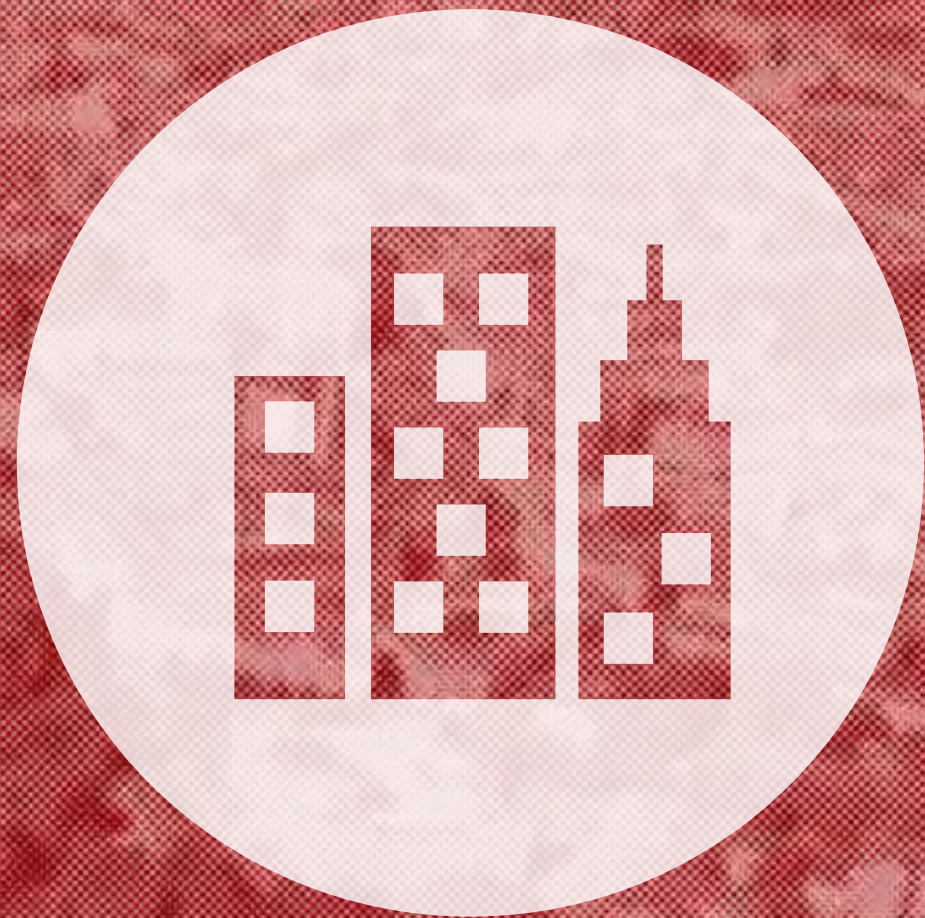
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# CONCERTO CITIES' TESTED SOLUTIONS: EXAMPLES OF EXCELLENCE TO FOLLOW







# CONCERTO CITIES' TESTED SOLUTIONS: EXAMPLES OF EXCELLENCE TO FOLLOW

With aspirations to change the very meaning of sustainability in Europe, the CONCERTO initiative was established in 2005 by the European Commission. During its creation, the defining concepts in mind were sustainability, replication and cost effectiveness, and the projects aimed at revolutionising and modernising cities' energy systems.

With an initial network of 27 cities/communities, the CONCERTO concept ignited, and five years later 58 cities/communities in 23 countries across Europe are full members and over 70 associated cities/communities benefit from the growing stock of knowledge. These cities/communities have a mission to research and demonstrate how energy efficiency and renewable energy use can be incorporated into cities' buildings on a large scale. CONCERTO, in every sense, is itself on a large

scale with CONCERTO cities/communities comprising a population of approximately 5 Million people and about 500,000 inhabitants are directly, or indirectly, affected by CONCERTO activities.

At the time of drafting this guide the CONCERTO projects are at different implementation stages. The purpose of this guide is to share the first results obtained from the projects already completed or close to completion. The implementation and monitoring of the projects currently under construction are expected to strengthen these first findings and to add further recommendations in the future. This guide is expected to be used as a user manual for all relevant actors hoping to implement sustainability projects in cities/communities across Europe. Much knowledge has been gathered until now from the CONCERTO experiences, and by sharing this knowledge, this

guide will provide an overview of what should be done and how local sustainability can become a reality.

## What are the characteristics of a CONCERTO city/community?

From sunny Italy to rainy Ireland and from office buildings to public housing estates, the CONCERTO cities, communities and the associated projects are extremely diverse. This is both in terms of their climates, their socio-economic make-up and most importantly their energy needs. The following key elements are however shared by all:

- ✕ The CONCERTO projects are based on clearly defined geographical areas
- ✕ All cities/communities thrive for a balance between demand and supply: large scale eco-buildings are supplied by different types

- ✕ of renewable energies
- ✕ Targets are ambitious: new buildings' energy consumption is at least 30% lower than national regulations for new buildings
- ✕ All projects conduct technical and non-technical monitoring

## CONCERTO at a glance

- ✕ 58 cities/communities in 23 countries and close to 70 associated cities/communities
- ✕ 1,830,000 m² of buildings built or refurbished
- ✕ 530,000 tons of CO<sub>2</sub> emissions saved per year
- ✕ 5,2 million people live in the CONCERTO cities/communities

## CONCERTO has shown that:

- ✕ Innovative technologies are available and ready to be used
- ✕ The built environment can cut its CO<sub>2</sub> emissions by up to 50 %
- ✕ Infrastructure to produce, supply and distribute clean energy for the built environment can be implemented efficiently and with no fundamental obstacles - renewable energies can be integrated into the urban environment



In Grenoble, the private developers could be successfully motivated to apply ambitious energy performance requirements due to the exceptional location of the neighbourhood. This provides a sale argument for developers and acts as a guarantee for a secure investment. © Thierry CHENU - Ville de Grenoble 2008



In Lyon, the CONCERTO demonstration activities involve an impressive 75,000 m² of new construction. © DESVIGNE Conseil SPLA Lyon Confluence



In Hannover, the CONCERTO districts housing stock consists mainly of old houses. Poorly insulated, and with old-fashioned heating installations, these buildings use more energy than necessary. After retrofitting they save on fossil fuels such as gas and coal and thus reduce CO<sub>2</sub> emissions. © Karl Johaentges



# THE CONCERTO PRINCIPLES TO OPTIMISE ENERGY PERFORMANCE IN THE URBAN BUILT ENVIRONMENT



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# THE CONCERTO PRINCIPLES TO OPTIMISE ENERGY PERFORMANCE IN THE URBAN BUILT ENVIRONMENT

The main common goal of the CONCERTO cities is to significantly reduce their CO<sub>2</sub> emissions in the most cost effective way whilst at the same time greatly improving the living habitats for their citizens.

From an energy perspective, this can only be achieved by a combination of measures which simultaneously focus on reducing energy demand, increasing the share of renewable energy sources on the energy supply side, and using efficient energy conversion systems (including cogeneration). The challenge for the cities is to find the most suitable and effective combination of measures. This most effective combination greatly depends on the local context of the

city defined by certain key characteristics such as size, population, climatic conditions, existing building stock, settlement type, mix of building typologies, energy infrastructure and regulatory framework conditions.

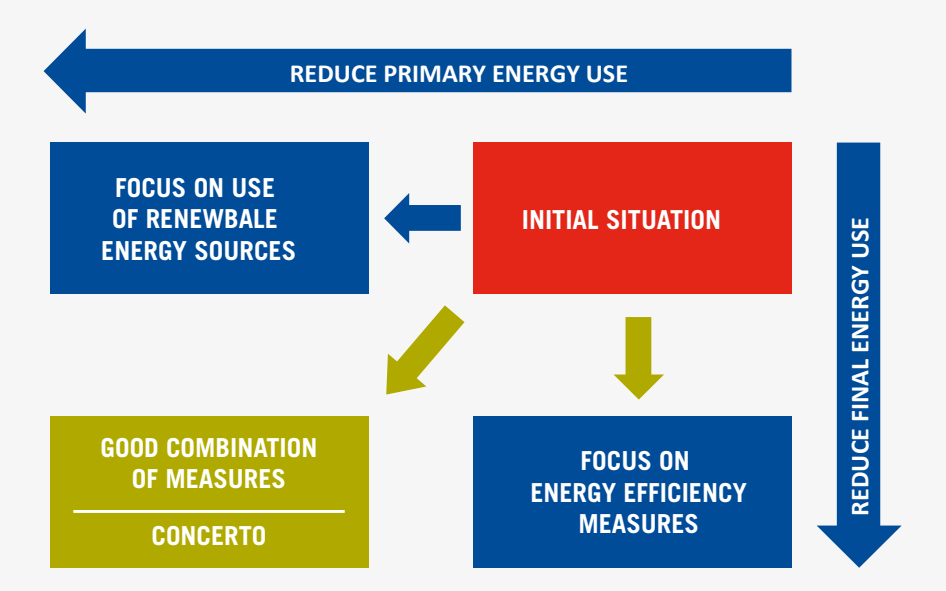
The CONCERTO cities demonstrate that through a holistic approach and through the application of smart, well defined energy concepts appropriate for the specific context of the district or city, emissions can be saved much more effectively than by looking only at a series of single measures e.g. targeting only energy efficiency in buildings or focusing only on the most efficient renewable energy supply. The CONCERTO cities excel in applying a combination

of measures designed for their specific needs by both reducing their final energy use as well as reducing their primary use, thus minimising their CO<sub>2</sub> footprint in the most efficient and cost effective way.

The following sections explain in more detail which combination of measures applied in the CONCERTO cities worked most effectively for which urban environment and outlines the key factors for successful replication in other cities.

**Demand side measures**

Targeting effective demand side measures is the first step to improving the overall energy per-



formance of a building, a neighbourhood/district and an entire city. Demand side measures applied in the CONCERTO cities focus on the well known principles of optimising:

- ✕ The building structure (e.g. improving the building form) and properties (e.g. thermal insulation, advanced materials) in order to reduce energy needs as much as possible
- ✕ The design of heating, cooling and ventilation systems, controls and building management systems in order to reduce expected energy use as much as possible
- ✕ Building operation and in particular user

behaviour mainly by motivating end-users to use their building in an intelligent way, while increasing the comfort

The CONCERTO experience so far confirms that these measures are significantly influenced by design choices, and by the way in which they are promoted by planners towards building developers and users. The responsibility therefore rests on the shoulders of the architects and engineers to propose an optimal design of the building, its architecture and its services. CONCERTO suggests giving attention to the im-

provement of control strategies of the heating/cooling/ventilation system installed, which could be for example as simple as adjusting set-point parameters. In the participating cities, this highly important task has been generally left to technical building operators and facility managers.

**CONCERTO experience of increasing the effect of demand side measures by making user behavior transparent**

What CONCERTO cannot stress enough is the need to change building user behaviour, albeit an office worker, home-owner or tenant should be equally conscious of the influence of his/her behaviour when it comes to the energy consumption. The most efficient way to convince the end user to change his/her behaviour is to highlight the non-energy benefits of renovation measures: increasing health and comfort while reducing energy bills. There are different measures, which are used throughout the CONCERTO initiative. One of the most common is the information on own energy use provided to building users in order to inform and confront them with their energy consumption and energy costs.

User information and efficient load management systems are very important. Informing end users about their energy use through dedicated displays has lead to longer lasting energy savings. This can be imple-



In Falkenberg, the multi-storey houses at Hertings Gård have unique, innovative solar air heating systems connected to the ventilation system. The solar air heating system contributes to the buildings energy supply by preheating the ventilation supply air. Hertings Gård provides quality housing for tenants, it's a good investment for housing companies and above all the buildings are environmentally friendly. © FaBo, Bengt Björnhammar



In Lyon, 80% of energy is supplied by renewable energy sources while energy consumption is reduced by 40% through the CONCERTO project. © SPLA Lyon Confluence



In Heerlen, CONCERTO demonstrates the use of locally available low valued renewable energy sources, specifically water from abandoned mines for heating and cooling of buildings. The building in the photo is one of the buildings connected to the mine water grid in Heerlen.





In Delft, the entire area of the Harnaschpolder is striving towards an Energy Performance Coefficient 20% beyond the current legislation. To achieve these energy performance indices, the targets will be an integrated part of the area's building permits and the city's contract with developers and contractors. © Hans de Lijser fotografie.

mented for electricity and heating/cooling, both in residential buildings (target group: tenants), as well as in office/public buildings (target group: users and facility managers), and also in energy plants. Different buildings require different means of informing residents about energy use. CONCERTO recommends solutions ranging from user-friendly displays installed in flats, and energy-saving competitions among inhabitants, to detailed energy reports which are delivered to facility managers and housekeepers. Correct use of ventilation systems is the key to improved air quality, comfort and health. Creativity and innovation is the answer!

Supply side measures

The CONCERTO cities applied a whole range of supply side measures based on the use of following renewable energy sources, including the following key technologies:

- ❖ Photovoltaic and solar heating systems (both individual and connected to district heating networks), often architecturally integrated
- ❖ Ground coupled and exhaust air heat pumps (mainly individual systems)
- ❖ Biomass boilers (mainly individual heating systems) and combined heat and power units (mainly large scale systems connected to district heating)
- ❖ Absorption cooling using solar energy or heat from renewable energy sources
- ❖ Large scale wind turbines
- ❖ Biogas generation plants
- ❖ District energy systems

The successful supply-side technologies in CONCERTO

It is ultimately all about combining known energy conversion technologies based on renewable energy sources, and being innovative when involving the cascade use of resources. Each individual technology is a bridge into a complex energy and resource network opening up a world of possibilities. It allows for instance the generation of high temperatures from low temperature heat sources, cooling energy from heating energy, heat from waste etc...

Solar thermal technologies were used in a high number of CONCERTO cities.

Beside the common individual use for hot water preparation, solar thermal collectors were used in few cases to increase system performance. Some cities used the technology in existing or new complex energy systems with the aim to maximise solar fraction, mainly working on the connection between solar systems and local energy system:

- ❖ Combined solar heating and cooling systems are a solution to maximise the use of solar thermal collectors, also at district scale (involving district heating as in Cerdanyola del Vallès (ES))
- ❖ Connecting solar collectors with an existing district heating network (i.e. using them for preheating) is a way to increase their number of operational hours (as in Almere (NL))
- ❖ Combining large scale solar collector fields, seasonal and ground-coupled storage, district heating and heat pumps (as in Neckarsulm (DE), see the box below) are another way of increasing the solar fraction in the local energy system.



In Dundalk, after refurbishment the O'Fiaich high school has seen an improvement of over 60% in energy efficiency. © Pdraig McGovern

CONCERTO example:

**Dundalk, Ireland:** In a low income residential settlement in Dundalk electricity display monitors are used to inform the tenants with their energy consumption. The monitors are combined with an information campaign, in which tenants learn about saving energy in everyday life. To allow a comparison, in order to see better the impact of such measure, the tenants are divided into groups, where one group receives monitors and information, the second just the information and the third remains without information to allow benchmarking.

CONCERTO example:

**Falkenberg, Sweden:** Display of metered energy usage data is a known way to increase awareness of end-users. It allows for broad distribution of information. The challenge is to bring the end-user to look for this information. In Falkenberg, by installing a dedicated display at the end-user site, the municipal housing company wanted to be sure that tenants would check their energy consumption. To do this they implemented a system in new dwellings built as CONCERTO demonstration activities. It consists of displays installed at each dwelling and providing information on the energy and water use, but also on other aspects that might be interesting for residents (weather forecast, time schedule of public transport, etc...)

**CONCERTO examples:**  
**Neckarsulm, Germany:** The existing solar-supported district heating system in Neckarsulm was optimised to increase the solar fraction in the overall energy balance. Because of the initially low capacity of the district heating network, the seasonal storage did not fully discharge during the first operation years. As a result, the solar fraction of the district heating was low. As a CONCERTO demonstration measure, a heat pump using the ground as a heat source was installed to increase heat extraction from the seasonal ground coupled heat storage, thus reducing the consumption of natural gas used as back-up.

**Almere, the Netherlands:** The large solar thermal collector field connected to a district heating network (ca. 7,100 m<sup>2</sup> called "Solar Island") allows for covering 10% of the total heating energy use in the of Noorderplassen West neighbourhood (2,700 dwellings). The system operates without any seasonal storage.

**In the Serve region, Ireland:** The houses in the Cloughjordan eco-village in the Serve region are supplied by a district heating system driven by a biomass plant. To avoid peaks and in order to meet the hot water demand also in summer 500 m<sup>2</sup> solar array is additionally connected to the system. By this measure all 132 houses in the eco-village can be served.



In Almere, the annual production of the Almere Sun Island is 4300MWh. The combination of solar heat supply and district heating allows for the cutting of CO<sub>2</sub> emissions by 50%.© panopictures for cRRescendo



In Hillerød, in the newly built residential area Ullerødbyen, the energy supply structure is fully integrated and consists of a biogasification plant, biomass boiler, wind energy, photovoltaic system and heat from 3,000m<sup>2</sup> solar collectors and individual heat supply such as heat pumps. The energy is thereby produced 100% from renewable energy sources.



In Grenoble, the shopping centre "La Caserne de Bonne" by the rue Berthe de Boissieux a 1000 m<sup>2</sup> photovoltaic plant is integrated into a high energy-efficiency multi-activity centre. The electricity generation from the roof-integrated PV plant is expected to be 47,500 kWh/yr, so far it should exceed the electricity use. © Thierry Chenu



In Dundalk, the Carroll buildings' energy efficiency level has been improved by over 40%. Innovative energy-efficiency technologies in a wide range of buildings across the Dundalk Sustainable Energy Zone have been installed. © Pdraig McGovern





**CONCERTO example:**  
**Geneva, Switzerland:** Existing office buildings and conference facilities connected to Geneva's hydronic lake water network were already equipped with chillers before starting CONCERTO. Given the size and the typology of the buildings, it was clear from the beginning that it would never have been possible to completely remove the existing chillers. The solution proposed and implemented thus consisted in keeping the existing chillers and using the lake water for pre-cooling and heat rejection, therefore replacing the existing cooling towers and still providing the possibility of free-cooling. The result is an improved performance of existing chillers.

Integration of heat pumps in urban energy systems

There are several ways to approach the integration of heat pumps into urban energy systems. Using the ground as a heat source and then supplying heat to a building or a neighbourhood through a low temperature distribution network, is one of the many possibilities. Connecting individual heat pumps to a low-temperature hydronic network used simultaneously as heat source and heat sink for different



In Geneva, this residential building in the heart of Nations' district has been one of the first buildings to be connected to the Genève-Lac-Nations network (for cooling purposes). Thanks to this connection, energy savings of more than 80% have been made on electrical consumption linked to cooling service.

buildings has been another innovative solution in CONCERTO, as shown by the example of Geneva (see the box on this page).

Polygeneration

Several polygeneration technologies are taken into consideration due to their ability to save primary energy sources, e.g. to actively use the 'waste heat' of the power generation process. Many technologies have been implemented in CONCERTO cities (gas engines, turbines based on organic rankine cycles, newly developed Stirling engines, etc...), on the basis of the energy sources available, the necessary capacity and various other parameters. Otherwise, larger combined heat and power plants were all connected to district heating networks guarantee the proper use of heat generated. All combined heat and power plants together in CONCERTO allow for nearly 66% of the overall primary energy savings among all supply-side measures, thus showing the rele-

**CONCERTO example:**  
**In Grenoble, France:** 9 individual gas engines ("mini Combined Heat and power") with a nominal electrical capacity ranging between 30 kW and 120 kW were installed to provide heat to each CONCERTO building of the De Bonne area. Following the French regulation on electricity generated by CHP unities, the gas engines only operate during winter months when heating energy is needed.



In Hannover, coal fired combined heat and power-plant in Hannover-Stöcken, where biomass (wood pellets) are co-burned. On the ground of the plant, the Wood Energy Centre is situated with a log splitting machine, drying kiln and an information centre. The wood is dried by district heating coming from the plant. © Karl Johaentges

vance and contribution of these technologies in terms of CO<sub>2</sub>-emissions reduction.

The right combination of measures plays a key role in success

As illustrated by CONCERTO cities, reducing energy demand is the most efficient way to avoid using renewable energy sources in efficient energy applications. A concrete outcome from the CONCERTO experience is that minimum energy performance standards have to be defined both from a final and a primary energy point of view, instead of exclusively using one sole indicator as done quite often.

So when it comes to thinking about how to combine and integrate energy supply and demand measures, the key is to consider individual conditions and specific use.

The CONCERTO cities had a vast array of technologies at their disposal. The degree of centralisation of an energy supply infrastructure should be adapted to the energy demand intensity, as shown in table above. In CONCERTO, distributed and scattered energy supply systems were mostly used in regions with low settlement density. On the other hand, centralised energy supply systems were traditionally used in city centres and highly populated areas with a high energy demand density.

It was found to be also necessary to select the right energy carrier quality (low temperature heat, electricity, etc...) compatible with the requested "quality" for energy needs (space

heating, household appliance, etc...). This helped the CONCERTO cities to combine the technologies while giving preference to optimal use of energy carriers:

- ❖ Low temperature systems for space heating applications
- ❖ Medium temperature systems for hot water production
- ❖ Heat pumps to adjust the temperature to the needs
- ❖ Electricity for applications which cannot be driven by another carrier (in particular, avoiding electrical heating)

In this sense, carefully choosing the right combination of measures is paramount. One needs to take into account the local context. The question should be for example 'What are the energy possibilities in the surrounding municipal and regional areas?' and 'Will this come from industrial waste energy, renewable sources or both?'

In CONCERTO, finding the smartest energy solutions for particular neighbourhoods and districts were done with due consideration to these principles. This led to the definition of priority areas for specific technologies and a dedicated energy distribution infrastructure.

The underlying reasons for choosing specific energy sources

Combinations of measures were actually chosen due to factors relating to each project' individual context: e.g. the settlement density within a city, the type of energy infrastructure available in a particular area, whether or not a city has to undertake a large degree of refurbishment actions, which regulatory framework it is placed in, etc... . One would also assume that the climatic conditions play a pivotal role in the choice of measures, however from the CONCERTO experience it showed that many other influencing factors took precedence over the climatic region the project was based in. The following two examples perfectly illustrate that decisions were taken in dependence of the local context and that the local climate conditions were playing a secondary role:

- ❖ Cooling demand is available all over Europe as it is not only induced by climate conditions. In Vaxjö (SE), Geneva (CH) and Cerdanyola (ES) the cooling demand density by a high concentration of office and commercial buildings, was high enough to justify the construction of a district cooling network. On the other side, none of the

<b>LOW ENERGY DEMAND INTENSITY</b> - LOW-ENERGY BUILDING / RURAL - LED LAMP	HARDLY JUSTIFIED	OK	OK
<b>MEDIUM ENERGY DEMAND INTENSITY</b> - LOW-ENERGY BUILDING / URBAN - CFL	OK	OK	MAY WORK
<b>HIGH ENERGY DEMAND INTENSITY</b> - HIGH-ENERGY BUILDING - INCANDESCENT LAMP	OK	MAY WORK	VERY DIFFICULT
	<b>CONCENTRATED SUPPLY</b> -FOSSIL FUEL -NUCLEAR POWER	<b>DECENTRAL SUPPLY</b> -BIOMASS -WIND TURBINE	<b>SCATTERED SUPPLY</b> -PV -SOLAR HEATING

southern European cities implemented cooling systems in residential buildings, whereas Lyon (FR) and Heerlen (NL) did so with "free cooling" concepts. In Heerlen, a natural heat sink (cold water extracted from mine galleries) is used directly for cooling purposes in flats. In Lyon, the innovation consists in using the radiant floor cooling system as heat source for a heat pump used for domestic hot water preparation.

- ❖ Solar thermal collectors have been implemented all over Europe and their installation was not purely driven by the amount of solar radiation available, but by technological traditions and preferences in the different countries and communities. In particular, countries having already a long tradition and experience with using solar thermal systems confirmed this tendency in CONCERTO.

Framework of conditions influencing the combination of measures to be chosen

Below, we present a combination of measures suitable for specific conditions and situations, according to the CONCERTO experience. We focus predominantly on factors of a 'hard nature'. In some cases, possible future improvements are mentioned, as the measures implemented in CONCERTO were a first step towards energy performance improvement within the urban built environment

Combination "building renovation + district heating + photovoltaics"

In existing neighbourhoods and districts, systematically reaching very low-energy building standards is sometimes economically and technically not feasible. In this case,

the combination of using district heating for heat supply and installing photovoltaics on the buildings is a good solution to improving overall energy performance. Depending on the individual context of the project, existing networks can be used or new networks can be built.

In which circumstances is this applicable?

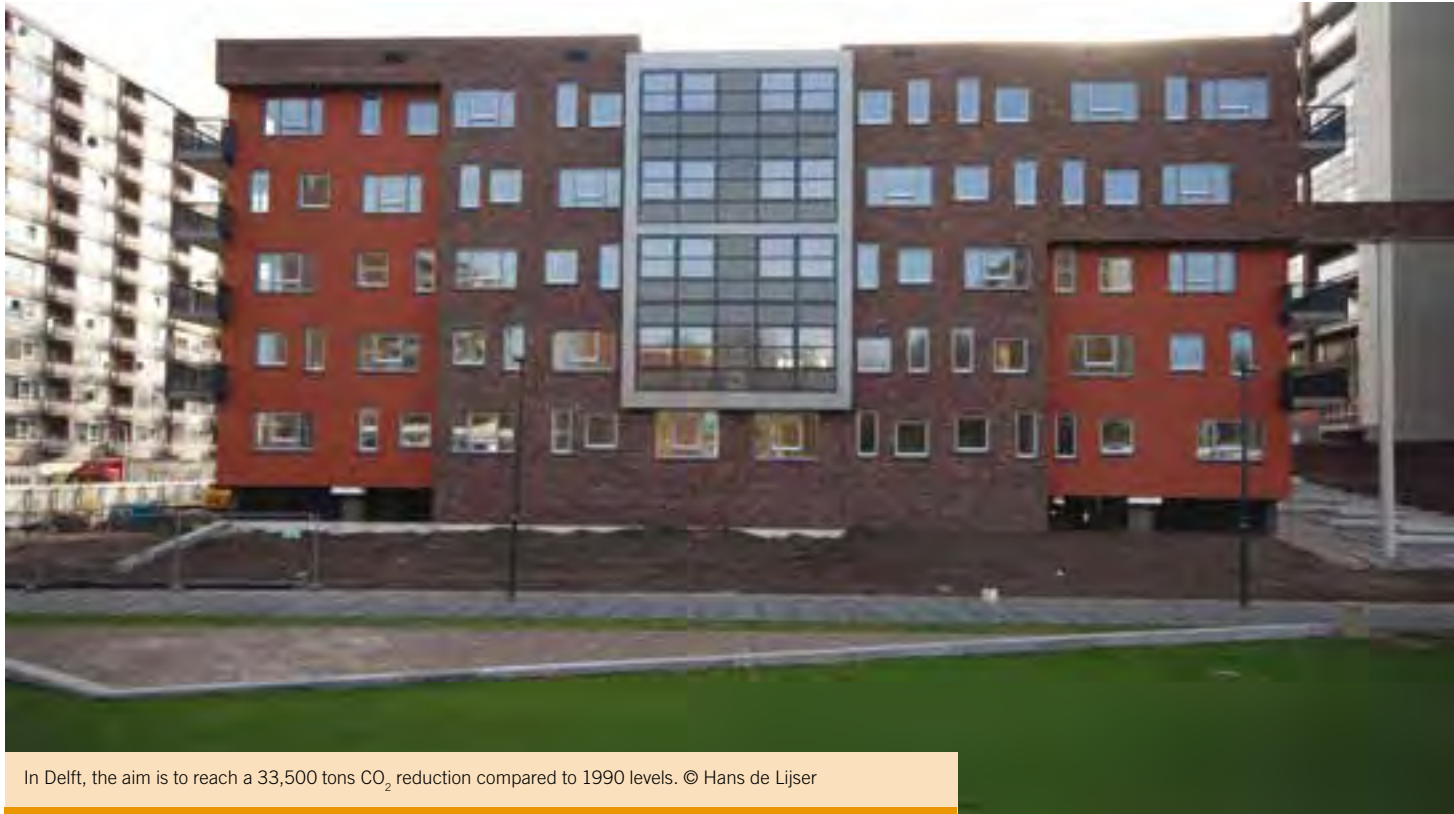
In existing neighbourhoods with a high settlement density and an existing district heating network.

What did the experience show?

The large-scale renovation projects implemented at neighbourhood level in CONCERTO produced interesting findings. It demonstrated that investing in a connection to an existing district heating infrastructure in combination with thermal improvements of the building envelope significantly reduced the primary energy demand of existing buildings, all in a cost-efficient way.

Often, particular projects did not allow for comprehensive improvements on the demand side. This was often due to the building substance (building physics and architecture), cost limitations (social housing) and the ability to implement specific measures (renovation in occupied conditions). As a result, it would have been impossible to reach highly ambitious energy performance standards (e.g. passive house standard). However, there is room for further improvement. Connecting to district heating was a practical way of reaching high primary energy savings despite the limited possibilities to act on the demand side. Increasing the share of waste heat or heat from combined heat and power or renewable energy sources in the district heating balance, or using photovoltaics, provided in many cases the opportunity to further improve the overall energy performance.





#### Which combination of measures is recommended?

See figure below.

#### What can be achieved?

This combination is more than attractive to most stakeholders involved. Firstly, it allows for high primary energy savings. Secondly, it involves

only moderate costs for the investors in renovation measures (developers) because costs are distributed evenly among the different stakeholders (developer, municipal utility/ESCO).

Combination “building renovation + natural gas + photovoltaics / solar thermal”

District heating is not always available and cannot always be built (low heat demand limits economic feasibility). In such cases, a connection to the existing gas network can be used as an alternative. To result in increased energy performance and environmental improvements, it requires making improvements upon the energy efficiency

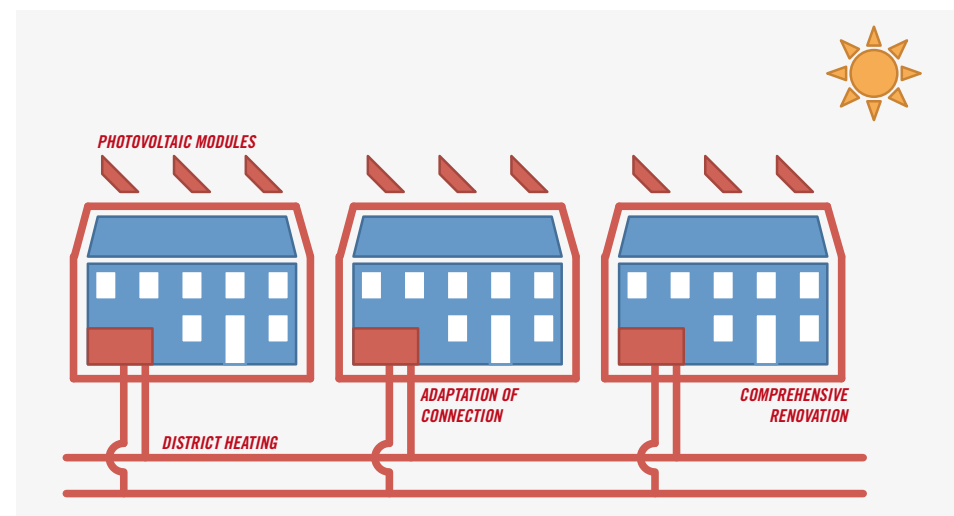
of the previous system (e.g. improved boiler efficiency, replacement of old fuel oil boiler).

#### Under which circumstances is this applicable?

In existing neighbourhoods with high settlement density already equipped with a gas network serving as a city-wide energy distribution system.

#### What did the experience show?

Using natural gas as an energy carrier for space heating and hot water preparation usually has less primary energy advantages than simply connecting the buildings to the district heating network. District heating however is not always available, and other innovative solutions are therefore required.



CONCERTO illustrates three possibilities:

- ✕ Decentralised gas boilers in each flat were kept in place because of organisational (renovation in occupied conditions) and economic limitations.
- ✕ Decentralised boilers could be replaced by a centralised system (one boiler per building) through the implementation of new piping. However, this is recommended only for very heavy renovation schemes.
- ✕ Small-scale district heating networks could be built to distribute heat from a central gas combined heat and power to a small number of buildings.

This latter combination led to the highest primary energy savings when still using gas. Another innovative solution is to incorporate photovoltaics to improve the energy balance. The use of solar thermal energy for domestic hot water preparation in apartment buildings was rather limited in CONCERTO, as it tends to be an expensive solution for retrofitting. It would, nevertheless, allow for a further reduction in gas consumption.

#### Which combination of measures is recommended? See figure 2.

#### What can be achieved?

This combination is clearly less attractive in terms of primary energy savings when compared to using district heating from renewable energy sources or cogeneration plants. If fuel oil was used before renovation, switching to natural gas is a first step to reduce CO<sub>2</sub>-emissions. The second step would consist in using individual gas engines to generate electricity. Small-scale gas cogeneration plants were installed in only one CONCERTO community (Grenoble), but this technology would be a very interesting solution for the existing housing sector where no district heating system can be installed.

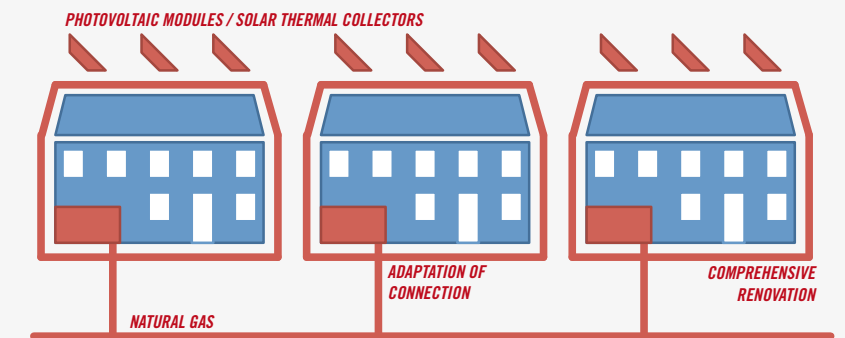
Combination “building renovation + biomass decentral or district heating/cooling + photovoltaics”

Using individual biomass boilers for each building or a small scale district heating network connected to a biomass boiler is an alternative

#### CONCERTO example:

**Zaragoza, Spain:** The thermal renovation of buildings in the “Picarral” area was combined with use of solar thermal panels for domestic hot water preparation.

Figure 2.



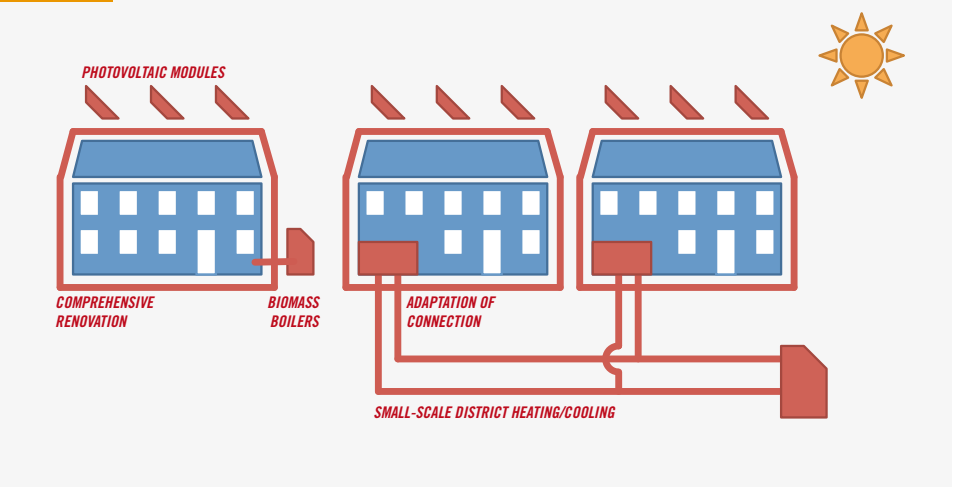
In Zaragoza, the objective involves a bioclimatic approach of social housings, with high energy-efficiency criteria, having an impact on the whole urban fabric.







Figure 3.



when no city-wide energy distribution infrastructure is available.

**Under which circumstances is this applicable?**  
In existing neighbourhoods that cannot be supplied by a city-wide energy distribution infrastructure, mainly because of a low heating demand density.

**What did the experience show?**  
The decision whether or not to build a new district energy infrastructure is largely dependent on non-technical aspects. CONCERTO suggests in some cases constructing new district or cooling networks to supply thermal energy to existing neighbourhoods. This approach should be undertaken when the guarantee of a high degree of connection could be obtained through specific models (risk guarantee overtaken by public authority, public authority/housing companies involved as shareholders).

**CONCERTO examples:**

**Hannover, Germany:** The buildings belonging to the housing company Gundlach were renovated according to this scheme. As district heating was not available, the existing gas heating systems were replaced by wood-pellet systems. Photovoltaics were not considered in this project. Similar approaches were followed in Neckarsulm, Germany and Falkenberg, Sweden where mainly schools and apartment buildings were equipped with large biomass heating plants (100 kW – 600 kW) during the course of comprehensive renovation works.

**Weiz-Gleisdorf, Austria:** Small scale biomass district heating networks were built to provide heat to a small number of buildings.

If the construction of a new district heating network is neither possible nor feasible, CONCERTO suggests the use of biomass in decentralised boilers (pellets) which has high fossil energy savings.

**Which combination of measures is recommended?**  
See figure 3.

**What can be achieved?**  
This combination allows for high primary energy savings. All costs can generally be undertaken by the building owner.

Combination “new neighborhood + individual heating from renewable energy sources/district heating + photovoltaics”

New neighbourhoods are abundant with technical solutions, as infrastructural limitations are

considerably lower. As a general rule, high heating and cooling demand makes district energy systems feasible. Therefore, in areas with very ambitious energy performance standards and high settlement densities, district heating systems may be feasible.

**Under which circumstances is this applicable?**  
New neighbourhood developments with a high settlement density. Choices can be made based on the availability or lack of district heating or a natural gas distribution network.

**What did the experience show?**  
CONCERTO’ experiences shows that viable technical solutions are largely dependent on available energy potential, but also on non-technical issues (including the particular interest of influential stakeholders towards using a specific technology or energy resource). In some cases, district heating may not be available or cannot be extended (due to economic or practical aspects). If this is the case, CONCERTO proposes the following solutions:

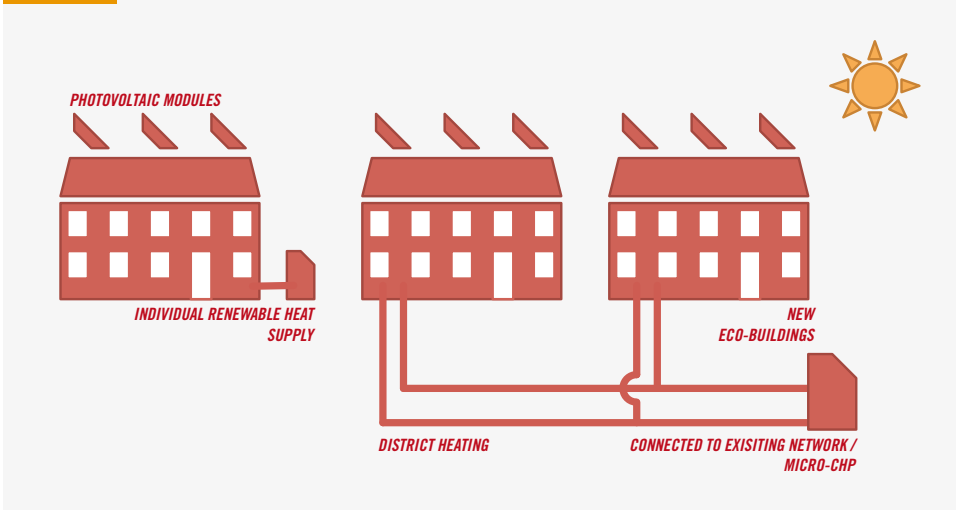
- ✕ The use of small-scale gas-driven combined heat and power
- ✕ Decentralised biomass boilers or heat pumps located at each building
- ✕ The use of individual solar thermal systems

All of these solutions can lead to significant primary energy savings compared to standard solutions.

**Which combination of measures is recommended?** See figure 4.

**What can be achieved?**  
This combination of measures results in high primary energy savings.

Figure 4.



**CONCERTO example:**

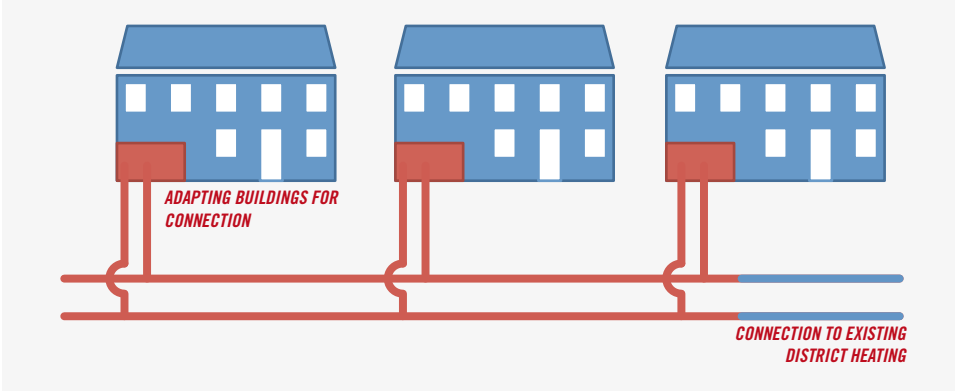
**Lyon, France:** With the use of biomass boilers, photovoltaics and solar thermal panels, the newly built “Lots A, B, C” in the Confluence area in Lyon constitute an area with one of the lowest specific primary energy demand in CONCERTO (below 40kWhPE, non renewable/m²GFA.a). This figure considers the overall energy demand in the neighbourhood (heating and electricity) and the local energy generation from biomass boilers and photovoltaic panels. ©Jacques DAMEZ (galerie Le Réverbère) pour SPLA Lyon Confluence

Combination “new or extended district energy + adapting buildings for better connectivity”

Extending existing district heating networks or building new district energy systems in unsupplied

areas can be the first step to achieve significant improvements in overall energy performance, if there are major barriers to implement comprehensive renovation works in a given neighbourhood in a short time. Of course this should be

Figure 5.



**CONCERTO example:**

**Geneva, France:** The “Genève-Lac-Nations” project is characterized by the fact that the hydronic lake water network can be used simultaneously for heating and cooling by transporting heat from buildings needing cooling (network used as heat sink) to other buildings needing heating (network used as heat source). Typically office buildings have a much higher cooling demand than private housing. The waste heat from offices is used to heat the dwellings and houses linked to the heating/cooling network. An important innovation consisted in adapting the existing cooling systems in the buildings to a natural heat sink at variable temperature, all this done while improving the overall system efficiency. Avoiding the use of energy-intensive cooling towers is an important contribution to energy efficiency increase.

done as a last recourse, since it is not recommended to oversize the network infrastructure and heating plant capacity if the energy demand can be easily reduced on the building side. Last but not least, this should only be done if a sufficiently high degree of connection is guaranteed, and when energy is generated from renewable energy sources or polygeneration plants. The risks of wasting renewable energy sources should always be considered and avoided here.

**Under which circumstances is this applicable?**  
Neighbourhoods with a high settlement density supporting the extension or construction of district heating and cooling networks, and where large scale renovation operations are exceptionally challenging (complex ownership structure, extraordinary energy requirements, protected buildings for historical and cultural reasons etc...).

**What did the experience show?**  
CONCERTO brings two examples of solutions where comprehensive renovation works could not be easily implemented, leading to a solution where the most practicable solution was to install a district energy infrastructure allowing for general improvements over the entire neighbourhood.

**Which combination of measures is recommended?** See figure 5.

**What can be achieved?**  
This combination allows relatively high primary energy savings in case comprehensive renovation measures cannot easily be implemented (exceptional situation).





Combination “individual housing renovation + individual heating + photovoltaics / solar thermal”

Individual solutions have to be proposed for small towns or regions which do not have an extended city-wide energy distribution network. Individual and innovative solutions are often required. Combining thermal housing renovation with the use of individual heating systems from renewable energy sources is one way of significantly improving the overall energy performance of buildings.

**Under which circumstances is this applicable?**  
Neighbourhoods or villages with a low settle-

ment density and without an existing energy distribution infrastructure.

#### What did the experience show?

In low density areas, and in particular for neighbourhoods with one-family houses, individual heating solutions should be chosen in combination with high building energy performance standards. Mainly individual pellet boilers and solar thermal systems for domestic hot water preparation were installed in one-family houses because quite often district energy infrastructure was not economically viable in such areas.

In the existing housing sector, the added value of CONCERTO (mainly due to custom-

ised energy counselling) consisted in combining thermal renovation measures with replacement of existing heating systems, thus guaranteeing major primary energy savings.

**Which combination of measures is recommended?** See figure 6.

#### What can be achieved?

This combination of measures can result in high primary energy savings.

#### CONCERTO example:

**Neckarsulm, Germany, Falkenberg, Sweden and Weiz-Gleisdorf, Austria:** Many individual heating boilers based on pellets were installed in one-family houses as replacement of fuel oil systems. In these communities, the local energy agencies providing the funding tried to catch the occasion of private persons asking for funding to install pellets boilers to inform them on the advantages of implementing thermal renovation at the same time. This work was particularly successful in Weiz-Gleisdorf, Austria where many home owners implemented together a thermal building refurbishment with a heating system replacement.

#### How to maximise effectiveness of measures - controlling the quality

To ensure the effectiveness and efficiency of the measures implemented, the CONCERTO cities included construction quality assurance processes in the project. Without this, it is difficult to have any guarantee that high energy efficient performance levels are reached in practice.

The CONCERTO mechanisms put in place, during renovation works and new building construction, help to ensure that buildings are of consistently high quality and perform according to the targets which their design characteristics are intended to reach.

The CONCERTO cities have developed effective approaches which can be replicated by other projects. Some of them focus on specific training programmes for on-site workers, while others involve punctual and frequent verification of the quality of construction works. In some cases the measures are implemented voluntarily, but the most advanced cities have included contractual obligations for construction companies towards building developers in terms of quality assurance.

As a good example, a training model developed in Grenoble, France was replicated in Lyon, providing training for on-site workers in the CONCERTO demonstration area. The local energy agency initially contacted the construction companies to define the objectives which the training programme should reach, and designed an approach to ensure that they are achieved. Financial and technical partnerships were then set up with the national and re-



Delft. © Hans de Lijser

gional agencies responsible for funding to pave the way for organising training programmes in the construction sector.

Organised courses focused on technical topics such as thermal insulation, avoiding thermal bridges and achieving high air tightness. They also contributed to stimulating interdisciplinary awareness on construction sites, as specialised workers need knowledge about the work done by their colleagues from other technical fields in order to better coordinate their activities, thus improving the overall construction quality. The trainings took place on the construction site and are supported by practical examples. Participation was free of charge and the time spent in trainings is counted as working time.

The second important step in ensuring high

#### CONCERTO example:

**Delft, the Netherlands:** Some cities go even further to maximise the effectiveness of measures and control the quality of their construction works. In Delft, the construction companies are contractually obliged to implement all renovation works on a test dwelling before putting them in place on a larger scale in the entire building. In the event that standards are not being met, the construction companies must then continue to improve their works until the original performance targets are reached. This can be seen as one of the best practices among CONCERTO cities.



In Grenoble, the photovoltaic plant installed in the shopping centre also serves as a training and awareness raising instrument for the end-users and visitors of the multi-activity centre, since the semi-transparent photovoltaic plant is visible in a glass roof over the centre and a production meter visibly posted at the entrance of the site. © JM FRANCILLON

construction quality is to frequently check certain key indicators, which guarantee that defined quality standards are being met. The most common methods involve using infra-red thermograph pictures to verify that insulation components are correctly installed and that the main thermal bridges have been removed. Another test - blower door tests - involves measuring the air-tightness of the building envelope. In some countries such as Austria, Germany and Luxembourg it is today a pre-condition to achieve positive results on blower-door tests to obtain funding for the housing sector. Elsewhere in Zaragoza (ES) procedures are being developed in the framework of CONCERTO to include the results of such tests in certification documents. Among the 18 buildings inspected in the framework of the Renaissance project, only four had failures with the very severe tests of thermal insulation quality.

A strong collaboration between the devel-

Figure 6.







In Lyon, social mix and cohesion are important topics in the Confluence neighbourhood. All blocks include apartments from an upper price range as well as social housing. © Jacques DAMEZ pour SPLA Lyon Confluence

oper and the construction team ensures that renovation measures are implemented at the highest levels of quality. Contractual obligations are the only way to ensure the proper implementation of works. Tests carried out after the finalisation of works are informative but cannot effectively guarantee the quality actions because they are retrospective. Therefore, the process implemented by the Delft based housing company, Woonbron, demonstrates a successful way of guaranteeing high quality of construction works.

Optimising the energy system operation is a key element in reducing the carbon foot-print of any building and city. Analysing energy consumption data at regular time intervals and doing benchmarking proved to be the first step for pointing out energy saving potentials due

#### CONCERTO example:

**Weiz-Gleisdorf, Austria:** The actual energy performance of all public schools of the Energie Region has been analysed in a benchmarking process, pointing out which schools have the highest energy saving potential, mainly based on their construction period. The analysis was done on the basis of simple energy accounting work.

**Ostfildern, Germany and Neckarsulm, Germany:** Energy management activities were implemented more in detail for chosen public buildings, leading to a detailed sectorial analysis of energy use within the buildings. Consequently, energy could be saved through better control of artificial lighting or appropriate set-point temperatures.

to improper operation in buildings in CONCERTO. Many cities have worked with these methods. At a more advanced level, energy system can be optimised in real-time, both at building and at city scale. Generally, it consists in controlling operation of energy generation and storage units based on energy demand requirements at a given time, in order to meet efficiency targets in operation. Another point consists in influencing directly the energy demand profile through real-time demand side management. In CONCERTO' experience, implementing real-time energy system optimisation procedures on a city scale was extremely challenging. This was often largely due to technical difficulties (incompatibility between systems, poor monitoring data quality), or could be attribute to rather low acceptance levels (households and industrial partner). As a recommendation for any future projects, attempting to incorporate such procedures, the following steps should be taken:

- ✕ Define the targets and main responsibilities while setting the system at early project stages
- ✕ Involve the main stakeholders and communicate their individual benefits and contributions clearly
- ✕ Define standards to allow for a higher compatibility between monitoring and control systems

Beyond the proposition of different technical combinations of measures which could be successfully integrated in CONCERTO cities and can be so far recommended, following conclusions and recommendations can be more generally formulated by considering the assessment results of the quality of integration.

### Combining integration at city and neighborhood scale

Pure neighborhood projects have proven to be feasible when supported by dedicated implementation processes described in detail in the CONCERTO Planning and Implementation Process Assessment report. The main challenges for implementing together ambitious demand-side and supply-side measures in a given neighborhood are rather of organisational nature. CONCERTO could however demonstrate that new urban development projects are real opportunities for reaching a high degree of integration, in particular because requirements can be both for building energy performance and for the use of specific energy carriers, e.g. by providing a thermal energy distribution network based on renewable energy sources or heat from combined heat and power.

In existing neighbourhoods the possibilities for using on-site renewable energy sources might be more limited, but CONCERTO could demonstrate different combinations of energy supply technologies which can compensate also the higher challenges for reaching high energy performance standards after renovation.

Nevertheless, the real motivation behind the idea of “thinking at neighbourhood scale” is the available opportunities for synergies with other programmes and activities implemented at neighbourhood scale, which can always be seen as an added value for the implementation of the CONCERTO principles. In particular, this is a way to increase acceptance towards the measures while combining energy improvement measures with other activities in order to bring other non-energy benefits, thus leading to a general improvement of quality of life in the neighbourhood.

However, thinking only on a neighbourhood scale alone is not sufficient. For many aspects the city has to be considered as a whole and it would be artificial and contra-productive to try building a city as a sum of energy independent neighbourhoods which would not be “energetically connected”. CONCERTO could really demonstrate that in many cases, the best way to use renewable energy sources and waste energy or resource potential is to use these resources at the place where they are available or the most easily and directly accessible. District energy system infrastructure and alternative storage concepts (e.g. storing domestic waste instead of storing heat) are then technical answers for bringing energy where it is needed and in the quality it is needed. In some cases (mainly in the areas around Amsterdam/Almere and Delft in the Netherlands) these ideas are applied at regional scale.

Thinking on a city scale is even more crucial when it comes to reducing the overall environmental impact of a city, considering the reduction of transport needs and the corresponding energy demand. In CONCERTO, the city of Växjö (SE) already works on optimising the overall energy and resource flows, in particular by considering the use of locally generated biogas both for transport and energy supply applications (combined heat and power).

Even if the use of “technical integration measures” like storage and the application of city energy management concepts were required in CONCERTO, experience shows difficulties in implementing such concepts. Storing domestic waste instead of heat was demonstrated in Trondheim (NO) and could be replicated if sufficient space would be available. In CONCERTO, thermal energy storage at neigh-



In Almere, one can see solar houses in the Columbus kwartier. Its first house was completed in 1976. From the start, Almere committed itself to sustainable development, and it now has the aim of doubling in size – to 350,000 people by 2030 – in a sustainable way.

borhood scale were implemented or optimised (in case of existing systems) only when existing energy systems were being improved. Storage systems have never been implemented in early phases of new energy system developments (new neighborhood development projects), but usually after having monitored the system performance and pointed out the necessity of a storage system. This is also the best strategy to avoid investment risks in costly storage systems.

Building energy management systems were commonly used in CONCERTO buildings. The initially proposed innovative concepts for implementing energy management (with real-time features) at city scale turned out to be very difficult to implement. Demand side management programmes coordinated by utilities were based mainly on informing end users about their own energy consumption.

Such activities were successfully implemented for instance in Växjö (SE), mainly thanks to the introduction of an energy saving competition between inhabitants. The concepts for automated city energy management systems based on real-time optimisation were developed in many CONCERTO projects, but none of them could be implemented successfully, mainly because of IT-incompatibility between systems and difficulties to obtain the agreement of the main actors.

#### Architectural integration: solar thermal

Even if architectural integration of renewable energy technologies was not the core of CONCERTO requirements, cities could show various approaches for integrating solar energy technologies (there is only one example of building integrated wind turbine in CONCERTO) in the urban context. Photovoltaic panels were integrated on roofs and façades, assuming different functions (solar protection device) often also on public accessible buildings, thus increasing their visibility.

Building integration of solar thermal collectors was more limited in CONCERTO, reflecting the current development of these applications. Going beyond architectural integration, the “Solar Island” in Almere can be considered a successful example of spatial-formal integration of a large scale solar thermal field, because the position of the field is integrated in the neighborhood master plan.

Even if the primary energy savings induced by solar systems in CONCERTO are much lower than the one of large scale combined heat and power plants or wind turbines, their systematic physical integration into the urban environment could be supported if more products would be available on the market. ⚡



In Trondheim, the CONCERTO demonstration sites comprises a whole integrated community approach and demand side.



# PLANNING THE PROJECT



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# PLANNING THE PROJECT

## Scoping the project – setting the objectives

### Gaining the residents' acceptance

How can cities develop and apply innovative instruments to promote sustainability on a technological, institutional economic, social and environmental level? And how can all this be done within an integrated methodological framework for local sustainable development? The path followed by CONCERTO cities is mostly to integrate energy and sustainability criteria into urban regeneration and urban development.

One of the important lessons learnt from CONCERTO is that for the project to be successful, it must be accepted by the people whom

it affects. This is especially the case for retrofitting projects. In this instance, residents must understand why potential short-term inconveniences are necessary for their long term comfort. They must understand this in both environmental and economical terms. If inhabitants of the refurbished buildings are not involved in the planning process, problems will most certainly arise later on. It is a duty of the investor to ensure residents understand why renovation activities are being implemented, pointing to the savings that can be made on energy bills. It is also important that residents are informed and supported during the construction phase.

CONCERTO suggests conducting initial consultations with inhabitants when planning building improvements (not only thermal improvements). This should include information

campaigns and surveys even before the demonstration activities start. This is sure-fire way of increasing acceptance. The experience of Hannover in Germany can be considered exemplary. Before starting renovation, tenants were comprehensively informed by a meeting not only addressing the planned measures, but also by the impact on the rents and their energy bill.

Also in Turin (IT) there has been a targeted information campaign towards residents and an active participation of local citizens, some of which have been trained to conduct questionnaires, interview neighbours and carry out surveys. Press releases were prepared and the local media made public the local urban rehabilitation measures and accompanying socio-economic activities. This involvement has resulted into:

- ✕ Strong identification of the inhabitants with the rehabilitation process
- ✕ Balance between appropriate management of public real estates and sustainability of the costs for underprivileged people
- ✕ Participation as the method for the implementation of the measures

CONCERTO found that ideally sustainability targets should be clearly defined in dedicated documents like Sustainable Energy Action Plans on a city scale. However, in practice, and to support implementation, the measures proposed are integrated and coordinated with neighbourhood development programmes that are undertaken in response to other needs (urban development, quality of life improvement in existing neighbourhoods, etc...).

The CONCERTO cities follow different approaches, depending on the extent to which CONCERTO measures have been defined. Some implement different combinations of measures from their respective Sustainable Energy Action Plans over the entire municipal area, especially smaller cities with less than 70,000 inhabitants. Larger cities tend to incorporate the CONCERTO approach at a neighbourhood and/or district level, applying it directly in integrated neighbourhood developments or regeneration projects. This has resulted in a different concentration of demonstration activities in CONCERTO areas (geographic project scale) and thematic project focuses (social housing renovation in a defined neighbourhood, new neighbourhood development, etc...).

In existing neighbourhoods and urban districts, improvements in terms of overall energy performance could be reached through extensive renovation programmes and energy system optimisation. In large cities, urban regeneration is quite often driven primarily by the willingness to improve quality of life. Improving the energy performance of a given neighbourhood/district was wholly achievable using the CONCERTO framework. Identifying the framework of conditions

It would be easy if there was a 'one size fits all' approach, however given the diverse nature of European cities, governments and citizens, this simply is not the case. Therefore, taking into account the individual characteristics of the city is paramount. The level of centralisation or decentralisation of a country is the foremost element playing a role in the decision process. This has a considerable effect on the support provided by various political actors. CONCERTO projects have had varying levels of support during the implementation phases

across the various countries. It should be remembered that implementation is not solely dependent on the relationship between the central state and local level but also on the political and administrative traditions, regulatory structures, policy styles and the enduring influence of past policies. Approaches should be developed accordingly.

### Planning barriers

The complexity of CONCERTO projects often presents stakeholders with legal, administrative and acceptance complications, largely because the integrated approach is not commonly applied in traditional energy projects. Planning therefore must be undertaken with this in mind. CONCERTO advises planners to put in place structures to deal with delays. Be aware that obtaining permits within a short-time frame may not be possible. Likewise, understand that long lead times might occur during tender procedures, or project developers might be reluctant to follow a proposed process or implement a recommended technology. In other words, expect the unexpected. Delays are likely to occur, so plan ahead!

Bureaucracy at the municipality level also creates significant delays. It fragments the decision making process, e.g. the need to involve separate departments in the authorisation process, together with short term budget planning, and ends up delaying early project development. Time spent selecting, contacting and motivating relevant stakeholders are another



In Cerdanyola del Vallès, all demonstration buildings constructed are public development projects, including the housing projects which are all implemented by public-owned housing companies. These institutions are leading the sustainable building sector, thereby facilitating the implementation of ambitious energy performance targets. © POLYCITY

crucial point which characterises the planning phases, in particular for refurbishment activities. New agendas due to major political changes, e.g. new 'master plans', may also provoke delays and potentially jeopardise the possibility for a city to meet the CONCERTO requirements. Other problems may arise from difficulties finding appropriate developers in the private sector willing to meet CONCERTO performance and time schedule targets.

Technical barriers are quite rare and there are generally clear solutions to overcome them. Such barriers usually consist of use of new technologies in a demonstration phase that cannot be used properly (because the know-how is not yet available), do not work correctly (prototype development), do not provide the expected results or are simply too expensive.



In Almere, the CONCERTO communities have high ambitions with regard to mixed-use urban development and the aim at creating exemplary models in terms of high-quality city life is evident. Almere's high ambition is to implement measures achieved in environmentally intelligent design using environmentally safe and healthy materials; design for material reutilisation such as recycling; the use of renewable energy and energy efficiency; efficient use of water, and maximum water quality associated with production coupled by strategies for social responsibility ended up delaying decisions. © top-shot.nl for cRRescendo



In Tipperary, one the ambitious objectives (of SERVE) is to create a region in North Tipperary, Ireland which is a leader in the implementation of sustainable energy actions. © SERVE





In Valby, a characteristic of the Danish energy policy is that its outcome is generated through the cooperation of many committed parties. This commitment is continuous both in the Danish energy sector and through local activities. In negotiations with the energy companies, the government tries to ensure that the energy sector is well rooted in a democratic, consumer-oriented structure. © Dragør Luftfoto

In some cases, cultural and social barriers can also prevent the adoption of more innovative solutions. Above all, this applies to building energy technology and also to the construction of renewable energy plants.

As previously stated, being aware of potential delays is the key. Sometimes they simply cannot be avoided, but planning for the unexpected will prevent a project from being a disaster.

**How did the CONCERTO cities select their targets?**

As CONCERTO demonstrated, selecting targets and baselines for action is ideally done in adhering to national and regional targets. Working with national and local authorities in identifying specific targets and objectives is an important aspect of the planning process. Working with and beyond these national objectives has the advantage of having higher levels of acceptance and awareness with regards to climate change and energy issues. It also allows cities to take ownership of their projects and go above and beyond what is required.

The CONCERTO experience revealed that setting ambitious targets is achievable. Within the CONCERTO initiative, goals generally adhere to the national/regional guidelines, which take into account CO<sub>2</sub>-emission reduction and percentage increase in renewable energy source share and energy efficiency. Concerning energy efficiency, the cities are at least 30%

more ambitious in the demonstration area in comparison with national standards. When considering setting ambitious targets, it's important that they take into account the specific city's baseline. It is equally important to determine the focal point of the specific targets: Will the targets be based around an overall



Nantes is one of the candidates for the 2013 European Green Capital Award. It has set itself ambitious targets concerning CO<sub>2</sub> emissions reduction – the aim is to cut emissions by 50% by 2025. © Nantes Métropole

CO<sub>2</sub> emission balances? Will they have a larger focus on renewable energy source and rational use of energy?

It remains important to have a focus appropriate to the specific city. Some of the CONCERTO cities have had a great focus on renewable energy sources and rational use of energy. These cities include Zlín (CZ) (by having a leading role in its own country on renewable energy sources and rational use of energy and Grenoble (FR) (developing one of the first positive energy buildings). Other cities introduced energy criteria in the urban planning process (Cerdanyola del Vallès (ES) and Nantes (FR)). A significant number of CONCERTO cities have laid down visions more specifically related to city objectives, such as: increasing competitiveness (Grand Lyon (FR)); becoming an eco-metropolis, eco-city, or sustainable city (Nantes Métropole (FR), Almere (NL), Amsterdam (NL), Zaragoza (ES), Tudela (ES), Helsingør (DK)); becoming a green energy municipality (Trondheim (NO)); a 2000 Watt Society without nuclear energy as a source (Geneva, (CH)).

Under CONCERTO, specific targets were set for the general energy performance improvements. The most operative targets, (because of their direct transferability to building developers and responsible planning teams), were aimed at reducing the final energy demand for space heating and cooling per m<sup>2</sup> of building. Targets concerning the overall elec-

tricity use and the energy demand for domestic hot water preparation in buildings are more difficult to set and guarantee, as they are usually not included in the energy performance calculation. This is because they mainly depend on user choices and behaviour, and partly on the choice of building design. To guarantee the achievement of the CONCERTO objectives, targets should not only be expressed in terms of final energy, but also combined with primary energy targets, allowing thus to consider energy generation from renewable energy sources and/or combined heat and power plants.

At the energy political level, as learnt in CONCERTO, quantifiable and verifiable targets are set, enabling the assessment of different measures' overall impact. A particularly easy target to monitor is the floor area (in m<sup>2</sup> of eco-buildings) to be constructed or refurbished in a certain period of time. The same types of targets can be defined for energy plants (megawatts of installed renewable energy source plants).

**Involving the relevant actors from the start: a prerequisite for success**

**Stakeholders involved in the CONCERTO cities**

Reflecting on the CONCERTO experience, it is revealed that certain types of stakeholders are active in most projects. It is important understand who has a vested interest in a project so as to plan and implement it accordingly. Outlined below are the main groups represented and the roles they fulfil

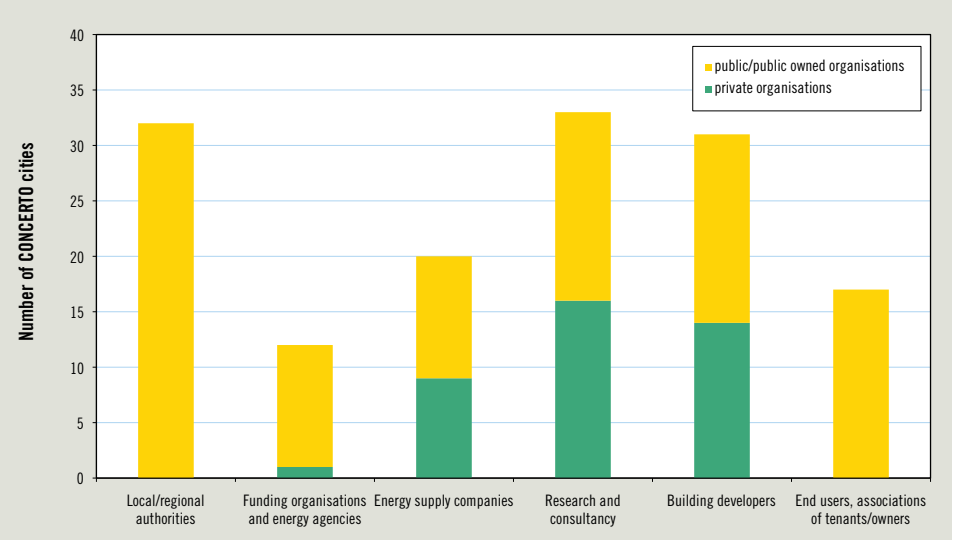


**✕ CONCERTO example:**  
**Stenløse, Denmark** (in photo): With national and regional urban planning as framework, municipalities act in Denmark as concrete planners on local level (zoning, infrastructure etc...). However the implementation of energy performance standards is not a mandatory. Thus the Danish municipality of Stenløse found an alternative solution – by making advantage of the extensive property law in Denmark, Stenløse acquired sites in the south of the municipality and set energy performance standards for these new development areas. The buildings (most of them residential) will have to keep the Danish Class1 standard which allows 50% reduction compared to national standard in 2006. ©Lisbeth Berg Egedal Municipality

to ensure a successful project. While it may not be necessary to have all of the stakeholders represented in the project management team, CONCERTO stresses the need that representatives of these groups are included, where appropriate, in project steering groups to ensure that effective communication and decision making takes place.

**Public authorities:**  
**local and regional authorities**

These are the main stakeholders, who are generally the driving force behind the project and also instigate action. Local and regional departments responsible for environmental issues, energy, urban planning and housing have tended to be leading actors in the CONCERTO initia-







tive. In the majority of projects, public authorities coordinate the entire planning process. This is hardly surprising given the fact that sustainable planning, including energy efficient buildings and a decreased dependency on fossil fuels, directly serves the interests of public authorities. At the forefront of their minds are issues such as quality of life in the city, and the need to be seen on a national level as doing their part to combat climate change.

Even in cases where local authorities did not initiate the project, they often remain key stakeholders cooperating principally with housing associations or utility companies. Cooperation is generally continued from the planning stages to the construction or renovation of buildings, as far as local authorities are involved in the implementation phases, e.g. to accompany the setting up of training or information campaigns.

### Energy agencies

CONCERTO found it commonplace for energy agencies to collaborate with or act as consultants to local authorities and other stakeholders. They are actively present in such cities as Grenoble (FR), Delft (NL), Lyon (FR), Milton Keynes (UK) and Neckarsulm (DE). In terms of stakeholder participation, these cities understood early on that local energy agencies are reactive and flexible tools, as they combine technical, economic, and social and communication expertise. Where feasible, CON-



In Ostfildern, the positive engagement by stakeholders has meant that they have not only accepted and acknowledged their role in the consortium or partnership, but also that they have provided the financial and time resources towards the project. They have also publicly supported the partnership and have helped to plan, review and refine activities based on their knowledge and connections as in the case of Ostfildern, through the regional economic promotion agency. © Riemann Aero Photo

CERTO advocates the involvement of energy agencies. These agencies hold an extensive knowledge base in the energy field, and often constitute an important network of local and regional actors in the energy supply and management fields.

### Funding bodies

CONCERTO finds that financial actors generally contribute a substantial portion of funds necessary to support energy-efficient building initiatives, which are also complemented with funds from other sources. Specialized funding institutions bring additional benefits in so much that their experience adds a certain degree of security to the project. A pertinent example in which private/public funding is used is in the CONCERTO city of Hannover (DE). In this case, both the municipality and the utility are the main contributors of a common fund called "proKlima, used to jointly finance a set of measures (ranging from thermal refurbishment to use of renewables)

### Energy suppliers

Within CONCERTO, energy supply companies and municipal utility providers are almost evenly divided between the private and the public sector. On the public side, energy supply companies are municipal utility companies while on the private side they can be considered as ES-

COs – usually a partnership between several agencies and firms with the goal of providing energy at a district or city level through energy contracting. The CONCERTO experience shows that it is advantageous to involve ESCOs in the project design and planning as early as possible in the process, might they be existing private utilities acting nationally or internationally and obtaining a concession from local authorities to supply energy to a given area for a given period of time, or local companies created ad-hoc, mostly in the framework of a public-private partnership. The choice between the one and the other solution should be done early in the planning phase, since it will influence the tendering and negotiation procedure which might take some years, as experienced by CONCERTO cities. Utilities play an important role in negotiating with building owners, which helps overcome legal barriers such as enforcing the use of district energy systems, which can usually not be included as mandatory requirement in local building codes. Another way to ensure a high degree of connection is to cooperate with local authorities, in the form of an involvement as shareholder (PPP) in the ESCO or in setting up subsidies for grid connection in given areas of the city where district heating is seen as priority technology.

Working in conjunction with municipal utility companies and private energy supply companies to produce consensus findings is strongly advised before commencing activities. This will help avoid and minimise any future barriers.

### Developers and building owners

Developers, housing associations and building owners form an integral group of stakeholders. They are responsible for the designing and constructing the buildings and facilities. The way in which they approach their work impacts greatly on whether or not the project will achieve its desired goals. In some cases, these stakeholders also manage the building once it is finished or maintain the newly installed measures when refurbishments are completed. In other words, this group of stakeholders are more often than not involved throughout the entire process, but only in specific phases, mainly depending on the type of neighbourhood. Usually new neighbourhood developments are initiated and coordinated by local authorities selling the land to single building developers, and trying to include energy requirements in development briefs. In case of neighbourhood renovation programmes, quite often the owner of the building stock (in many cases housing associations) initiates the programme. In some cities, housing associations



In the Confluence area in Lyon it has been a common practice that the developers required ambitious energy performance. © SPLA Lyon Confluence 1

play an important role in promoting energy efficiency and the use of renewable energy sources in their buildings because they typically build, own and operate buildings. They also often face the additional challenge of having to maintain affordable rents after refurbishments because they serve the low income and social housing market. This group of stakeholders should play a central if a project is to be successful.

### End users

End users include residents' associations and facility managers. This group is represented in a number of CONCERTO projects and fulfils an important role, ideally throughout the project and particularly once the project is finished. In cases of refurbishment, experiences show that including residents in the process through information campaigns, involving them in metering energy use and allowing them to provide feedback to designated persons when problems occur improves end user satisfaction. This also helps to promote a positive image of the project itself, an often neglected aspect of project planning.

### Benefits of public-private partnerships (PPP)

Partnerships between public authorities and private sector (PPP's) companies can be very beneficial, notably through combining and sharing public and private sector budgets,

skills, knowledge and expertise. Beyond this, PPP's achieve innovation and diversity in the provision of public services which is crucial in a fast-paced field of energy modernisation. In CONCERTO, ESCOs created in the framework of PPPs can guarantee that public inter-

### ✂ CONCERTO examples:

**Helsingborg, Sweden:** An innovative billing procedure was implemented by the municipal housing company Helsingborgshem to motivate tenants to save energy for space heating. This consists mainly in renting flats at a given temperature of 21°C. Choosing a lower set-point temperature leads to a discount in the rent, whereas a higher metered temperature results in a rent increase. The tariff structure is chosen in a way to be financially interesting for the housing company.

**Nantes, France:** In some communities, namely the French projects in Grenoble (De Bonne), Lyon (Confluence) and Nantes (Ile de Nantes) and the Spanish projects in Cerdan-yola and Zaragoza (Valdespartera), the development operations are coordinated by urban development companies owned by public institutions and operating on behalf of the local authorities. The development areas are always in public hand or if they are not, the development companies have the task to buy privately owned estates and sell them to building developers, thus having the possibility to include additional requirements to the sales contracts. The development company employs energy experts working directly with building developers. Their role goes beyond the task consisting in ensuring that energy requirements are applied. They have rather a guiding and consulting role for the building developers, guaranteeing thus a better understanding and implementation of the energy targets.





In Delft, the district heating company was created after a tendering process and involves, together with the winning company, the municipality of Delft and three housing companies, facilitating the connection strategy of district heating, thus making it economically feasible. All important decisions related to the extension of district heating, major investments and sustainability issues have to be taken jointly by the three “priority” shareholders. © Hans de Lijser

est (sustainability) is taken into consideration in an energy generation and distribution infrastructure project financed by majority by private funds (so-called “shareholder-driven approach” based on “priority shares”). This is a main added value compared to the traditional way of working with concessions given to private companies.

### Why joint decision-making in CONCERTO?

In undertaking CONCERTO projects, each stakeholder takes into account a number of factors when considering an investment. These include:

- ✕ perception of risks and uncertainties involved by adopting the measures
- ✕ future evolution of energy costs and prices

Conversely, the main challenge for public administrations taking up the lead is to mobilise actors that can influence the town agenda and, therefore maximise stakeholder support. The possibilities offered by public private partnerships (PPP's) have been explored in many forms by CONCERTO, and are mainly effective in fulfilling general public objectives such as sustainability in large energy systems investments which require the contribution of private capital. One should be aware of the longstanding issues that must be resolved, e.g. economic competition among certain stakeholders.

The experience of CONCERTO shows that stakeholders such as urban planners, architects, engineers, energy and climate consultants, property developers and builders are generally involved at the very beginning. Depending on the type of project (i.e. existing social housings, regeneration area, etc...), there has also been an inhabitant participation in order to identify needs at a project level. The majority of new neighborhood developments involve more than six different categories of stakeholders of which on average of two thirds are partly or entirely public organisations. In general, projects involving private building developers could only be successfully implemented thanks to additional technical support provided by consultants directly to the developer. In the few projects which included private building developers, this was the only way to guarantee the fulfillment of the energy performance targets. There are only two known examples of self-motivated and innovative private building developers in CONCERTO, who committed themselves to reach the proposed targets without a strong impetus from local authorities. ✕



# FINANCING



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# FINANCING

The CONCERTO cities demonstrate that there is a wide range of approaches possible when it comes to financing. This is particularly the case since the move towards more efficient and sustainable energy use leads to substantial savings over the life-cycle of the project. Even though initial efforts may seem tiring, the participating CONCERTO cities consider the investments in the sustainable built environment highly profitable in the mid to long-term. What is more, this is accompanied by an improved quality of life and a healthier and more sustainable environment.

## Financing with a long term vision

Costs to be taken into account when approaching financing

Traditionally, investors and developers look at the immediate outlay and aim to minimise

the amount of the initial investment. Consequently, this reduces the ambitions for achieving an optimised energy performance of the building. This is especially the case if the building is intended for sale or rent, because the buyer or future tenant will pay for energy costs and therefore only the costs that occur during the construction or refurbishment period will be taken into account. So what's the solution? The CONCERTO answer is the full life cycle costs and not solely the pure investment costs. A life cycle cost assessment makes sure that the building's energy performance is optimised taking into account the costs occurring throughout the whole life span. CONCERTO recommends that a life-cycle cost analysis is performed during the planning phase of a project. It should include the costs of CO<sub>2</sub> and show the external costs of CO<sub>2</sub> saved through the energy optimisation of the building project.

**CONCERTO examples:**  
The ING REAL ESTATE is one of the developers selected to build a monolith (offices, shops and a central open garden) in the SEM-Confluence area in Grand Lyon project. The representatives of the company underline how CONCERTO experience has positively influenced the company in raising awareness regarding sustainability. They have decided to focus their activities on sustainable urbanism and to take into consideration future maintenance. Since being involved with CONCERTO, they are now involved in a new pioneering "ECO-Quarter" project in the Region Ile de France.

How did CONCERTO attract and convince investors and solve the user/investor dilemma?

Fortunately these days, estate valuers and surveyors are aware of the economic risks linked with buildings that emit excessive CO<sub>2</sub> emissions and have high energy consumption. CONCERTO's projects solved the problem by setting targets that motivate developers to invest in locally available renewable energy sources and energy efficiency technologies. Renewable energy produced by the buildings is used to contribute to their economic viability, because any surplus energy not used by the buildings themselves can be sold to the network operator. This is further optimised when backed up by attractive feed-in tariffs for renewable energy source electricity, which in many CONCERTO projects represented an opportunity to finance part of the renovation works.

Pre-financing and guarantees - the best channel to secure pre-financing guarantees

Having public entities play the role of a financial guarantor is generally the best way to go. Financial, administrative and legislative changes affecting the original plan can usually be better buffered because resulting project delays may not cause financial disaster (as can often the case for private firms). They are also capable of bringing together large groups of stakeholders

who have an interest in participating in state of the art projects because a public entity represents a credible guarantee that the project will be carried through in its entirety. Without public-sector interventions for large-scale projects, funding is usually difficult to secure and interest rates are increased accordingly, sometimes rendering investment prospects less attractive.

## Financing models

All of the CONCERTO projects rely on a combination of financial sources. This includes linking the public and private sector together in the project under a public-private partnership, as well as developing a strategy to incorporate financing models such as energy service companies or energy performance contracting into the project structure.

The most difficult part of the financial plans is the last few percent. CONCERTO finances the last few percent (non-reimbursable grant) and thus leverages 10 to 30 times higher investment. In the Lyon Confluence, CONCERTO finances some 4.2 million Euros of the total project budget of EUR 140 million. This small share and the positive evaluation by the European Commission however were essential to the success of the project. The banks gained more confidence in the project and thus granted the necessary loans.

### Energy Service Companies (ESCOs)

ESCOs provide the capital flow and balance the costs of the initial investments by reaping the savings which come from significantly reduced energy demand later on. They provide finance and expertise to projects aimed at curbing energy demand and at the same time control CO<sub>2</sub> emissions. Another advantage is that they are able to exploit market benefits for customers by lowering the energy costs for their clients through their purchasing power and, in the case of private companies, by making profit for themselves.

Barriers include a lack of integrated planning, long pay-back periods for energy efficiency investments and procurement problems. Additionally, there is still a lack of knowledge about how successful ESCOs can be managed. The markets in Europe are at very different stages of development. Some countries such as Germany, Italy, France and Spain have large numbers of ESCOs, whereas others are just setting the initial steps. Sweden and the Czech Republic are among those countries where there has been a rapid rise in the number of ESCOs established in recent years.



In Grenoble, at the shopping centre "La Caserne de Bonne" generation of electricity from renewable energy sources is enhanced through different national measures and incentives. Amongst them especially prominent are direct and indirect financial and fiscal measures. France has applied a VAT reduction and developed an income tax credit. © JM Francillon 2010



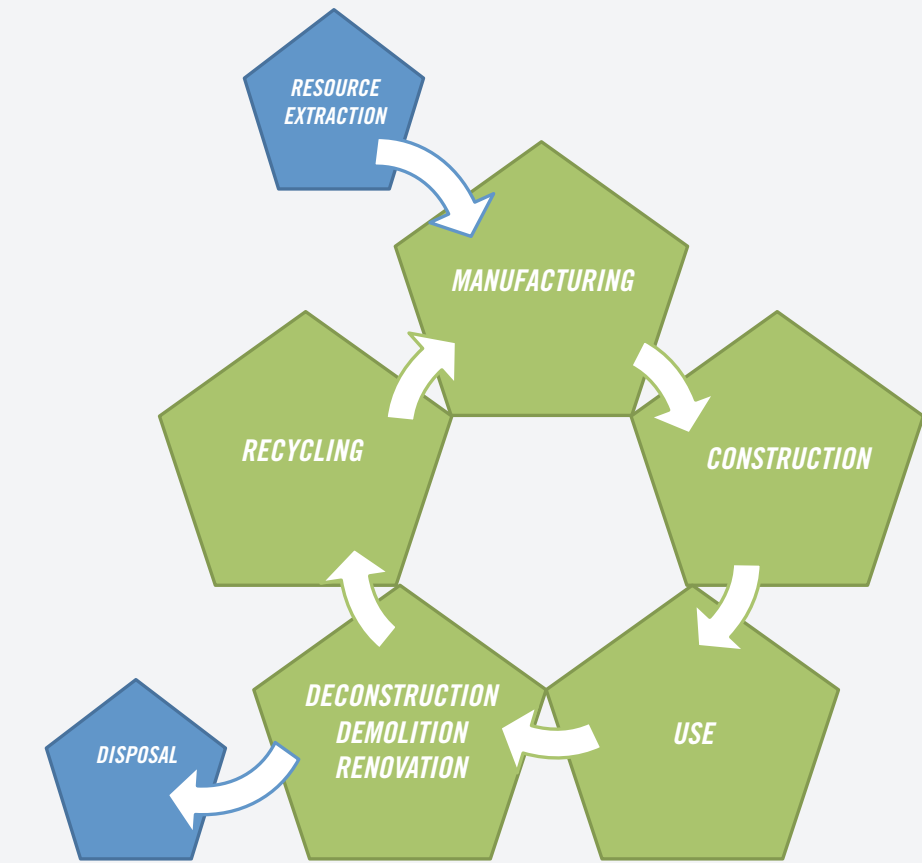
Lyon. © Depaule Asylum

Outlined below is an overview of ESCOs used in CONCERTO projects, which could be replicated in future projects.

In Delft in the Netherlands and ESCO has been established to build and operate the new district heating network. The district heating company (Warmtebedrijf Eneco Delft BV) was created after a call for tender to find the main private investor. This included the Dutch municipalities of Delft and Midden Delfland, as well as the four largest housing associations, thus giving a guarantee on a sufficient number of buildings

to be connected. Under these conditions, the district heating company could be economically feasible. Even if the private investor is the main shareholder (97%), the definition of so called "priority shares" is the key success to ensure that the ESCO fulfils the sustainability development criteria.

In Ostfildern in Germany, an innovative energy contracting model was developed between the municipal ESCO Stadtwerke Esslingen and the company ELEKTOR air systems which is the beneficiary of the ESCO concept (user of







In Ostfildern, the Scharnhäuser Park quarter of the town is home to about 7,000 inhabitants. All the buildings are built in low energy standard and are connected to the heat grid of a biomass plant with 6.3 MW thermal energy and 1 MW electrical energy.

cooling energy). All feasibility studies have been accompanied by a research partner (zafh.net). The ESCO concept is focused on using waste heat from the biomass plant - especially in summer - for cooling the office building. The chiller is installed at the office building but is owned by the ESCO which is delivering chilled water as an energy service.

In Geneva in Switzerland, the ESCO is managed directly by the municipal utility Services Industriels de Genève which is owner, designer and manager of the project. With the state which guaranteeing the financial risk, there was no major legal or regulatory problem, except for the financial aspect which was quickly solved. The project implementation was supported by the fact that the public financial guarantee was known from the beginning. The works were financed by the private company SERONO under a public financial guarantee (ScanE – State of Geneva). The building structure was oversized and prepared to be compatible with the future construction of the GLN network which was being designed at that time.

In Cerdanyola in Spain, the design, construction and operation of the city energy system (including district heating and cooling and large-scale use of solar thermal and biomass sources) was subject to a call for tender. A particularly innovative aspect of the implementation concerns the tender procedures for the ESCO. Experts from universities and consulting companies played a key role by preparing the pre-feasibility

studies and by providing the scientific methods for the set of requirements included in the call for tender for the ESCO. This was the solution for customising the city energy system based on the energy needs of the neighbourhood (electricity, heating and cooling) and the availability of resources. Had each single building developer chosen his own energy supply solution, there would not have been any possibility to implement the polygeneration plant in combination with district heating and cooling as it is being done. The shareholder structure of the ESCO in Cerdanyola (ES) reflects the degree of risk taken by the investors. The private investor owns the main share of the company (90%). The certainty that very large consumers (mainly public buildings) will connect to the district heating and cooling networks (mainly the synchrotron facilities) has been a guarantee for a secure investment and acted as a major driver.

In Växjö, Sweden, Energi AB is an energy company created by the municipality of Växjö and owned by the local residents. It is devoted to the provision of district heating and electricity (the Sandvik bio-fuel based combined heat and power plant) as well as the implementation of energy saving measures. VEAB has a wholly owned subsidiary responsible for the electricity trading company, based on a partnership of several local energy companies.

Indeed ESCOs were not appropriate in all CONCERTO communities. They usually are

only really needed when there is a need to use performance contracting and innovative financing mechanisms. Often they are considered key stakeholders when during the negotiation process, and can at other times help overcome legal barriers which sometimes present themselves.

In some cases there is already a strong financial legal and financial backing from the local/state authority itself, or building companies are already willing to adhere to environmental targets, hence an ESCO would not be of any further strategic value. Furthermore, ESCOs may be inappropriate in countries where swift action is required, running in to wide variety of administrative and establishment barriers, as was the case in some of the Spanish CONCERTO communities. Such companies may not also be the best option in which there are large difficulties associated with implementing new technologies on to the market, which may prove to be too risky for the investor.

### The CONCERTO learning's about setting up an Energy Service Company

In order to be successful in setting up an ESCO CONCERTO suggests:

- ✕ To start with a thorough analysis on which type of ESCOs is appropriate, when looking at the specific conditions

### CONCERTO examples:

**Hannover, Germany:** the municipal utility (Stadtwerke Hannover – enercity) together with the city of Hannover and neighbouring municipalities and organisations established the enercity-fund proKlima in 1998. The proKlima fund represents a unique model for the voluntary, local and cooperative implementation of climate protection targets. The climate protection fund awards subsidies if four established criteria are addressed: CO2-efficiency; absolute CO2 reduction; dissemination effects and level of innovation. The range of services provided includes financial subsidies, expert information and project advice. ProKlima Know-how and different promotional programmes support especially:

- ✕ Energy-efficient building and construction
- ✕ Consultations on energy-saving measures for tenants
- ✕ Installation of solar thermal applications
- ✕ Expansion of district heating and installation of combined heat and power plants
- ✕ School equipment, including teaching materials on climate protection and renewable energies

In addition, proKlima provides vocational training for tradesmen, engineers and architects and supports independent quality assurance. This scheme is a lighthouse example showing how climate protection can boost the regional economy.

- ✕ To avoid “business as usual” procedures, which hinder the transition towards sustainable buildings
- ✕ To fund pilot projects to improve best practice - either they show that the new approaches work and/or we learn from encountered difficulties on how to do it better

Public-Private Partnership (PPP) describes a venture structure which is funded and operated through a partnership of public bodies and one or more private sector companies for the purpose of providing infrastructure or energy services. PPPs are another approach tried and tested under CONCERTO. One of the relevant and successful CONCERTO approaches for stimulating PPPs is ensuring a future high degree of connection to a network infrastructure. This acts as a guarantee for private investors concerned with profitability. Both successful ESCO examples mentioned in the ESCO section are based on PPP's.

### Benefitting from financial incentives

All CONCERTO cities had to find ways to stimulate the implementation of ambitious energy performance targets, thereby making use of the incentives available in their cities, regions and countries.

In the field of supporting schemes for energy efficiency measures some of the main incentives available include:

- ✕ Financial support and state funds for energy efficient refurbishment

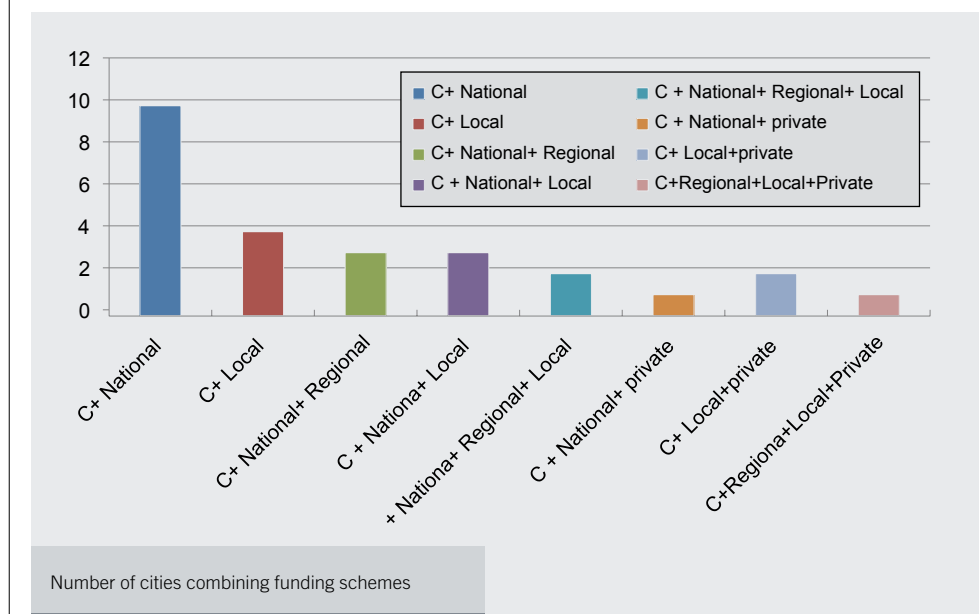
Loans for private investors and tax credits for energy performance equipment  
The range and depth of financing mechanisms

experienced in the CONCERTO pays testament to the fact that all available incentives when strategically availed of can have a major impact on the financial viability of a project.

### Obtaining public funding

CONCERTO projects have used a variety of public funding sources, mainly in combination with private sources. Evidently, all the projects receive some funds from the CONCERTO initiative itself, however most have complemented this with funds granted or lent by national, regional or municipal bodies.

Combining different funding possibilities: prerequisite for success in CONCERTO



In Amsterdam, an exceptionally broad consensus was reached among all housing associations to initiate the long term urban renewal of the “Nieuw West” area under the drive of the municipality of Amsterdam. The main housing associations having part of their building stock in the western part of Amsterdam funded the temporary organisation “Far West” to overtake the role of regenerating the area by 2015. Far West represents and temporarily substitutes every single housing association during the time urban regeneration will take place, decides over renovation options and negotiates with tenants, the municipality, etc...

In CONCERTO, financing was always combined from several sources. For example, the municipal budget was sometimes used for project preparation, energy audits, feasibility studies, interest payments and project management, while borrowed equity or grants was used for project implementation.

Local and regional energy agencies generally support the transition to more sustainable energy systems. They spread management practices, provide information guidance, offer a range of services based on specific local needs, both on energy demand and supply issues and assist in the search for energy-management incentive funds. As experienced in CONCERTO, one should be aware of na-





Ajaccio. © cRRescendo

#### CONCERTO examples:

**Ajaccio, France:** the urban renovation area is regarded as highest priority, which fulfils the requirements of the national agency for urban renovation (ANRU: “Agence Nationale pour la Rénovation Urbaine”, created in 2003 to improve quality of life in specific areas characterised by socio-economic difficulties. It benefits from financial support for the urban renovation programme (PRU). This support is much higher than the CONCERTO funding, but does not cover energy improvement measures, which are funded as part of CONCERTO activities. At local level, the programme is managed by the municipal urban renewal department. As there is no local regulation fixing minimal energy performance requirements to be reached after renovation works, the municipality selected housing companies which were interested in obtaining additional financial support to reach more ambitious energy performance levels.

**Salzburg, Austria:** In Salzburg the state government provides funding scheme for energy saving measures and the use of renewable energy sources in the housing sector. The scheme is based on energy bonuses which are provided depending on the energy performance and environmental quality of the construction. The amount of points influences the share of funding. Additional points can be acquired by the installation of special measures such as biomass boiler, ventilation with heat-recovery or district heating. This simple system allows implementing high energy performance criteria and helps increasing the share of renewables on the energy supply side.

tional funding possibilities, which often can be combined with other sources of funding to make a project economically feasible. In many cases these can be in the form of loans which are paid back in line with the savings achieved from significantly lower energy bills.

The presence of national and regional funds has been crucial in determining participation in the CONCERTO initiative, and CONCERTO funding also had a positive role to play. CONCERTO financial resources enable the completion of more complex projects, filling the gaps in national and local funding schemes. Multi-funding schemes in relation to the territorial scope and targets have been evaluated by the CONCERTO project as the most effective

instrument. The comparative analysis of 26 CONCERTO cities identified the use of eight different combinations of sources of finance in the projects (see figure on page 43).

#### Accessing EU funding

The European Union (EU) places a high premium on a rapid shift to a low carbon economy with rational energy use and conversion to sustainable, renewable sources. Thanks to the principle of subsidiary, (meaning that action should be taken at the lowest level of government) the EU looks towards local projects to achieve this shift. As such, a variety of funds are available. The funding opportunities at the

European level are constantly evolving, so it is important to keep an eye on new funds or new calls for tender by consulting the European Commission websites on a regular basis.

Many European countries have specific funding and support programmes for projects to increase the energy efficiency of their built environment and the integration of renewable energy systems in place. There is a centralised European database which gives information on national contacts on who can assist preparing applications for funding. It includes advice on technical and administrative questions regarding proposals, partner search, national priorities, and matching national co-financing possibilities, where applicable.

It can be found at:  
[http://ec.europa.eu/energy/intelligent/contact/national\\_en.htm](http://ec.europa.eu/energy/intelligent/contact/national_en.htm)

#### CONCERTO examples:

**Budapest, Hungary:** funds were raised from the EU, the Hungarian Government's Panel Plus programme, the local municipality and the homeowners. The 900 flats have been completely insulated: the renovation has included isolation for the roof and the entire façade, window changing and the renovation of the heat system infrastructure.



Budapest, Hungary



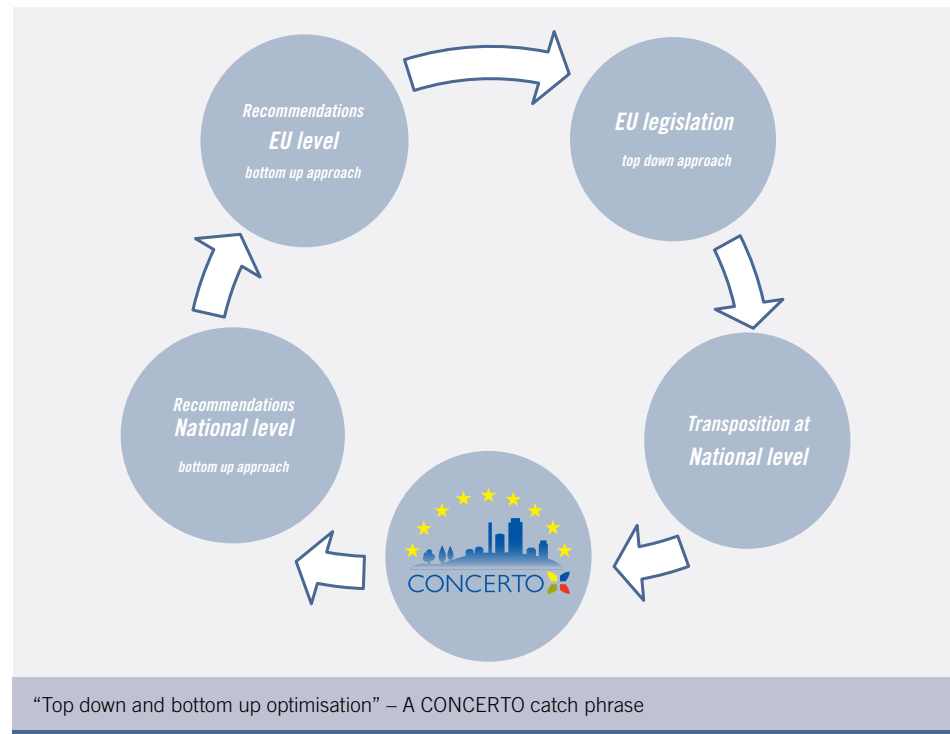
# CREATING THE ADEQUATE REGULATORY AND POLITICAL ENVIRONMENT



Regional & national level – implementing laws and procedures	50
CONCERTO solutions to technical, administrative and legal barriers	50



The involved projects have been a vehicle to implement top-down policies from national governments. At the same time the experimentation on new forms of policy at the local level has also led to bottom-up approaches. In other-words, CONCERTO has discovered that both bottom-up and top-down approaches can both be attractive. What remains important is applying the right approach in the right situation. For example, a bottom-up approach would be less attractive in France and Norway for instance in which government control is highly centralised and regions and municipalities have little responsibility regarding energy requirements. Such an approach would be more reasonable in Germany, where regional and municipal legislations play a major role in fostering energy efficiency.



In Almere, the CONCERTO experience is arousing interest at the national level. The national energy policy strategies have moved towards a major support for an extended use of waste heat from existing power plants, even if there are long distances (up to 20-30 km) between the plants and the cities where the heat can be used.



In Helsingør, the solar façade of the social administration office and job center has integrated solar shading and the use of daylight in the building is efficient. The local authority is responsible for planning and regulation, the following units being active participants in the project:

- ✧ The development department, responsible for strategic planning and follow-up on environmental measures
- ✧ The technical administration, which is in charge of operating the municipal buildings.





Regional & national level – implementing laws and procedures

An important aspect in planning is deciding on how it should be done at local level. It is all very well to have EU and national directives, but it is ultimately local governments which make the final difference. Cities involved in CONCERTO projects have further developed their local plans, pursuing the climate and energy objectives of their respective countries.

Strategic and operational planning applied in the CONCERTO cities

Climate plans are the most common instrument used at the local level and dominate strategic and operational planning in most CONCERTO cities. This tool usually reflects the structure of national plans or the principles developed by European networks such as the Aalborg charter, Agenda 21 and Climate Alliance. In these networks, such targets and planning mechanisms are provided in order to support local authorities in reaching their goals. Energy efficiency and renewable energy technologies are usually an operational means of reaching targets.

Already more than 20 CONCERTO cities are signatories to the Covenant of Mayors, a European Commission initiative actively creating sustainable energy policies. Being a part of this initiative, communities are required to submit Sustainable Action Plans within 12 months of joining. The relationship between the Covenant of Mayors and the CONCERTO initiative has been both complementary and reciprocal. CONCERTO, on the one hand has played a fundamental role in convincing councils to join the Covenant of Mayors and develop sustaina-

ble actions plans. Conversely, for CONCERTO, the Covenant of Mayors has proven to be a valuable support tool, encouraging municipalities to set-down methodologies towards political commitment and achieving targets. The two initiatives are both similar and self-sustaining, with both projects emphasising the crucial role of local authorities in the fight against global warming, and both aiming to create jobs locally and improve the quality of life for local inhabitants.

CONCERTO solutions to technical, administrative and legal barriers

All urban building projects inevitably encounter barriers, which often require innovative and creative solutions. With regards to new technologies, one expects to encounter administrative and legal barriers. In CONCERTO, these barriers have been generally related to obtaining temporary permits (especially for buildings or connecting polygeneration plants to the grid), obtaining authorisations for renewable energies and long lead times in tenders or procedures as well as unexpected delays.

Deploying the renewable energy sources: the common challenges

A common barrier encountered in CONCERTO has been the deployment of renewable energies and their likelihood to erode existing economic interests. In other words, deploying renewable energy sources is likely to encounter difficulties when companies already have an exclusive or vested interest in supplying energy to a particular area. Companies are likely to resist new technology if it places them in a more



In Trondheim, the state enterprise Enova SF administers the Energy Fund and supports through grants energy savings and environmentally friendly forms of energy production including renewable energy. The energy fund is financed through a levy on the transmission tariffs and by the revenue from the so-called “Basic Fund for Renewable Energy and Energy Efficiency”. The Norwegian regulation mandating connection to the network in the cases where district heating is available (the users pay the connection fee and the fixed part of energy) can be considered a good example for other countries.

precarious economic situation than would have been the case had nothing changed.

In the CONCERTO context, this was the case in Denmark. Within the CONCERTO project, natural gas companies had been granted an exclusive right to supply heating to the region and were therefore opposed to any renewable development (in this case a biomass boiler). Although these exclusive rights are slowly being abolished, the high workload of the judiciary and the complaints board meant that the case took more than five years to decide (in favour of biomass). As a solution, long term planning is required, with an understanding that such problems may be encountered.

It is equally important to understand the underlying reasons for project implementa-

tion delays as this can potentially have a strong impact on private investors. The comparative analysis of the cities shows that the real estate and financial crisis, is one of the main reasons for project implementation delays. This has a strong impact on private investors. Many of them encounter difficulties in respecting construction deadlines, especially in Spain and the United Kingdom. Furthermore, some countries are shifting financial support towards increasing employment measures instead of renewable energy sources and energy efficiency measures. This has a negative impact on the sector, slowing the development of new energy technologies and supplies. Understanding these reasons may help develop strategies to alter local government’s perceptions and highlight the need for a long-term vision of sustainable energy.

In CONCERTO, a surprise variety of barriers have been encountered in the different countries. Financial, technical, regulatory, administrative and cultural barriers have been encountered in the CONCERTO cities.

In countries such as Italy and France, it is difficult to reconcile historical preservation and environmental sustainability due to the large number of heritage buildings. This is particularly the case for solar panel installations. Encouraging authorities to be proactive is one possibility. Torino (IT) is experimenting with new models of governance with favorable results towards sustainability measures.

In France, in the existing building regulations, windows are considered as privately owned, while facades are publicly-owned. This aspect

can potentially lead to misunderstanding between the owners and the co-owning council. In Denmark, multinational companies mainly manage renewable energy. They can effectively block local renewable energy source activities if they do not agree with local plans. In Sweden there is a general problem due to the definition of minimal energy performance requirements for buildings. The same factors are used for electricity and for district heating. As a result, there is no particular incentive to give preference to district heating rather than electrical heating by designing a new building. Different problems presented in different countries should be incorporated into the implementation strategy of any project.

Recommendations

Leaders and officials of local governments have started to become more involved in climate change policy-making by undertaking strategic planning; formulating, approving and implementing appropriate policies, evaluating their effectiveness, and disseminating successful actions that might be replicated elsewhere. National governments in some countries have encouraged this trend, by returning, for example, the revenue from the sale of carbon credits to the local municipality that invested in an accredited renewable energy project.

Local authorities can serve as a vehicle to help implement top-down policies from national governments, deliver meaningful results and ensure national mandates are carried out. They can design solutions to climate change that are

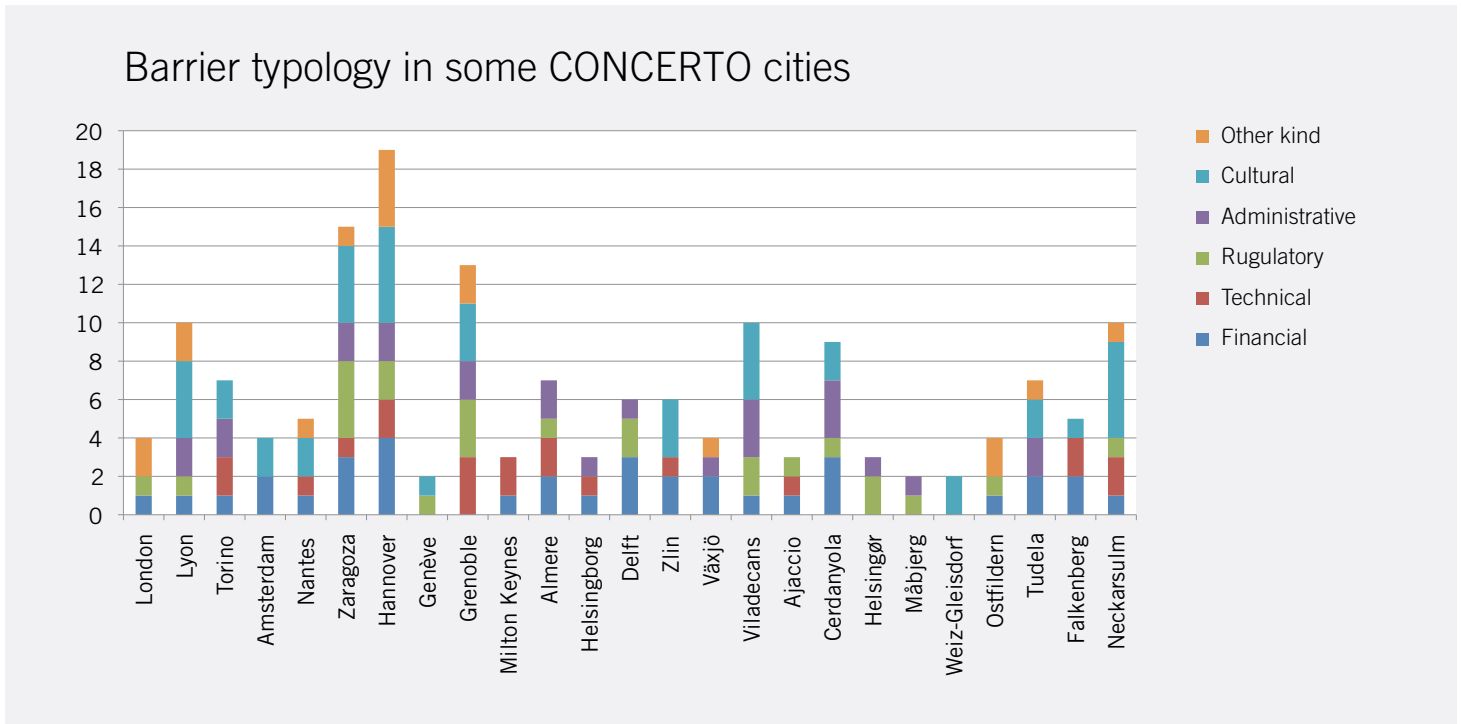


In Dundalk, photovoltaics have been installed on the roof of the O’Fiaich high school. The Irish government target is to achieve a 15% share of renewables in gross electricity consumption by 2010. Government supported Alternative Energy Requirement competitions have run since 1994. Following a call for tenders, competitors are assessed on the bid price per unit of electricity. Successful competitors are offered a power purchase agreement of up to fifteen years. © Padraig McGovern

adapted to the needs of local constituents and are consistent with local policy priorities. Experimentation on new forms of policy at the local level can provide learning and experience and, when successful and where appropriate, can lead to bottom-up diffusion of approaches between cities, at the national and international level. Social experimentation relating to renewable energy deployment and climate change mitigation can also be undertaken at the local level and when successful, adopted nationally. National governments therefore need to stimulate action at the local level in order to fully integrate renewable energy and climate considerations into urban development strategies. 🌐



Nantes is one of the CONCERTO cities which joined the Covenant of Mayors initiative. As part of a community-wide integrated project, Nantes partners combine an ambitious set of demonstration activities within the Ile de Nantes district with scientific and training-related collaborations. © Atelier de Portzamparc





# MEASURING SUCCESS



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# MEASURING SUCCESS

## Collecting data in a project

### The importance of monitoring

Monitoring activities are crucial in any supporting programme and should, as was the case with CONCERTO, cover more than a mere assessment of actual community energy performance aspects. In fact, the type of monitoring activities set up by each city depends on the general targets followed and the resources which can be allocated to monitoring in relation to the costs of the measure implemented. In any case, monitoring programmes should cover both technical and socio-economic issues.

In general, an effective approach to monitoring in CONCERTO was accomplished when:

- ✕ monitoring costs were not “too high” in comparison with the costs of the measure whose impact was being monitored (Monitoring costs should not be higher than the costs of the energy saving measures implemented.)
- ✕ monitoring activities delivered satisfying results in relation to the targets aimed. In particular, and if necessary, the results could allow a timely corrective action to improve the energy performance of the system being monitored (basis for energy management)

The main aspect characterising the CONCERTO initiative is that the scale of monitoring

activities has been extended from building to city level. Activities consisting in monitoring the use of energy are also, where possible, complemented by socio-economic monitoring covering the same geographical area. This combination enables a better interpretation of the results from energy performance monitoring and of the overall impact of the implemented measures. As energy use does not only depend on technical building features but also on user choice and behaviour, it is necessary to identify the socio-economic profile of a city (demographic data, income, general interest towards sustainability in general and energy issues in particular) to better understand its energy performance.

Cities cannot take charge of monitoring everything. Nevertheless, the CONCERTO experience suggests that it is ideally the city administrations which should coordinate different types of monitoring activities and collect general aggregated figures from the organisations that are responsible for this. This is the only way of knowing the real impact of

measures, of having a realistic picture of energy flows in the city and for taking corrective actions, if necessary.

### The implementation of monitoring programmes in CONCERTO

When applied at city scale monitoring is closely linked to the elaboration of periodical statistics characterising a city from different points of view (demographics and, more generally, socio-economic aspects, energy balance, etc...) Socio-economic monitoring activities look at a wide range of social aspects: acceptance and attitudes of the inhabitants and stakeholders, change of behaviour and reluctance to change, sense of city and involvement, etc... Activities should also address the quality of life of the inhabitants (as well in their living space) and their perception of the energy measures. Attention to criteria such as users' perceptions, opinions and satisfaction enables responsive action to be taken to meet the needs of users and stakeholders and improve performance in a targeted way.



Milton Keynes is considered to be one of UK's energy pioneers. The project there aims to give the inhabitants information so they can monitor their own energy consumption via intelligent energy management. Displays in some apartments show exactly how much power is being consumed. The project also features intelligent management on the supply side.

### CONCERTO Example:

**Weilerbach, Germany:** Raising the share of renewable energy generation becomes a challenging task due to fluctuating deviations between energy supply and demand in the distribution network. Thus energy generation from renewables, as well as the energy demand, needs to be managed in a way that the energy service is provided at the lowest possible cost. The German community of Weilerbach is implementing an energy management hardware and software system. This system will enable the management of a large number of small-scale energy generation units and customers distributed over the municipal area and gather monitoring data.

When applied at building scale and at energy plants, monitoring is carried out in order to characterise actual energy performance and user satisfaction. For buildings, this leads in particular to the calculation of energy consumption ratings (expressed in kWh/m<sup>2</sup>.a) for the different usages and pointing out potential energy savings. For energy plants, efficiency indicators or specific performance indicators (expressed for instance in MWh generated/MW installed and specific CO<sub>2</sub> emissions expressing CO<sub>2</sub> kWh) are used to quantify performance improvements for instance.

The CONCERTO experience shows that monitoring is ideally implemented at both scales. If this is done, cities have an instrument at hand to check on a regular basis the status and performance of the implemented measures, eventually taking corrective actions to realise aimed for targets. Thus monitoring will provide answers to following questions:

- ✕ is the local funding programme or the sustainable energy action plan on track to fulfil the original objectives?
- ✕ are the buildings and energy plants actually performing as planned?

The outcome of monitoring depends on the approach that has been chosen and on the availability and quality of data. The main challenge for city administrations is to find an original data sources (primary sources). A major difficulty for the socio-economic monitoring is the availability of a proper baseline encompassing information about the socio-demographic characteristics of the cities and initial status indicators.

Monitoring of performance and costs and user acceptance well allows a much better (and more precise) assessment of the financial risks and pay-back periods. Future investment plans in replication projects will become much more reliable and precise. Future decision taking will be much easier and faster, as based on a lower risk.

## Concrete monitoring approaches

One can distinguish a number of individual concepts, but in CONCERTO a mixed approach was often followed. Below are some examples of the different monitoring approaches used in CONCERTO:

### Detailed measuring of building energy use with dedicated metering equipment

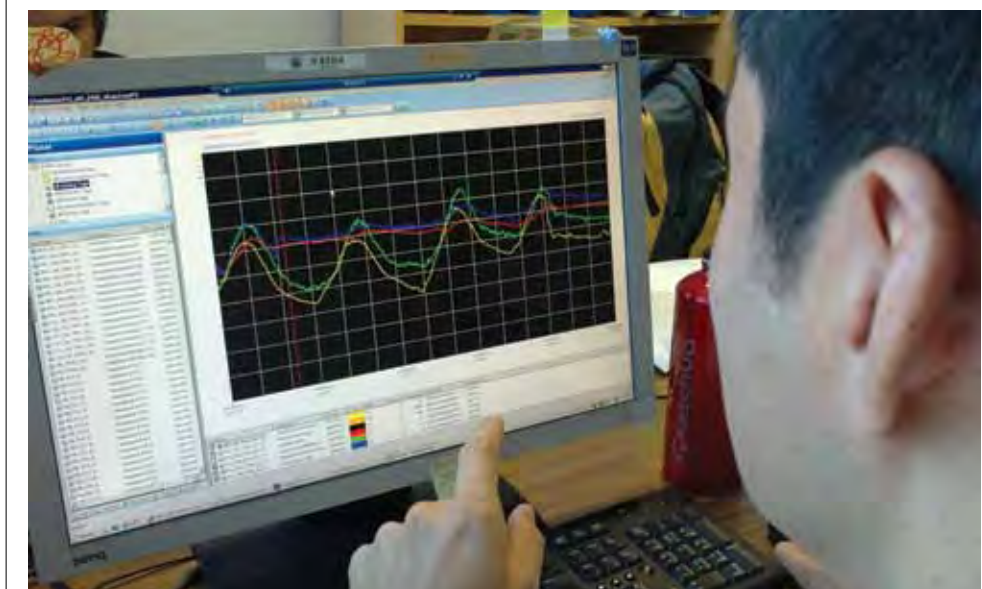
Some cities take an ambitious approach when it comes to energy use monitoring programmes. Their approach involves using dedicated meter-



In Grenoble, the traditional system consists of installing many stand alone data loggers at different places of the buildings and/or plants and exporting the data recorded in the embedded processor at the end of the monitoring period for post-processing and data analysis. With this system results are available at the end of the monitoring period. © Sylvain Frappat - Ville de Grenoble 2010

ing equipment (temperature and humidity sensors, heat flow and electricity meters, data loggers and dedicated servers) which collect over a defined time period energy use and include comfort parameters in a group of buildings. In Grenoble (FR) and Lyon (FR), a traditional sys-

tem using stand alone data loggers at different parts of each building provides the results at the end of each monitoring period. A functionally more advanced system with a combined fibre optic and GSM communication system operate in Zaragoza (ES), where database



CONCERTO cities implement energy use monitoring programmes for a high number of buildings and plants. The approach consists of using dedicated metering equipment (temperature and humidity sensors, heat, flow and electricity meters, data loggers and dedicated servers) to collect data during a defined time period energy use and comfort parameters in a group of buildings. Here, engineers in the University of Zaragoza monitor variables such as gas consumption, electricity consumption, lighting and temperature in real time. A most advanced system consists in connecting data loggers with devices (e.g. servers) having the task to collect data and implement post-processing functionalities. The frequency of data emission by the network connected data loggers (e.g. wireless) determines how often data can be processed. Real-time functionalities can be implemented with very high transmission frequencies for data packets. Such a system is implemented in Zaragoza in Spain with a combined optic fibre and GSM communication system. A database software is installed at the report acquisition server, which is directly coupled with information displays in a public assess building in the neighbourhood.





software is connected to real-time information displays in a neighbourhood public access building. The pros and cons of both solutions will be compared.

#### Energy management assisted by the measurement of energy use data and real-time data transmission

In a few cases, cities kept the metering system already used in the past for energy management targets. Such systems were implemented in public buildings in Ostfildern (DE) and Neckarsulm (DE), as well as in the residential buildings owned by the municipal housing company in Falkenberg (SE). They were adapted for individual building energy management and did not involve monitoring at neighbourhood scale, which sets them apart from the previous approach to monitoring.

#### City energy management assisted by measurement of energy use data and real-time data transmission

By far the most advanced and innovative monitoring systems implemented out of all the CONCERTO cities, the real-time city energy management systems are a combination of the two systems described above. Such concepts are being implemented in Turin (IT) and Cerdanyola del Vallès (ES). They manage energy generation and storage patterns using factors such as the varying energy demand and energy resource availability (real-time energy

management system), taking into account factors such as the weather and energy price forecast information. They are mainly adapted for complex energy systems and storage features in which there are many possibilities at a given time to provide the required energy service. The main condition for operating these systems is that energy use data for both buildings and energy plants has to be collected in a unique database (dedicated server).

#### Collection of energy consumption data from existing databases already gathering information on energy use

In certain instances, no ad-hoc metering system is necessary and the monitoring task mainly involves collecting data from pre-existing databases (e.g. databases for billing issues). This solution is used mainly for buildings being renovated, it is neither possible nor does make sense to implement an ad-hoc monitoring system before the renovation works have commenced. This data collection procedure has been implemented in Amsterdam (NL), Delft (NL), Hanover (DE), Nantes (FR) and Växjö (SE).

#### Collection of energy consumption data using forms and questionnaires distributed among consumers and users

For small and decentralised renewable energy systems, energy use is not always metered due to limited budget resources. For this reason,

the cities implementing such measures have decided to use questionnaires to be filled in by the end-users. It would not be serious however to allow a long-term energy monitoring programme to rely entirely on questionnaires, unless it is officially recognised as part of a census programme (usually only undertaken at national scale and at time intervals which are inappropriate for an energy programme).

#### Punctual (in space and time) metering of comfort and quality parameters

Punctual metering of comfort and quality parameters is a common activity that measures indicators of comfort and construction quality. For instance, infrared thermographs and blower door tests are carried out to check the construction quality of the building envelope. Air quality tests are carried out to ensure good health and comfort levels.

#### Socio-economic monitoring

Socio-economic monitoring relies on a set of indicators covering the three classic dimensions of sustainability (environmental, economic and social). Social data are normally gathered from census or through surveys (questionnaires and interviews) or even the weekly usage of diaries (as in the case of Turin (IT)). Economic data are derived from energy bills, interviews with stakeholders and simulation of energy parameters. Environmental indicators are usually simulated



In Ostfildern, the low energy POLYCITY demonstration buildings can be seen. Visualising the actual energy use of buildings directly on the neighbourhood map is a convenient way to understand the energy demand of a neighbourhood by indicating for instance the groups of building with the highest energy demand and those with a high energy performance. This method has been implemented in Ostfildern (Scharnhäuser Park), where energy use data is transferred automatically from heat meters to a dedicated database which is coupled with a Geographical Information System (GIS).

through modelling programmes. A number of cities have an ambitious and dedicated plan for socio-economic accompanying measures and use a large number of indicators for the socio-economic monitoring (Ostfildern (DE), Turin (IT), and Hannover (DE)). Other cities engaging in new development (e.g. Lyon (FR) and Cerdanyola del Vallès (ES)) have followed similar approaches. Other cities follow either a traditional and/or very focused (e.g. on economic aspects), but dedicated plan on socio-economic and soft measures as for example Amsterdam (NL), Zaragoza (ES), London (UK), etc....

#### Communicating the results

Going beyond the mere scientific and political task of assessing the actual impact of energy saving measures, some cities extend the use of monitoring data towards end-users, finding new ways of communicating results and getting additional benefits from available monitoring data. This approach is based on the conviction that the awareness of one's energy use can lead to additional energy savings. This is valid at each level and for each stakeholder group: for households, building developers and facility managers. Different methods have been implemented by CONCERTO cities. These are outlined below:

#### Use of price signals depending on actual hot water consumption and/or indoor temperature


The lessons from CONCERTO suggest that figures concerning space heating energy usage are always presented in combination with the air temperature reached in the rooms of a building. In fact, this is a practical way of checking if an abnormally high space heating energy usage is due to an overheating of internal spaces or excessive window opening during wintertime. In practice and even in CONCERTO, combining this with a price signal (increase of specific heat price in case of a high indoor temperature combined with high energy consumption) was rarely done.

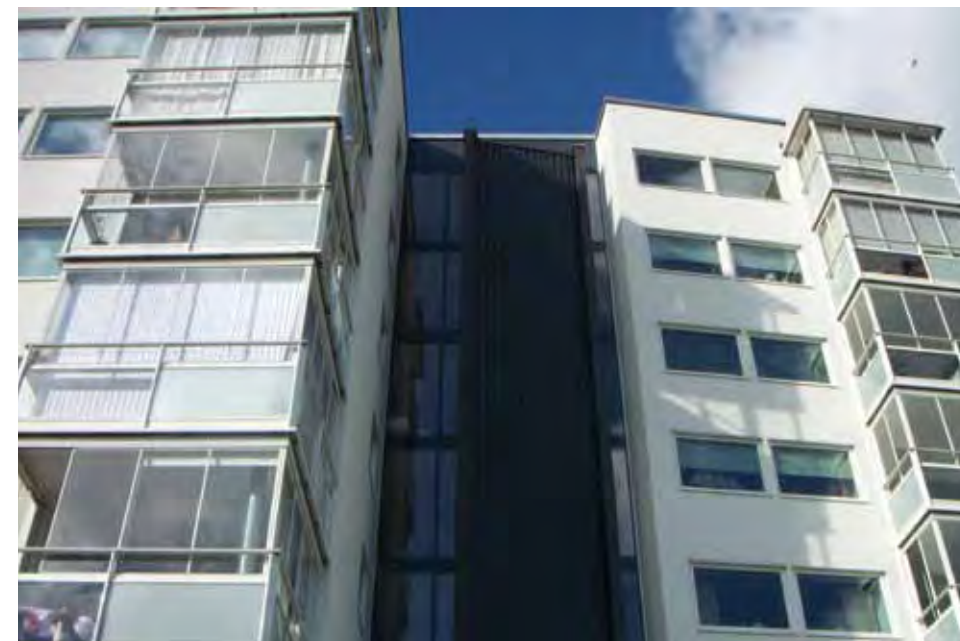
#### Display of metered energy use data at end users

There are two examples of CONCERTO cities employing this concept in different ways. In Växjö (SE), the municipal utility informs end users about their own energy use (both for electricity and district heating) through a user interface called "EnergiKollen". This interface is available online and can be accessed by every end-user. The municipal utility has also set up a successful energy saving campaign based on competition between households. In Falkenberg (DE), a comparable system has been

implemented by the municipal housing company and installed in the new dwellings built as CONCERTO demonstration activities. It consists of displays installed at each dwelling and providing information on the energy and water use, but also on other issues that might be interesting for residents (weather forecast, time schedule of public transport, etc...). By bringing into play competition between end users, the municipal utility in Växjö (SE) found a successful way of increasing tenant interest in reducing their energy bill. In Falkenberg (DE), by installing a dedicated display in end buildings, the municipal housing company wanted to be sure that tenants would check their energy consumption.

#### Presentation of metering results using a Geographical Information System

Visualising the actual energy use of buildings directly on the neighbourhood map is a convenient way of understanding the energy demand of a neighbourhood by indicating the groups of buildings with the highest energy demand and those with a high energy performance. This method has been implemented in Ostfildern (DE) (Scharnhäuser Park), where energy use data is transferred automatically from heat meters to a dedicated database that is coupled with a Geographical Information System (GIS). 



In Herting gårds area in Falkenberg there are over 120 low energy consumption apartments. So called "smart boxes" (displays) have been installed in every dwelling to inform the tenants about their energy and water consumption and compare the figures with the average figures for all tenants. © FaBo, Bengt Björnhammar



In Helsingborg, all flats in Kvarteret Fronten 3 are equipped with energy monitoring devices, to allow the occupiers to monitor their energy consumption.



# MAXIMISING THE SUCCESS OF A PROJECT THROUGH INFORMATION, TRAINING AND EDUCATION



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# MAXIMISING THE SUCCESS OF A PROJECT THROUGH INFORMATION, TRAINING AND EDUCATION

## The value of awareness raising, dissemination and training in CONCERTO

CONCERTO strongly advises providing information & awareness-raising activities to decision makers, investors, building owners, developers and housing associations, building users, and the general public. In CONCERTO, specific training activities are designed and targeted at decision-makers, planners, architects, on-site

workers, developers, housing associations, investors, owners and users.

The effects of providing awareness and information activities are more than worth the time and effort. They lead to outcomes ranging from better acceptance of construction works and general public interest about the results, to an improved perception of the district, a tangible increase of property value and concrete improvement in health and the quality of life in general. These are but some of the aspects of positive spillovers from successful informa-

tion campaigns. In the case of building users, and the city at large, it is useful to measure acceptance of a project both before and after an information campaign.

### Information campaigns and participatory approaches: ways to increase acceptance

CONCERTO has developed various examples of dissemination activities which can serve as an inspiration to any project team developing

#### CONCERTO Examples:

**Torino, Italy:** Awareness rising is an important element in the Turin CONCERTO activities. An image campaign was initiated at the very beginning of the project. Posters, leaflets and press releases were prepared and distributed. There has been an active participation of the local inhabitants including interviewing neighbours and carrying out surveys. Based on the results, a specific communication and training plan was developed and applied. The interviews were repeated a year later in order to verify the real impact of new sustainable interventions and to test the developed framework. The analysis of the questionnaire shows that inhabitants in Arquata generally appreciate the district they are living in and also value the interventions/new energy supply systems. Most people did not feel annoyed by the inconveniences caused by the re-

structuring measures and were satisfied about the interventions. Moreover, inhabitants of Arquata think that rehabilitation measures improve the quality of life and image of the district.

**Viladecans, Spain:** Additional to its demonstration activities in CONCERTO, the municipality of Viladecans organises training sessions for unemployed craftsmen in the building sector. About hundred craftsmen will get trained in the installation of renewable energy and energy efficiency measures to raise the chances on the labour market.

**Zlin, Czech Republic:** The CONCERTO project involved energy checks in all private, office and industry buildings in the demonstration area and provided a number of supporting measures, such as a general energy or climate plan, financial incentives, information and a public campaign, education, training, activities



of local energy agencies and networking for local actions. The success of implementation is due to a broad information campaign and seminars for private house-owners. Energy awareness in the community has increased significantly during the project. In Zlin, the information campaigns were very successful leading to increased energy awareness and a community that remains motivated to save energy.

**Växjö, Sweden:** A test house was built on the construction site of the neighbourhood "Biskopshagen" just for training purposes. Builders and other professionals could train their skills in applying new technologies (e.g. building air tight, installing thermal insulation panels, doing a blower door test etc.) just before applying it on the real project. This ensured a very high quality in the finished buildings, without needing to rely on ad-hoc contractual requirements.

**London, UK:** In the Roupell Park, a survey was carried out by small teams on three different occasions on each estate.. Residents were given the opportunity to opt out of answering the questionnaire. They were also advised that completing the survey would guarantee entry to a prize draw to win high street vouchers. Staff were trained in survey delivery and provided with identification. Surveys were carried out face to face on the respondent's doorstep. The surveys show that residents have a good level of awareness of the existence of environmental issues and may be open to changing their behaviour to reduce their environmental impact. The work on the estate is generally well supported, although it was felt by surveyors that this was mainly due to the appreciation of investment in the estates rather than specific support for energy efficiency measures.



Lyon. In some CONCERTO cities, stakeholders are active in promoting the benefits of the project to other cities. Active promotion of CONCERTO vision and objectives through stakeholders has resulted in transfer of good practices from one community to another. A typical case is the transfer of training for site workers on the CONCERTO demonstration area first implemented in Grenoble and then transferred to Lyon. © SPLA Lyon Confluence



The CONCERTO cities disseminate information about the project for example by producing leaflets and brochures.





its dissemination strategy. Some CONCERTO projects set up one-day courses or workshops which targeted municipal department employees, including the certification department, as well as conferences or seminars for mayors and top administrators. As experienced in CONCERTO, another key group benefitting from information and training is that of investors, building owners and developers. These actors need to understand why sustainability is directly beneficial to the local economy and of course that there are economic returns.

The target groups vary, but the goal is the same – to inform, disseminate and spread the knowledge. Methods include:

- ✂ activities and information to stimulate relevant departments to take up energy saving strategies
- ✂ excursions to innovative city planning projects and discussions with the project leadership and municipal decision makers
- ✂ targeted information sessions to update building owners, developers and investors about new technological solutions, their impact on the overall life-cycle costs,

the savings potential and innovative financing models

- ✂ information campaigns on the impact of energy certificates and the impact of sustainable of buildings on the development of property prices

Within the CONCERTO projects, different dissemination tools varying from simple information boards at the construction sites, to TV and local media campaigns were employed.

Another, effective dissemination method tested in CONCERTO, is to dedicate one of

the refurbished or newly constructed buildings to demonstration purposes. Many participating cities therefore dedicated an apartment in a block or a specific building, as a “showcase” and opened them to the public for visits during which the new installations and the principles of energy efficiency are explained.

**Reaching wide audiences**

The CONCERTO projects have found effective ways to reach a wide audience, thereby

improving the image of sustainable buildings and plants, and increasing peoples’ desire to live and work in them. Projects featured regular information in local media, such as monthly updates in a popular local paper. Featured magazines and news shows on television can be used for raising positive awareness about sustainable installations. Renewable energy sites such as wind and solar plants are often rather attractive for media, as in the case of the solar island in Almere in the Netherlands. The opening of the fourth largest solar ther-

mal system in Europe has enjoyed great media coverage.

In the Lyon Confluence (FR), very attractive and highly visible building design has led to high media coverage at its official inauguration. Within a few months, it has become an attractive place to visit by Lyon’s citizens and tourists.

Another possibility to reach a wide audience is the establishment of info points or centres. In Zaragoza (ES), for example, the CUS (Sustainable Urbanism Centre in Valdespartera) has been opened in June 2010 and is used for training and events and will host an exhibition on energy efficient building systems.

**Importance of involving the inhabitants and how it is done**

The CONCERTO experiences indicate that taking a bottom-up approach is the most effective way of persuading inhabitants to engage in a project, with the aim of giving them a sense of ownership over the project. In this respect, the key is to encourage participation right from the start, by taking a user-centric approach, and by evaluating the success by gathering information through specific district documentation of inhabitants (e.g. bills), interviews with stakeholders and simulation of energy parameters.

In countries with a tradition of strong tenants’ rights, and where residents associations have bargaining power, CONCERTO findings strongly outline the need to involve the stakeholders from the beginning of the project in order to gain the inhabitants’ and the whole city’s support.

Using leaflets through letterboxes, posters in prominent areas near the site and importantly special events convince residents that they are being thought of by the project team, and the information conveyed to them will lead to a better understanding amongst those who may initially be reluctant towards the project. It will also make them feel engaged in the discussion about the need for efficient energy use, and the new and existing ways to achieve it. Public dialogue rounds, (where residents are informed and involved about measures and possibilities), are a good way of increasing resident acceptance. Once people start to see that the project will benefit them in the mid- to long-term, they will be more willing to engage with the project.

Extensive renovation projects for existing urban neighborhoods are especially challenging due to socio-economic implications and sometimes due to resistance to change. The challenge is to implement comprehen-



In Zaragoza, the Valdespartera exhibition centre was opened on the 3rd of June in 2010. As a part of the ECO-City Valdespartera project, exhibitions are held in the centre with the aim to increase local public's awareness on energy efficiency and sustainability.





sive renovation activities that ensure significant primary energy savings, but at the same time also guarantee an increased social cohesion and a sense of place and identification of the inhabitants in the concerned districts. Thus taking into account tenants' needs and attitudes in advance can help enhancing readiness to change. The analysis shows that comprehensive renovation activities can be successfully implemented at neighborhood scale mostly when the specific needs of the inhabitants and stakeholders have been taken into consideration and when the concepts have respected social and cultural diversity, social cohesion and attachment to the existing neighborhood structures (e.g. Hannover (DE), Turin (IT), Amsterdam (NL), Zaragoza (ES)). These activities have been organised in a way to ensure at the same time that the social mix and diversity, social cohesion and sense of place in the concerned neighborhoods is maintained or even improved at the same time avoiding the potential negative effects of gentrification tendencies. In these cases targeted information and feedback of the residents was also a major concern.

The analysis shows that comprehensive renovation activities could be successfully implemented at neighborhood scale mostly when participative approaches involving residents in the renovation process were initiated at an early project phase (e.g. Hannover (DE), Zaragoza (ES), Turin (IT)) and supplemented by targeted information. In Turin (IT), for example this approach has been applied in the different implementation phases of the project (the design, implementation, training and monitoring stages) to involve stakeholders at each stage. In particular, a representative sample of inhabitants was involved to provide a communication support aimed at ensuring the most effective use of the new systems, to save energy and reduce costs. Thus some inhabitants have been trained to help filling the questionnaires, interview neighbors and carry out surveys. Inhabitants trained to interview tenants that act as multipliers were valuable to speed up the construction process, to take the pressure off the site supervisors and to increase the social acceptance of the measures. This was also experienced in Hannover (DE).

In countries with a tradition of strong tenants' rights, and where residents associations have a certain bargaining power, there is a stronger identification of the inhabitants with rehabilitation processes. In these cases a good balance between appropriate management of public real estates and sustainabil-

ity of the costs for low-income households has been achieved. The Ecostiler project in Amsterdam West (NL) carried out information campaigns targeting residents as well as a stakeholder dialogue. In the stakeholder dialogue, about 30 participants from citizen groups, local district councils and housing associations discussed intensively preferred energy and CO<sub>2</sub> reduction options for future housing renovation in their district. The stakeholder group extensively discussed options for combining rents and energy bills so that refurbishment activities do not increase the costs of living for the tenants excessively.

In Zaragoza (ES), focus groups were organised and formed by a limited number of inhabitants with a manifest interest in energy saving and ecology. The purpose of training this kind of residents was to create leaders who promote good practice in their homes. At the same time these residents became a point of reference of the project in the respective blocks. Through them a relationship could be established enabling to gather feedback.

But also in the case of new development early participation has been of crucial importance. The planning process of the Cerdanyola Directional Centre was accompanied by an important participation process. An information office was created from the very beginning of the project to show the development of the Directional Centre and to facilitate the information and the participation of the citizens in this process.

Communities that had dedicated socio-economic plans could better cope with difficulties related with:

- ✕ implementing comprehensive renovation activities that ensure significant primary energy savings, but at the same time also guarantee an increased social cohesion, sense of place and identification of the inhabitants in the concerned districts
- ✕ finding the right balance between energy improvement measures and quality of life improvement measures e.g. by increasing local acceptance of measures while renovating under occupied conditions for example by involving tenants (information campaigns prior to projects, metering activities by tenants, training tenants as advisors and potential multipliers)
- ✕ finding means to contact and motivate the various user groups
- ✕ identifying acceptance issues problems at an early stage and reacting to these problems by either adapting the project activities or taking these aspects into account for further activities

- ✕ designing support programmes and providing additional financing incentives

## Refurbishment in low-income areas

### CONCERTO Examples:

**Amsterdam, the Netherlands:** Dutch legislation requires that 70% of the residents must agree with the proposed changes to their building renovation. Good communication and direct involvement helps to raise awareness among residents of the positive impacts of sustainable energy. The Ecostiler project in Amsterdam West carried out information campaigns targeting residents as well as a stakeholder dialogue. In the stakeholder dialogue, the stakeholders involved discussed intensively preferred energy and CO<sub>2</sub> reduction options for future housing renovation in their district. The stakeholder group extensively discussed options for combining rents and energy bills so that refurbishment activities hardly increase the living costs for the tenants.

Often, refurbishment activities have been carried out in "difficult" areas. Due to the improved standard of the dwellings and buildings and of the infrastructures, the neighbourhood could become or is on the way to get a better image and therefore ranking. As a consequence, some districts are starting attracting also young persons and families with higher income, thus improving the social mix and possibly helping decreasing the level of unemployment.

In countries with a tradition of strong tenants' rights, and where residents associations have a certain bargaining power, there is a higher participation of residents in rehabilitation processes. Successful concerted gradual rehabilitation processes rely strongly on:

- ✕ Participation as key method
- ✕ Strong identification of the inhabitants with the rehabilitation process
- ✕ Balance between correct management of public real estates and sustainability of the costs for low-income households

The involvement and continuous engagement of different stakeholder groups is an essential element for acceptance of the measures and their successful realisation.

## Training for building professionals, installers, inhabitants & tenants associations



In Salzburg, several training workshops on renovation and air ventilation have been organized as part of the project activities in Salzburg.  
© Green Solar Cities

As demonstrated in CONCERTO, it is important to train the people who will use the buildings on a day-to-day basis, to ensure that user behavior supports the rational use of energy for which the project has been designed. Building users must know how and why their own behavior can further enhance energy performance in their houses, apartments and workplaces, increasing the comfort, health and well being.

### Target groups of training programmes

In CONCERTO, the target groups of building users have equally included caretakers and building managers, as they benefit from receiving even more detailed information and trainings than residents. In CONCERTO, there have been courses and workshops which trained this group on subjects including the energy balance of the building, the advantages of district heating systems, metering, lighting and certification.

Training for residents' associations is particularly important for renovation projects because it has been shown to increase understanding and, crucially, acceptance of temporary inconveniences and disturbances due to the works.

### Training of decision-makers

Increasing the knowledge and awareness among decision-makers on all levels about the possibilities for sustainable buildings and an ecologic urban development is one of the key priorities to positively steer the way how citizens will live and work in the future. The CONCERTO projects aimed at making decision-makers view energy criteria as a central consideration, and have better vision of the

### CONCERTO Examples:

**Hannover, Germany:** Successful activities in Hannover encompassed the energy advice campaign for low-income tenants in the district of Hainholz. Information material, both for tenants and promoters, as well as an online-platform has been set up to disseminate information to the target groups. The engagement of energy advisers, who went from house to house within the districts, has proved to be a win-win strategy. The adviser's work consisted of giving initial and intensive energy advice to house owners and tenants and of making recommendations for retrofitting measures and the correct use of wood pellet boilers, solar thermal and/or photovoltaics. Energy assistants also provided help in calculating energy consumption and applying for loans and grants.

Four low-energy-house training courses took place between 2006 and 2009. A highlight of the training was the production of the so called work sheet for implementing short trainings on quality assurance for craftsmen and skilled workers in the field of energy recovering building refurbishment for architects and planners.

options available to them. Therefore training sessions were aimed to equip local and regional decision makers with the knowledge of how a sustainable development programme is drawn up and how sustainable procurement can be achieved in practice. Some successful examples include:

- ✕ Workshops for civil servants and local decision makers on new regional, national and European energy legislation to improve their knowledge about the legal background for energy efficiency measures and renewable energy supply. The principles and the practical application of new legislation were presented and explained with the objective of giving local authorities better control over the application of energy legislation in buildings.
- ✕ Information tour for local Parliamentarians, Mayors, city councillors and other politicians to see the finished projects in operation. In this way, local elected representatives are informed about the results of the project and the benefits of energy efficiency measures and the use of renewable energies more generally. ⑤





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A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu>).





# NOTES

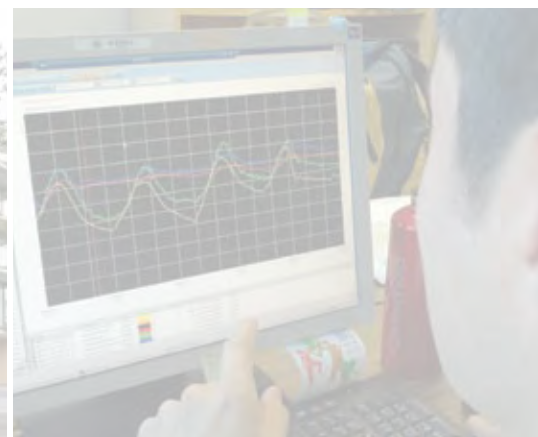
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