# Review of some INCENTIVE MECHANISMS being used by some EUROPEAN MUNICIPALITIES TO PROMOTE SUSTAINABLE HOUSING

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# INCENTIVE MECHANISMS IN EUROPEAN MUNICIPALITIES TO PROMOTE SUSTAINABLE HOUSING

## 1. Introduction

Since the publication of the Brundtland report 'Our common Future" in 1987, many countries including EU started to propose measures to promote energy efficiency and household sustainability. As part of this effort to promote sustainability the European Union (EU) and its 28 member states designated the building energy sector is a priority sector to try to reduce GHGs and promote sustainable development.

In 2002, EU approved the Energy Performance of Buildings Directive (EPBD) - Directive 2002/91/EC that started to be implemented by countries members. This directive offered a holistic approach towards more energy efficient buildings. It impacted the housing sector of member states at national, regional and local levels and was translated into Building Codes and policies for new buildings. Building companies and associations had to provide certification of their complete building stock, revision of their Energy Performance Certification schemes, implementation of their inspection of heating systems and air-conditioning systems accompanied with quality control mechanisms, training of qualified assessors, information campaigns, incentives and subsidies to support the implementation and acceptance of these new regulations.

In 2010 the EU revised the Energy Performance of Buildings Directive of 2002 with more stringent targets, indicating specific activities to be carried out to improve the energy performance of buildings and with special recommendation to include these procedures into their national and local building codes.

One of the most important actors in the promotion of sustainable housing is local government, as they are the ones who award most of the building permits. Local governments play a key role in the implementation of the EU and national policies, programmes and laws. Many EU cities are actively engaged in using incentives mechanism such as financial incentives to encourage energy efficiency and housing sustainability

Local authorities can choose to encourage housing sustainability on many levels. At an informative level, councils can encourage change by offering education, advisory services, technical assistance and in-house advice and education. Councils can also use policy to encourage change, for example, through the use of ratings systems for sustainability features and urban design initiatives. In a more proactive capacity, councils can offer flexibility within local planning provisions, fast track consents and use regulation to encourage change, for example, through bylaws and district plans. It is important for local governments to take into consideration when deciding on the viability of providing an incentive, whether this spending is a justified use of council funds or a reduction in the budget they have for infrastructure spending.

In respect of financial incentives, there are many ways in which councils can use financial incentives to promote sustainable housing such as reducing permit fees (Building Act), reducing user fees (rates), reducing consent fee waivers , providing financial assistance and capacity building (e.g. loans), providing discounts on particular products and services, providing development contribution remissions and providing financial contribution remissions.

This report was requested by the "*Green Homes Project*" in Nepal and its purpose is to give an overview of some incentive mechanisms being used by a selected group of cities (Amsterdam, London, Hamburg, Barcelona and Malmö) to promote sustainable housing. It is important to mention that most of these mechanisms are linked to the implementation of the new EU building code regulations which place energy efficiency and the use of renewable energy as a top priority.

The report consists of 4 parts: Introduction, EU Cities incentives mechanisms to promote sustainable housing, conclusions and references. In part 2 we introduce and discuss the implementation of the main

incentives mechanisms being used by the selected cities to promote sustainable housing and in chapter 3 we present a brief conclusion.

Throughout the report the reader will find in bold blue font hyperlinks to original documents (laws, plans, projects, etc.). By clicking on these the reader will be able to delve into any topic in as much detail as desired.

For the purpose of this report the following definition of "Sustainable Housing" has been used:

"A sustainable house is one that uses energy and material more effectively both in production and operation while polluting and damaging natural systems as little as possible."*(Green Building and Sustainability, John Straube, p. 6)*[1]

# 2. EU Cities Incentive mechanisms to promote sustainable housing.

Not only countries but also cities are required to make greenhouse gas reductions to reduce its annual emissions to achieve the new EU GHGs target by 2012. One of the EU key strategies to achieve this target and to promote sustainable housing is to make energy efficiency a compulsory aspect of all national building codes. Since 2012 all member countries need to adapt their existing building codes to comply with the new EU regulations. Once these new regulations are embedded into the national building codes, they also become compulsory for local governments.

Several instruments and initiatives have being proposed, developed and implemented by EU municipalities to comply with the new EU targets. Among these incentive mechanism we can find:

1. **Financial and fiscal incentives,** which are by far the most popular. This concept includes taxes, charges, subsidies and grants. Examples of these incentives are: carbon dioxide tax, petrol tax, reducing permit fees (Building Act), reducing user fees (rates), reducing consent fee waivers , providing financial assistance and capacity building (e.g. loans), providing discounts on particular products and services, providing development contribution remissions and providing financial contribution remissions.
2. **Economic incentives** are a key tool also for advancing sustainable development and can take a variety of forms. These are not just tools for the government but also for businesses and utility companies which can adjust their own pricing policy to ensure that their customers have incentives to conserve scarce resources. Examples of these incentives are: levies on waste with social and environmental benefits; pricing policies (spreading demand for electricity over a wider period reducing peak pressure); water efficiency and water wastage reduction projects; reduce flood risk and impacts of flooding.
3. **Promotion and Awareness incentives,** which can be delivered on many levels: informative level; local governments offering education, advisory services, technical assistance, in-house advice and education, demonstration projects.

For the purpose of this report the incentives provided and implemented by the European Local governments will be grouped into these 3 categories mentioned above.

## 2.1 LONDON's INCENTIVE MECHANISMS & INITIATIVES

As the UK is a member state of the European Union, its laws and regulations are required to comply with EU legislation and directives. During the 1990s many countries restructured their energy industry as a result of European pressure alongside other factors. In 2002 new directives were launched that defined an internal energy market including the building construction legislative framework with directives, principles, procedures and deadlines established in a clear, consistent and comprehensive

[1] Digital version of Green Building and Sustainability can be downloaded from this link:green building and sustainability

way. The revised EPBD in 2010 set even more stringent targets requiring the UK to reduce $CO_2$ emissions by 80% by 2050; in order to achieve this goal the UK has taken 3 important and complementary measures:

- Enactment of the Code for sustainable Homes (CSH) "The Code"
- The revision of part L of the Building Regulations (Conservation of fuel and power) and voluntary housing standards
- The launch later this year after a long consultation process of the BREEAM (The Building Research Establishment's Environment Assessment Method) 2014 revised and updated version. This is the most commonly used building rating tool in the UK.

Therefore, British cities are working extensively to strengthen their capacity to reduce energy demand and environmental impacts in cities, by working in the areas of building and transport technologies, district power systems, water, waste and urban planning. In the following part of this report we will try to show how London is applying the standards from the building codes to their projects and programmes.
When clicking on the underlined blue links you can access the original documents and websites.

### *2.1.1 INCENTIVE MECHANISMS & INITIATIVES TO REDUCE $CO_2$ EMISSIONS*

The Mayor of London has been working very hard encouraging all Londoners to get involved and work together in making their city more sustainable. The following are some of the incentives to reduce $CO_2$ emissions adopted by the city of London grouped by type on incentive.

1. **FINANCIAL AND FISCAL INCENTIVES**

   The **RE: FIT programme** has been established by the Great London Authority (GLA) and is a building retrofitting scheme to support public sector organizations to reduce their carbon footprint and subsequent energy bills. The target is for 40% of public sector buildings to be retrofitted by 2025; if achieved, this would reduce carbon emissions by over 2.5 million tonnes per annum.
   This scheme to reduce $CO_2$ emissions are a central focus of the strategy.

   To date, the RE: FIT programme has retrofitted 257 of London's public sector buildings in 28 London Boroughs.
   As an example we can mention the project in Tower Hamlets College. This comprises a portfolio of buildings ranging in age from late Victorian to modern day, and the objective is to reduce carbon generation by 20%.
   The energy conversion measures planned for this college are:
   - Renewal of the building management system[2],
   - Renewal of the main domestic hot water boilers,
   - Replacement of the heating circulation pumps with new high efficiency driven units and new atrium roof replacement.

   With these measures the college estimates to save 26% energy,
   For more information on projects retrofitted under this programme follow this link: RE:FIT projects

2. **ECONOMIC INCENTIVES;**

   The city is focusing on protecting its resources (water, energy and waste) and using these more efficiently. It has, therefore, developed strategies with the utility companies on: energy, water, and waste areas.

[2] BMS is a computer-based control system installed in buildings to control and monitor the building's mechanical and electrical equipment.

With respect to energy, the city has set out a target to reduce their $CO_2$ emissions by 60% by 2025 (from 1990 levels). London boroughs councils and social housing providers also have their own carbon reduction targets.

By clicking on this link you can access the city's website on environmental issues: London
The CSH categories 1, 2 and 3 (Energy and $CO_2$ emissions, water and materials) are addressed in London by the RE: NEW and RE: FIT programmes. Regarding the areas of waste and water included in the CSH, the city of London is also implementing several interesting projects that are mentioned in this section.

- **WATER.** In order to comply with the CSH – category 2 which refers to reducing internal and external water use, the City's strategy is focusing on Securing London's Water Future aiming at reducing consumption and increasing water efficiency by:
  - Investing in water management and the sewerage system
  - Supporting and encouraging Londoners to take practical action to save water and energy in order to reduce their utility bills. With respect to water the City the GLA is working with the four water providers (Thames Water; Affinity Water; Essex and Suffolk Water; and Sutton and East Surrey Water) to introduce a Universal Water Metering System. Currently Londoners pay less for their water services than many other areas in the UK because they pay a fixed charge for their water and sewerage services. Water meters will help in reducing water consumption but will create water affordability problems; the Mayor will work with the water industry in order to address these problems.

## 3. PROMOTION AND AWARENESS INCENTIVES

This section covers the efforts made by the GLA in promoting awareness campaigns among Londoners and providing advisory services, technical assistance and in-house-advice and education to people on how to increase the sustainability of their homes through the active participation of the community.

- **WASTE.** Is included in category 5 of the CSH and indicates that in order to increase the sustainability of homes waste should be recycled, reused and reduced. In this respect the ***GLA is offering information, education and advisory services*** and is implementing several initiatives and projects such as:
  - 'Recycling Saves Money campaign' – targeted to 'non-committed recyclers'. Focusing on the fact that recycling saves money for the city, 31 out of the 33 boroughs participated, saving London £ 30 million last year.
  - 'Waste reduction campaign' – with the slogan 'less in your bin, more in your pocket', launched in Wandsworth. Residents were challenged to reduce the amount of rubbish they produced by one kilo per week, saving the Council £ 500,000 a year.
  - 'Community composting' – This is a waste prevention implementation plan with which the community benefits by no longer having to purchase compost. The Boroughs that participated were Hackney, Warburton, Darcy, Hoxton
  - 'Business waste recycling collection services' – This is an innovative commercial waste collection service implemented in the boroughs of Kensington and Chelsea with a strong recycling focus. The service operates seven days a week with three collections a day for recycling customers.

For more detailed information on waste projects and London's waste management strategies follow this link: Municipal waste projects

- The RE: NEW programme – domestic energy efficiency. In this programme ***the Greater London Authority (LGA) is offering In-House Advice and Education***. It has been designed to allow every home, regardless of tenure of housing type, to benefit from measures to help them reduce energy bills and stop wasting energy. A package of easy measures is installed in each household by a trained energy advisor who explains how the customer can make changes to their behaviour to stop wasting energy and water, at the end of the visit the advisor produces a personalized report for each property as an output. Part of the easy measures recommended includes: standby savers, low energy light bulbs, installation of LED luminaries, hot water tank jackets, chimney balloons, draught-proofing a home, tap aerators and shower timers.

  This programme has been implemented in partnership with London Development Agency, the Greater London Authority, London Boroughs, London Councils and the energy Saving Trust.

  **Results**
  The programme has improved energy efficiency in 55,000 homes in several Boroughs, among them: Camden, Croydon, Haringey, Harrow, Havering, Kingston, Lewisham and Southwark.
  The RE: NEW, Home Energy Efficiency for tomorrow – Good Practice Manual can be downloaded from this link: RE:NEW Manual.

- Continuing with the ongoing process of learning from developments built into the Code standards, and in order to promote amongst developers and communities the building of sustainable homes, the GLA has started the ***promotion and dissemination of these projects*** by commissioning different organizations to research and develop a four set of case studies on some of the developments that are being built according to "the Code" standards. The four volumes can be downloaded from this link: Code for Sustainable Homes: Case Studies.

For the purpose of this report we have chosen the project in Graylingwell Park which provides green solutions for new build and refurbished domestic buildings as well as the area as a whole through commercial and community amenities including allotments for residents to grow their own food, a farm shop, gallery space and office space. In this project national and local incentives have been implemented in order to achieve their goal to become one of the first developments in the UK to be net zero carbon.

As a ***demonstration project*** we have chosen:
Project Case Study: Graylingwell Park
This projects is built on an 85-acre former hospital site, is offering 750 new and converted homes along with nearly 8,000m² of commercial and community amenities.

In order to use energy efficiently in buildings, photovoltaic panels and roof panels are being used and all appliances are energy efficient. The homes are expected to use around a third less water than usual. Rainwater from the roof will be collected and stored in rain-water butts and will be used to supply water to irrigate the properties back gardens. More than 50% of the roof area is used for rainwater harvesting or green roofs.

## 2.2 BARCELONA's INCENTIVE MECHANISMS & INITIATIVES

We have been describing in this report some initiatives and strategies taken by some European cities to reduce their carbon emissions as required by the 2010 EPBD. Several cities have focused on renewable energies and have developed global concepts of sustainability in order to comply with their National Building Energy Codes and, Barcelona is not an exception.

The Spanish Building Code is called:"Código Técnico de la Edificación" (Building Energy Code[3]) and all the local governments need to comply with this document which requires:

Energy demand limitation, energy efficiency of lighting installations, solar contribution to domestic hot water and electric power. The city has focused on the use of sun as a natural source of energy because it has an average of 2,800 hours of sunshine / year.

The City of Barcelona intends to achieve an energy reduction potential of 58.2 GWh/year (-19.59 % of 2008 per capita energy consumption) and 14,827 t/year of GHG emissions (-23.45 % of 2008 per capita emission value). With this 23.45% GHG per capita emission reduction by 2020, the city will accomplish the Covenant of Mayors Commitment.

### *2.2.1 Incentive Mechanisms and Initiatives to reduce $CO_2$ Emissions*

The municipal elections in Barcelona in 1995 resulted in a new coalition where the Green Party was elected for the first time in the city's history and the Sustainable City Councilor was created with the commitment to push programmes for the development and diffusion of renewable energies and created the Barcelona Thermal Ordinance.

1. **COMPULSORY REDUCTION OF $CO_2$ EMISSIONS**

   The first "**Solar Ordinance**" (webpage in Spanish) was the first ordinance in a large city in Europe, and it reinforced the Spanish Building Code in Barcelona. It came into force in 2000 and was updated in 2006. The purpose of this ordinance is to regulate the incorporation of solar thermal energy and is use for the production of sanitary hot water in the city's buildings. This ordinance affects new, restored and fully refurbished buildings and those seeking to implement change of use. This regulation appliers to buildings intended for residential, health-care, sports, commercial and industrial use and generally, any activity involving the existence of canteen, kitchens, laundries or other circumstances that lead to a large consumption of hot water.
   This ordinance is enforced by random installation checks and fines between € 6,000-60,000 for the violation of the ordinance.

   To make the implementation of this ordinance possible different incentive programmes were used to promote, encourage and motivate people in the use of these new technologies and change of behaviour such as:
   - Training courses for professionals
   - Solar thermal guide
   - Information to assist users in the implementation process

2. **FINANCIAL AND FISCAL INCENTIVES**

   All PV installations can benefit from the Spanish feed-in-tariffs. Besides this, the Institute of Urban Landscape and Quality of Life provides subsidies of up to 25% of the installation costs for private buildings.

   The Buildings Consortium in Barcelona (*Consorci de l'Habitatge de Barcelona*) promotes the refurbishment of buildings through a grant programme with the aim of improving their acoustic levels and the reduction of electric consumption. This programme comprises:
   - Refurbishment of buildings; which includes thermal insulation of facades and roofs
   - Refurbishment of individual housing units including; thermal and acoustic insulation (window frames, double glazing) and installations of renewable energy.

   This grant programme is addressed to housing associations and private owners. Among the requirements are
   - A minimum of 70% of the building should be for residential use

[3] El Codigo Tecnico de la Edificacion (Building Energy Code) is available in this link **codigo tecnico** (only in Spanish)

- The minimum budget for the improvement should be€ 2,000
- The building should have been built before 1981

3. **ECONOMIC INCENTIVES**

The municipality of Barcelona has invested in its **waste collection service** in order to improve its efficiency and is encouraging communities to reduce, reuse and recycle their garbage. The city has distributed containers in a way that makes them accessible for everyone. Currently the city has waste disposal containers for organic matter which has completed the range of selective waste disposal options, which already includes those for general household waste, glass, paper, cans and plastic. This activity has been accompanied by public awareness campaigns to encourage households and business to get used to separate their garbage. One of the important characteristics of this service is that it has been adapted for the blind with tactile symbols indicating the container's waste type.

4. **PROMOTION AND AWARENESS INCENTIVES**

***Demonstration projects*** in municipal buildings have been present in the city for several years to support the use of renewable sources, to inform and educate the people with awareness raising campaigns, and stimulate the use of these technologies amongst the community and private sector. Some examples are:

- The installation of solar systems in schools, cultural centres, public libraries.
- The solar thermal installation in the Olympics Swimming Pool or the solar photovoltaic installation in the Town Hall building. The pergola placed on the roof of the town hall has a power of 85 kWp, its collectors take up 650 m² and it generates 93,000 kWh every year. This implies that almost 10 metric tons of $CO_2$ emissions are avoided.
- Urban solar PV power station "Solar Pergola" – Instalment of 10,700 m² of photovoltaic modules (energy obtained to serve about 1,000 homes)
- Ecoparc District heating and cooling system – The incinerator plant will be transformed into an Ecoparc facility. It is based on the use of steam generated and will supply hot and cold water to the nearby neighbourhood.
- The conversion of an industrial and marginal area in a new central area of services and leisure, integrating the environmental infrastructures in the city. The urban solar power station is located in this area and produces energy to 1,000 homes during the New District Barcelona Forum.

## 2.3 HAMBURG's INCENTIVE MECHANISMS & INITIAVITES

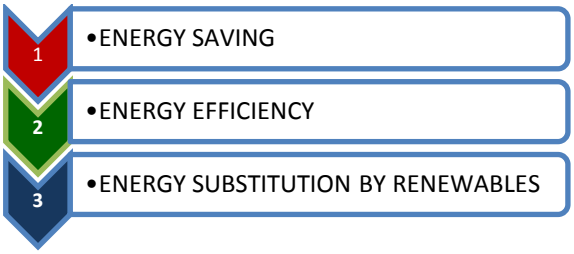
Germany is the EU's biggest energy user, with limited internal energy supplies but a strong track record in energy saving in buildings. The use of energy is 10% higher than the UK (Europe's second highest per-capita user), partly because of the large part manufacturing plays in its economy, and partly because of its wealth. Its commitment to energy savings for buildings dates back from 1977.

The first performance – based code was introduced following the implementation of the EPBD in 2002. The 2009 version of the code and supporting policies encompasses many progressive aspects including: air-tightness requirements, well established incentive schemes, frequent boiler and HVAC testing, robust EPC programmes, voluntary low energy classes and a national target for carbon free buildings by 2020.

Within Germany, Hamburg is a major industrial centre and facing all the environmental challenges that confront other European cities. The city has already made excellent progress in environmental protection and intends to increase these efforts. Hamburg implements all aspects of European environmental policy, enacted in the German building energy code, and aims to achieve a substantial contribution to the national goal of 40% $CO_2$ reduction by 2020 and 80% by 2050. So far, the $CO_2$

emissions per capita has been reduced by about 15% compared to 1990 with annual energy savings of about 46,000 MWh.

The city has a clear hierarchy of goals to comply with the regulations in the German building energy code:




### *2.3.1 Incentive Mechanisms & Initiatives to Reduce $CO_2$ Emissions*

In order to achieve a substantial reduction to $CO_2$ emissions the city is focusing on creating demonstrative projects, clusters, involving different stakeholders and creating subsidies as mentioned below:

(All the original documents can be accessed by clicking on the links underlined in blue)

1. **FINANCIAL AND FISCAL INCENTIVES**

   As mentioned before, the German building code sets out the compulsory framework to produce greener and energy-efficient buildings; but since the implementation of these guidelines are very expensive the local government had to establish a number of schemes to support and encourage the application of these guidelines. Here are just some of the subsidies implemented by the municipality.

   - Through the IFB Hamburg which is an investment and development bank, direct subsidies are offered for implementing a higher standard within the social housing programme and energy improvement measures by the state-owned bank. The IFB is working together with the KfW[4] and offers a programme called "Energy Efficient Building". This programme promotes the construction of efficient and passive houses through low-interest loans. The level of funding is €50,000 per unit and the repayment term is a maximum of 30 years with a between 1-5 years grace period.

     The bank has other programmes within their "Environment and Energy Programme" such as: Thermal insulation in existing buildings, energy efficient modernization, renewable heat, energy-efficient rehabilitation

   - Direct subsidies for installing renewable energy systems such as solar thermal panels or biomass systems by the Hamburg Ministry of Urban Development and Environment.
   - Subsidy programme for enterprises to improve energy efficiency.

2. **ECONOMIC INCENTIVES**

   To achieve a 40% $CO_2$ reduction by 2020 and 80% by 2050 the municipality is working with the utility companies in order to deliver their services more efficiently saving their natural resources.

[4] KfW (Kreditanstalt fur Wiederaufbau) is a development agency of the Federal government. One of the largest development banks in Germany

- **WATER;** Hamburg draws on high-quality, natural, local groundwater for 100% of its supplies. This assures high quality drinking water. The city has invested in a comprehensive infrastructure maintenance programme to improve water efficiency which has exceptionally reduced the water wastage from freshwater pipes by just 4%.

  Innovation also has its place, for example with pilot schemes that allow for heat from wastewater to warm house, by means of heat exchangers situated at the bottom of large sewers. The Hamburg Water Cycle enables sewage disposal which is energy self-sustaining and neutral for the climate with nutrient reclaimation. Among others, these innovations help to reduce the amount of carbon dioxide emitted and are therefore an essential part of Hamburg's climate adaptation strategy.

  Hamburg has controlled per capita water consumption through metering, reducing leakage, and high investment in infrastructure. The city has strong systems for wastewater removal, overflow capacity, and energy efficiency. It implements innovative processes to remove ammonia from sewage sludge and recover energy from sludge incineration.

- **WASTE MANAGEMENT;** Hamburg's integrated waste management system works very well, reducing landfill waste through a recycling and incineration processes. The local authorities have carried out public awareness campaigns to encourage households and businesses to sort paper, glass, plastics, metals and bio-waste. There are plans to boost recycling and energy recovery in the future. Projects include modifying raw material collection from private households, intensifying public information campaigns, motivating the housing industry and adjusting legal frameworks. Hamburg is well on the way to its objective thanks to the regular collection and recycling of old paper, glass, plastics, organic and green waste.

## 3. PROMOTION AND AWARENES INCENTIVES

In this section we will see some of the ***education and advisory services*** and *demonstration projects* that the municipality is offering and implementing with different stakeholders to achieve its goal in reducing $CO_2$ emissions and to demonstrate to the community the new technologies available.

- Fifty/fifty financial incentive programme

  It was implemented in schools and kindergartens in many German cities and is an energy and water savings programme. Within this programme schools are encouraged to reduce their energy and water consumption simply with changes in behaviour. Half of the costs saved go directly to the schools. In the case of Hamburg's schools they have reduced their CO2 emissions by some 120,000 t since 1944 and in turn have received over 12 million Euros to be used as they need.

- Energy Management for Public Buildings (including public housing)

  In order to reduce energy consumption a central department was created with the objective of "Energy management for public buildings". This department specifies energy standards and regulations as well as defining the type of energy supply and monitoring consumption. It also provides a wide range of consulting and services to all municipal departments. This department has three million Euros available per year as subsidies for solar technology, block heating power plants, heat recovery, and energy-efficient power systems.

- Renewable Energy Sources and Distributed Generation

  The municipality wants to become a leading location for innovative services in the renewable energy sector. To this end a Renewable Energy cluster company has been set

up. Given that Hamburg has a large energy and district heating network, the local government has purchased a 25.1% share of the network to guarantee a strategic impact on energy decisions.

With respect to renewable energy, in 2011 the city expanded the use of roofs for solar panels as a continuation to a project which evaluated over 130,000 roofs to assess their suitability for photovoltaic or thermal solar panels.

A significant partnership programme, called "Enterprise for Resource Protection: has the objective to encourage voluntary investment in increasing energy and resource efficiency in enterprises. For each € 1 invested by local government, participating companies contribute €10. This has generated total private investment of € 146 million matched by municipal support of € 15 million. In total the enterprises currently save 134,000 tonnes of $CO_2$ emissions each year.

Another initiative that involves the private sector in new building technologies is the design of the Bio Intelligent Quotient (BIQ) House which is the world's first algae-powered building. A 15 unit net-zero energy apartment complex. This project features a bio-adaptive algae façade and it will serve as a testing bed for sustainable energy production in urban areas and self-sufficient housing. A joint team of the Austrian-based sustainable architecture firm Spitterwerks Architects, Colt International, Strategic Science Sosult and global engineering firm ARUP - developed this concept.

For more information on the BIQ House click in this link: BIQ House

- Energy-Efficient Buildings and District

  There are major urban redevelopment projects in Hamburg which incorporate climate change actions and focuses on energy efficient buildings: these include Europe's largest waterfront re-development of Hafen City, and the restructuring of the older and more disadvantaged part of Wilhelmsburg.

  The latter is the biggest urban planning project and also one of the most innovative districts in Europe. This district is located in the Elbe islands and the master plan envisages a colourful mixture of housing, offices, retail and service establishments. With respect to housing, four different housing types ambitiously demonstrate the future of housing featuring everything from Hybrid Houses to Smart Materials. This district was designed with the goal to show residents how to build sustainable houses and respecting the environment.

  The Water Houses, represent one of the housing types mentioned above that are located in the Wilhelmsburg district. The buildings are constructed according to passive house standards; that means that they require minimum of heating and all of their energy needs can be met using renewables. A geothermal heat pump uses the water to heat the houses, while solar thermal elements in the façades ensure the provision of a basic hot water supply. Smart building technologies control the ventilation and the energy supply, and give the residents feedback on their energy consumption.

## 2.4 AMSTERDAM's INCENTIVE MECHANISMS & INITIATIVES

According to the EPBD enacted in 2002 and revised in 2010 the Netherlands and all the other member states are required to implement a policy framework that will improve the energy performance of buildings in order to meet its requirements.

With this in mind, the Dutch government has expressed the intention to increase the current energy performance standard of the national building regulations for new buildings with the objective of reducing the energy consumption in the existing building stock by 50% compared to 1990 levels, and construct only energy-neutral buildings by 2020 (VROM 2007).

For that reason, the building code in The Netherlands called "Bouwbesluit" added a complete Chapter which is dedicated to: Technical building regulations in terms of energy efficiency and environmental construction.

With the goal of reducing $CO_2$ emissions, municipalities are formulating ambitious local policies, creating incentive mechanisms and implementing projects; and their current EPC will have to decrease by 50% by 2015.
When clicking on the links in blue and underlined you can access the original documents and websites.

### 2.4.1 Incentive *mechanisms and initiatives to reduce $CO_2$ emissions in Amsterdam*

We will now look at some of these initiatives being implemented in Amsterdam to see how they are applying the regulations in the Dutch national building code regarding the development of new technology to increase energy efficiency. The Municipality believes that the best incentive is to start an energy saving campaign in municipal buildings as an initial step towards reducing $CO_2$ locally.

Amsterdam's goals with respect to energy efficiency are to reduce $CO_2$ emissions by 40% by 2025 and to provide 30% of the city's energy with locally produced sustainable energy. Helping the city to reach these goals is a unique partnership between the private sector, authorities, research institutions and residents called Amsterdam Smart City (ASC). An explanatory video of this project is available in this link: "Amsterdam Smart City – Smart Stories.

The following are some of the incentives the municipality is applying to achieve its goals:

1. **FINANCIAL AND FISCAL INCENTIVES**

Under the heading of "Incentives on Housing and Environment" the municipality of Amsterdam is providing a group of subsidies towards the improvement of the existing housing stock and to keep it sustainable.

- The Home Grant Insulation; this is a subsidy from the city boroughs. The scheme is designed to encourage private owners to improve poorly insulated buildings. This provides immediate savings in money and $CO_2$ emissions. This is only addressed to private owners and the subsidy rate covers up to 15% of eligible costs. The maximum amount of the grant is € 5,000.
- Collective Solar Projects Grant - South; this grant targets residents, businesses and/or institutions in the South districts. The amount provided is between € 500 – 5,000 to buy and install solar panels in their buildings. After using this grant the users have to work with the municipality in sharing the acquired knowledge with others. Similar projects have been implemented in other areas of Amsterdam
- Resident's Initiative; this is a grant provided to organized (residents and entrepreneurs) neighbourhoods who want a sustainable improvement of the living environment. A greener, cleaner and/or safer neighbourhood. The plan has to be designed by the residents and they make a contribution in the form of volunteering or external funding. The maximum amount of the grant is € 5,000.
- Subsidy for Green Roofs and Walls; as of 2010 the City of Amsterdam has introduced a subsidy programme to encourage residents of the city to create green roofs and walls on their properties. This will significantly help reduce air pollution by absorbing more particles of pollution making rainwater cleaner. This will also better insulate the buildings and will keep them cooler on hot summer days, saving on air conditioning costs. Residents can apply for a subsidy of € 50 per $m^2$ up to a maximum of 50% of the total installation costs. A maximum of € 20,000 subsidy will be awarded for each individual project.
- Energy Subsidies; this is a subsidy given to projects in their different stages:
  - *PROJECT PREPARATION*; this requires co-financing of up to € 5,000 which is a maximum 50% of the total cost.

- *IMPLEMENTATING INNOVATIVE PROJECTS*; co-financing can take place only in an innovative project in which new sustainable technologies and sustainable materials are being applied. This should be an experimental project with high ambitions for sustainability. The issue of energy saving is paramount. The maximum contribution from the city is up to 20% of the execution up to a maximum of € 10,000.

**2. ECONOMIC INCENTIVES**

Some of the projects being implemented in the areas of energy saving and renewable energy are:

- Installation of solar collectors in residential buildings to supplement the heating network of West Poort Warmte with locally generated heat. These collectors will be used as well to cool 300 houses in the summer.

- Alliander, the energy provider will become a 'smart' network right up into the home. Sensors will be added to the network and all residents will gain more control over their energy usage. For example, the technology will be in place to allow a resident to sell the energy generated by their solar panels to a neighbour. Special batteries will also be installed to store energy (for example, from solar panels), enabling the resident to use it whenever they need it.

- The Waternet[5] sewerage system will make it possible to dispose of biodegradable waste using a small grinding machine. Waternet will extract this biodegradable waste during the purification process and reuse it as raw material or use it to produce biofuels. An initial trial involves 250 households.

**3. PROMOTION AND AWARENESS INCENTIVES**

The city of Amsterdam is supporting sustainable development and promoting the use of new technologies. The city offers advisory services, technical assistance, awareness campaigns and demonstration projects to disseminate knowledge and achieve its goal to reduce $CO_2$ emissions

- Climate Street. This is a ***demonstration project*** where the municipality of Amsterdam is transforming together with entrepreneurs the Utrechtsestraat into a sustainable shopping street where innovative technologies are tested. In this Street, the municipality will determine which technologies, cooperative agreements and approaches are the most successful in making the city's (shopping) streets more sustainable on a large scale; with the aim of realizing $CO_2$ reductions in the street. The focus of sustainable solutions lies in three main areas: entrepreneurs, public space and logistics.
- **Nieuw-West – City-Zen**. This is another ***demonstration project*** in which Amsterdam is working with private partners and service providers on € 30 million worth of innovative projects in the district of Nieuw West. They are working together to develop innovative, sustainable solutions to energy-related issues. This project will complement planned investments by developing and implementing a range of products and services on such a scale that they can also be applied in a city as a whole. It is hoped that Amsterdam will become a leading example for other European cities.

  Residents will be the central concern during domestic renovations and the project will work closely together with them to explore how energy-saving measures can be introduced most conveniently and with minimal hassle. Over the course of this project, a total of 52,000 m² of residential buildings will be renovated.

## 2.5 MALMÖ's INCENTIVE MECHANISMS & INITIATIVES

[5] World Waternet is a Dutch organization dedicated to improve access to clean drinking water and adequate sanitary provisions for all.

In 2009 Sweden set ambitious targets under the "Integrated climate and energy policy" framework regarding energy efficiency; requiring:

- to reduce energy intensity by 20% by 2020
- a share of at least 50% renewable energy in gross final consumption
- zero net greenhouse gas emissions by 2050

In order to achieve this, a new and more demanding code was developed in 2011. The Building Energy Code BBR Chapter 9 Energy Management states: "Buildings shall be designed in such a way that energy use is limited by low heat losses, low cooling demands, efficient use of heat and cooling and efficient use of electricity

Based on both documents on national level, the municipality of Malmö has prepared an Environmental Programme to ensure that the city runs on renewable energy by 2030. The city is placing great emphasis on energy efficiency, reducing consumption and investing in renewable energy, reason why it has created a service department working with energy efficiency and renewable energy and a technical unit operating to optimize the buildings. According the Director of the Environment Department in Malmö "It is not the systems and technology available; it is how the city uses them. People have to understand where they live and they have to use the technology in the right way - it is about behavioural changing; that is why educating the community through promotional and awareness campaigns are so important and the best way to create impact is through demonstration projects".

The objectives of the city of Malmö are:

- To reduce energy user per $m^2$ per year by 50% from the levels of 2001 by 2020
- The city as an organization uses 100% renewable energy by 2030.

### *2.5.1 Incentives Mechanisms and Initiatives to Reduce $CO_2$ Emissions*

The following are some of the incentive mechanisms and initiatives grouped by topic, which the city is implementing to achieve their objectives.

#### 1. FINANCIAL AND FISCAL INCENTIVES

- There is a grant implemented by the national government called ***The Local investment programme*** (LIP) which is Sweden's largest investment in environment. This programme started in 1992 in several municipalities, Malmö being one of them. The objective of this grant is to increase ecological sustainability which comprises projects for creating good residential environments, purify discharge to air and water and to increase biodiversity.

  With these grants in 1998 the city of Malmö was allocated SEK 147 million for seven projects, the EKOstaden Augustenborg being the largest one of them. This is a group of projects that together constitute one of the largest investments in Europe aimed at the ecological transformation of an existing neighbourhood. Investments and decisions are being made through a consensus process with the residents which in the end led to social improvements while reducing environmental load.
  Other projects within this group are:
  - Environmental actions in the Rosengärd city district
  - Expansion of bicycle paths and information programmes leading to more frequent bicycle riding
  - Creation of wetlands leading to greater biodiversity and reduced emissions of eutrophic nutrients to Oresund.
  - Soil remediation in Västra Hammen
  - Environmental investments for the Bo01 housing estate (further explained in section 3.)

- Support for installation of energy saving windows in existing private houses**.**
  This is a grant offered not only to people living in houses containing one or two residences but also housing cooperatives and other privately owned housing companies.

Entire windows including window-frames must be changed. The grant covers 30% of material and labour costs up to a maximum of SEK 10,000.

- Conversion grants.
  These are funds given for installation of bio fuelled space heating systems in new private houses. This grant is available to private owners and housing cooperatives. The grant covers 30% of material and labour costs up to a maximum of SEK 15,000.
- Support for installation of solar heating installations in residential property.
  This fund is addressed to people who install solar heating in private houses, apartment blocks and hobby premises adjacent to residential property. Maximum grant is SEK 7,500 per house and SEK 5,000 per apartment and/or associated premises.
- Environmental car parking.
  In 2007 Malmo introduced a free hour's parking for all environmental cars with a permit. The purpose was to increase the percentage of environmental cars in Malmö. Anybody who has an environmental car that is not older than three years can apply for a permit that costs SEK 300. With this permit the holder can park their car free of charge on municipality owned land for the first hour.
- Environmental zone
  In 2007 the municipality created the "Environmental zone" for heavy transport. This area comprises all of central Malmo inside the Inner Ring Road. It imposes environmental demands on heavy vehicles which travel in the central parts of the city. Only new heavy diesel powered vehicles are allowed to travel inside the environmental zone for six years from the date of registration. Vehicles whose engines comply with Euro-5 criteria are allowed to enter until 2020.

## 2. PROMOTION AND AWARENESS INCENTIVES

- Renewable Energy Sources and Distributed Generation
  The municipality has developed a project named: "100% local, renewable energy in the Western harbour of Malmo, Sweden" which plans to house 10,000 people, offices and a University.
  The first stage- the Bo01 housing estate, was constructed and completed in 2001 and was called the "City of tomorrow". This new district is supplied with 100% locally produced renewable energy. While each technology has been tested and used before, the whole system which combines wind power, solar photovoltaic and solar thermal, with a heat pump to supply the district with district heating and cooling – is unique. Solar energy supplies approximately 15% of the total energy needed on an annual basis. The solar collectors – totalling 2,600 $m^2$ – are located on the roofs and facades of buildings, and are connected to the district heating system. This is a totally new solution to avoid large heat storage tanks in the buildings and instead use the district heating system as storage. The final aim is to use the experiences from the Western Harbour or *Västra Hammen*, as an incentive, inspiration and driving force for the development of other neighbourhoods in a sustainable way.

- Refurbishing of Buildings
  Malmö's municipality installed Sweden's largest and most spectacular photovoltaic plant at Sege Park in 2007. The city is transforming a hospital area built in 1930s to a new neighbourhood. Sege Park is going to become as self-sufficient as possible using renewable energy and become an example of an ecologically safe environment in the long term. It has a total area of 1,250 m2 and a maximum effect of 166 kW. The facility produces during summer more power that what is consumed in the houses
  The municipality is using streets lights with solar cells which also eliminates the need to lay cables for electricity.
  The roof of the central kitchen has been fitted with solar panels that produce heat, unlike solar cells that generate electricity.

Sustainable Hilda is another project taking place in the district of Rosengärd; it includes an ecological total renovation of 800 flats which belongs to a housing cooperative called *HILDA* and is one of the first major renovation projects in buildings constructed in the late 1960's. This renovation process required a very intensive dialogue with the inhabitants, organizations and business from the area. Innovative environmental engineering is being used, in line with the city of Malmö's high demands regarding environmental sustainability and energy efficient buildings.
The renovation was made focusing on efficiency, renewable energy, water, transportation and lifestyle.
The renovation process included:
New energy-saving ventilation, renewal of all radiators, façade renovation, new internal walls, environmental investment, solar panels on the roofs.

- Municipal energy counselling
  In order to help people in managing their energy supply and to reduce energy consumption the Municipal energy counselling service was created not only in Malmö but in many other Swedish cities. Municipalities were given financial grants to employ experts who could be easily approached by the residents.

## 3. CONCLUSIONS

The EU approach to promote sustainable housing is focused on setting energy efficiency targets and developing policies and instrument to speed up behaviour change in the building sector.

This behaviour change is being driven by the constant rise in energy costs which are forcing more and more EU citizens to consider buying and/or making their houses more energy efficient. As a consequence a green building market has seen a rapid development in the EU context.

Local governments are key actors involved in implementing national policies and instruments to achieve the national targets. They are putting in place technical standards, labels and important financial, economic and promotional incentives to support citizens, the private construction sector and other stakeholders in reducing energy consumption and increasing the use new green materials, technologies and recycling processes.

Various kinds of financial/fiscal, economic and promotional incentives are being applied by the four cities studied in this report. One general characteristic of these incentives is that they are being applied to reduce energy consumption in the building sector. Very often this objective is being pursued by creating financial/fiscal and economic incentives to promote the refurbishment including retrofitting of old buildings, and the development of new technological devices that are able to increase energy, water, and wastewater efficiency.

Among the sectors in general benefitting from these incentives we can cite: rainwater harvesting, grey water recycling, water treatment, taps, showers, urinals, WCs, above and below ground pipes, small turbines adapted to buildings, photovoltaic (PV) cells and modules, boilers and stoves using biomass, solar hot waters, heat pump and exchangers, ventilation, insulation materials and others.

Another important example of incentives being use by these four cities are the so-called informative incentives. With this kind of incentives, local governments can offer education, advisory services, technical assistance, in-house advice, education and implement demonstration projects. As the report has shown many demonstrative projects are being or have been implemented in these cities linked to different aspects of energy, water, wastewater and material use efficiency.

We hope that the experiences of these cities in using incentives to promote sustainable housing could be useful for the Nepalese local government when defining the processes and measures to be developed for their own incentives to promote the sustainability of local housing.

# 1. REFERENCES


Amsterdam Energy Subsidies available; www.noord.amsterdam.nl/wonen/wonen-leefomgeving/duurzaam-noord/energiesubsidie-2014/energiesubsidie-kort/

Amsterdam Grant Collective Solar Projects available; http://www.zuid.amsterdam.nl/wonen_en/natuur_en_milieu/subsidie-collectieve/

Amsterdam's Residents Initiative available; http://www.zuid.amsterdam.nl/wonen_en/buurten/bewonersinitiatief/

Amsterdam, Subsidy for Green Roofs and Walls available; http://www.iamsterdam.com/Subsidy%20for%20green%20roofs%20and%20walls

Amsterdam The Grant Home Insulation available: http://www.amsterdam.nl/wonen-leefomgeving/klimaat-energie/woningisolatie-0/de-subsidie-woningis/

Amsterdam Smart city project site is available: Amsterdam Smart City (ASC).

Amsterdam's municipal buildings project site is available: Municipal Buildings

Barcelona's Solar ordinance available: Solar Ordinance

Climate street project in Amsterdam available: Climate Street

The Hamburg Climate Action Plan http://www.hamburg.de/contentblob/4028914/data/booklet-englisch).pdf

Hamburg's Water houses project is available: The Water Houses

Hamburg's BIQ House available: BIQ House

Hamburg's IFB Bank available: http://www.ifbhh.de/umwelt/modernisierung-von-wohngebaeuden/

London's environmental webpage available: London's

London's RE: NEW programme on energy efficiency available: RE: NEW programme

London's RE: NEW manual on energy efficiency available: RE:NEW Manual

London's RE: FIT retrofitting scheme available: RE: FIT programme

London's RE: FIT projects available: RE:FIT projects

London's municipal waste projects available: Municipal waste projects

Malmo; A sustainable city – ecological transformation in Malmo available: http://malmo.se/download/18.4a2cec6a10d0ba37c0b800012471/en_hallbar_stad_eng.pdf

Malmo: Summary of financial incentives and other control measures in Sweden and Malmo for creating a sustainable energy system at local level available: http://www.secureproject.org/download/18.3d9ff17111f6fef70e98000475/1350483411887/Ekonomiska+styrmedel+2008-12-12_engelska.pdf

Niew-West project available: Nieuw-West – City-Zen.

Passive house requirements available: Passive House

Project case study in Graylingwell Park in UK available: Project Case Study: Graylingwell Park

Project Wilhelmsburg in Hamburg available: Wilhelmsburg.

Spanish building energy code available in Spanish: codigo tecnico

Spanish Ecopark district page available: Ecoparc

Spanish solar PV power station “Solar Pergola” available: Solar Pergola

Straube John, 2006, Digital version of “Green Building and Sustainability” can be downloaded from this link: green building and sustainability

The Code for Sustainable Homes: Case Studies available from this site: The Code for Sustainable Homes - Case studies

The UK code for sustainable homes available: The Code for Sustainable Homes