

Eco-Cities — A Global Survey 2009

Part A: Eco-City Profiles

Simon Joss

University of Westminster

www.westminster.ac.uk/ecocities

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Introduction

Efforts to render cities environmentally and socially sustainable are not new. Urban planning and regeneration over the last one hundred years or so have been significantly influenced by attempts to redress the perceived detrimental effects of large-scale urbanisation, such as environmental degradation, social inequalities and urban sprawl. The Garden City, the New Town and the Techno-City are nineteenth and twentieth century exemplars of such attempts to reinvent the city in the (post)industrial era.

More recently, these efforts have culminated in a new phenomenon – the so-called eco-city. The term can be traced back to the mid-1970s, when it was first coined in the context of the rising environmental movement. Throughout the 1980s and early 1990s, it remained mainly an innovative concept, with practical examples few and far between. The United Nations 'Earth Summit' held in Rio de Janeiro in 1992, and the resulting sustainable development programme ('Agenda 21'), formed the background to a first wave of practical eco-city initiatives. For example, Curitiba (Brazil) was heralded as one of the first eco-cities, on account of its advanced, integrated public transport system. Waitakere (New Zealand) became known for its attempt to integrate Western and Maori concepts of sustainable resource management in its eco-city master plan. Schwabach, a small German city, was selected by the federal government for a pilot study to develop a model for ecological city development. In Sweden, all local authorities were required to implement Local Agenda 21 plans to encourage environmental innovation.

However, it is only in recent years that the eco-city phenomenon has become truly global and mainstream, against the background of a majority of people now living in cities and the growing international recognition of the scale and severity of climate change. Thus, China is currently at the forefront of eco-city development in East Asia, with international projects such as Dongtan and Tangshan; in the United Arab Emirates, Masdar is being developed as a brand-new zero-carbon city to be emulated elsewhere in the Middle East (and beyond); Hacienda Ecocities in Kenya is promoted as a model sustainable city for Africa; and Växjö (Sweden), Freiburg (Germany) and St Davids (United Kingdom) are vying to be the 'greenest city' of Europe, while President Sarkozy recently declared that Paris would become the first post-Kyoto capital eco-city.

The Eco-Cities Project

To date, there have been few systematic global surveys of eco-cities. The aim of the Eco-Cities project, therefore, is systematically to map, analyse and compare contemporary eco-city initiatives. The particular focus of this study is on trying to gain a better understanding of the innovation and governance processes driving and shaping eco-city developments. What distinguishes eco-cities from 'normal' cities? Why do eco-cities seem to have become globally mainstream in such a short period of time? How are eco-cities located, designed and implemented?; and can eco-cities be socially and democratically sustainable? In order to provide answers to these questions, amongst others, the project is structured in three parts: (1) an ongoing global survey of eco-city initiatives, the aim of which is to establish the scale and diversity of current developments; (2) an in-depth comparative analysis of a sample of eco-cities, with the aim of analysing key characteristics, processes and contexts; and (3) a critical discussion of eco-cities' capacity for innovating for environmental and social sustainability, and of related governance processes.

Methodology

For the preliminary global survey – the present study – an initial ‘horizon-scanning’ of recent eco-city initiatives was carried out during 2009-10 based on an analysis of relevant literature, conference proceedings, policy documents and websites of international networks and interest groups (including Eco-Cities; Ecocity Builders; Ecocity World Summit; Sustainable Cities), using the terms/descriptors ‘eco-city’ and ‘eco-town’ (the terms ‘urban regeneration’ and ‘urban sustainability’ proved to be too broad as analytical categories for this part of the research). The search results were triangulated through cross-referencing of information and sources. While this methodology may not capture all eco-city developments (especially non-English, or local ones without international outreach), it should nevertheless be sufficiently comprehensive and robust to identify all major initiatives reported internationally. As this survey focuses on the recent period, earlier initiatives which did not go beyond conceptual stage or were abandoned (such as the Halifax and Whyalla eco-city projects in Australia) were not included.

For each of the developments identified in this way, a brief profile was compiled, including information about the nature of development, key actors involved, and availability of data. Furthermore, in order to be able to identify various types of eco-cities and discern current trends and patterns, the sampled eco-cities were categorised according to the following variables:

Type of eco-city development	I—new development II—expansion of urban area III—retro-fit development
Development phase	1—pilot/planning stage 2—under construction 3—implemented
Key implementation mode	a—technological innovation b—integrated sustainability vision/planning c—civic empowerment

The present study is divided into two parts:

- Part A (this document) lists the compilation of 79 eco-city profiles
- Part B provides a cross-comparative analysis and discussion of the survey results: Joss, 2010. “Eco-cities—a global survey 2009”. WIT Transactions on Ecology and The Environment, vol 129, pp 239-250 (ISSN 1743-3541). See also www.westminster.ac.uk/ecocities.

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1**Aerial Treasure Island**

Location	North America - USA
Website	http://ecocity.wordpress.com/2008/02/09/aerial-treasure-island-in-san-francisco-bay/
Size	13,500 inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key implementation mode	b - integrated sustainability vision/planning

Aerial Treasure Island, a decommissioned US military airbase originally built in the 1930s on an artificial island in San Francisco Bay, is an initiative by San Francisco city council to build a model sustainable community. The first residents are scheduled to move in by 2013, while the project as a whole should be completed by 2020 by Lennar Corporation as lead contractor. In addition to converting the existing military barracks, there will be 6,000 newly built eco-houses. 300 out of the 450 acres of island will be turned into parks and agricultural allotments/farms. Aerial Treasure Island is designed as a self-contained community offering all the necessary facilities and services (shops, schools, hospitals etc), thus minimising transport requirements. A ferry service will provide public transport to San Francisco city mainland.

2**Amman**

Location	Middle East - Jordan
Website	http://ecocity.wordpress.com/2008/05/26/jordan-to-build-green-city-for-one-million/
Size	1 million inhabitants
Type	II - urban expansion
Phase	1 - planning stage
Key implementation mode	a - technological innovation

The team behind the Masdar (UAE) project (see profile no 40) in 2008 announced plans to build a major new district for one million inhabitants in Amman, Jordan. The development aims to address the large demand for additional, mainly middle-class housing facing Amman. Some of the eco-solutions developed in Masdar will be applied here on a larger scale, although the new neighbourhood is not designed to be fully carbon-neutral. Houses will be designed to maximize energy efficiency, while renewable energy will be generated on site through wind and solar power plants. Advanced water and waste recycling systems will be used to minimise waste. The project is scheduled to commence in 2010, with a construction end date not currently available.

3**Arcosanti**

Location	North America - USA
Website	www.arcosanti.org
Size	5,000 inhabitants (currently 50-150)
Type	I - new development
Phase	2 - under construction
Key implementation mode	b - integrated sustainability vision/planning

The construction of this self-declared 'experimental town' built in the desert of Arizona began in 1959. The town is based on the vision of architect Paolo Soleri to realise his concept of 'arcology', combining architecture with ecology. Among Arcosanti's innovations are the layout of the town following the features of the surrounding landscape, and terraced greenhouses. Currently still a work in progress, the site serves mainly as an education centre offering accommodation and workshops for architecture students and visitors.

4**Auroville**

Location	Asia - India
Website	www.auroville.org
Size	1,500 inhabitants
Type	I - new development
Phase	2 - under construction
Key implementation mode	d - civic empowerment/involvement

This self-styled 'universal city in the making' focuses on bringing together people from different countries and backgrounds to live in an ecologically friendly and harmonious way. Initiated in the 1960s by a group of volunteers inspired by Indian scholar Sri Aurobindo, Auroville has been endorsed by UNESCO and the Indian Government. The development consists of a series of small settlements where sustainable farming is practiced. Auroville has also participated in several reforestation campaigns in the region. The project has, however, been criticised by some for relying on a polluting, private transport system for goods and people.

5**Bahia de Caraquez**

Location	South America - Ecuador
Website	http://www.ecuador.us/bahiadecaraquez.htm
Size	30,000 inhabitants
Type	I - new development
Phase	3 - implemented
Key implementation mode	a - technical innovation

Bahia de Caraquez was devastated in 1997 and 1998 by El Nino and an earthquake, respectively. As a consequence, the city had to be completely rebuilt, for which the regional authorities of the Sucre region used an eco-city development model in collaboration with Japanese environmental NGO Action for Mangrove Reforestation (ACTMANG). Key characteristics include an advanced waste recycling system (including organic waste), permaculture allotments and farms in the surrounding areas, and community schools offering environmental training. More recently, a large scale reforestation project has been underway in the areas surrounding the city.

6**BedZED**

Location	Europe - United Kingdom
Website	http://www.bioregional.com/what-we-do/our-work/bedzed/
Size	82 homes and 20 businesses
Type	II - urban expansion
Phase	3 - implemented
Key implementation mode	a - technical innovation

BedZED, short for Bedington Zero Energy Development, was opened by Bioregional (a leading UK sustainable community development business) in Sutton (South-West London) in 2001 as the largest mixed-use sustainable community in the UK. 50 percent of its houses are under private ownership, while the other half provides housing for 'key workers' (such as nurses and teachers) and social housing. The aim of BedZED is to combine technological innovation with behavioural change: buildings incorporate advanced insulation and ventilation systems, while inhabitants' resource consumption is automatically monitored. Thus, energy saving, locally sourced food, sustainable transportation and waste recycling are actively promoted. Although the planned biomass burner has to date proved difficult to implement, solar and wind energy are produced on site. In 2007, BedZED residents consumed 45% less energy and 50% less water than the average of residents of Sutton Council.

7**BicycleCity**

Location	North America - USA
Website	www.bicyclecity.com
Size	Not yet known
Type	I - new development
Phase	1 - planning stage
Key Implementation mode	b – integrated sustainability vision/planning

Bicycle City is a concept for a car-free city developed in the USA. It embodies a comprehensive vision for environmentally and socially sustainable cities and communities, with a strong focus on bicycling and walking. The initiative appears more conceptual than rooted in concrete plans, acting as promoter of new ideas and a change of policy within existing cities across the USA and beyond.

8**Black Sea Gardens**

Location	Europe - Bulgaria
Website	http://www.blackseagardens.com/
Size	Not yet known
Type	I – new development
Phase	1 - planning stage
Key Implementation mode	b – integrated sustainability vision/planning

Black Sea Gardens aims to become the 'world's first carbon-neutral luxury resort'. The resort, built by Bulgarian property companies with involvement of London-based architects Foster & Partners, is designed as a chain of five villages located on the coast of the Bulgarian Black Sea. The plan includes public transport using electric vehicles, with private cars prevented from entering the resort. The layout of the resort closely follows the features of the local environment. There is no indication of the timescale of the project.

9**Chalon-sur-Saone**

Location	Europe - France
Website	http://www.add-home.eu/docs/AMI_scheda_progetto_SAINTEAN_ADDHOME.pdf
Size	180 homes
Type	II - urban expansion
Phase	3 - implemented
Key Implementation mode	a - technological innovation

The resort town of Chalon-sur-Saone in Burgundy developed one of its former farming areas into a new eco-neighbourhood, 'Saint Jean des Jardins'. Opened in 2005, the new houses incorporate sustainable small-holding, in keeping with the tradition of the area. Public transport is encouraged by walking and biking routes and a bus service. A central heating plant and grey water system reduces energy and water consumption. The municipality also opened an 'ecomuseum' with focus on the regional heritage.

10**Changxing**

Location	Asia - China
Website	http://www.wannian.com.cn/EN/NewsShow.aspx?CID=20081212162037375430&AID=20081212162200062434
Size	70,000 inhabitants
Type	II - urban expansion
Phase	1 - planning stage
Key Implementation mode	a - technological innovation

Changxing Ecological City – based on a master plan published in 2005 by the Beijing authorities – is a private-sector initiative led by Vanion Group with international input including Arup. It aims to create a new cultural and industrial centre (science park) to the West of Beijing. The development will include a mixture of residential units, office buildings and public facilities. The aim is to balance environmental, social and economic needs and, thus, to achieve 'energy efficiency, environmental friendliness, economic growth, and social harmony'. Energy consumption is to be reduced by 20 percent through energy efficient buildings. 15 percent of energy will be produced from renewable sources. Transport-related CO₂ emissions are to be cut by half (in comparison with existing cities) through an integrated public transport system.

11**Clonburris**

Location	Europe - Republic of Ireland
Website	http://www.clonburris.ie/index.php?option=com_content&task=view&id=26&Itemid=0
Size	15,000 homes
Type	II - urban expansion
Phase	1 - planning stage
Key Implementation mode	a - technological innovation

Work on Clonburris, a new district of Dublin, was started in 2007. The focus is on implementing several technological innovations and encouraging behavioural changes among residents. In the building phase, recycled and sustainable materials have been used. Energy efficiency and renewable energy will be standard requirements for all new building. Local food production will be encouraged by providing allotments to all residents. A sustainable lifestyle will be further promoted by, for example, banning tumble dryers and providing communal areas for drying clothes.

12**Curitiba**

Location	Latin America - Brazil
Website	http://www.curitiba.pr.gov.br/siteidioma/?idiomacultura=2
Size	Over 1.5 million inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key Implementation mode	a - technological innovation

Curitiba has a longstanding, international reputation as one of the first eco-cities, initiated in the 1970s under the then leadership of Mayor Jaime Lerner. Its reputation is mainly built on its pioneering integrated bus system, which has resulted in increased public transport and a reduction in traffic congestion. More recently, the city has piloted a recycling systems based on incentives (food-for-recyclables exchange system) and public education. The city's network of parks and green spaces has been expanded with the aim to enhance the environmental, social and cultural dimensions of urban living. Curitiba is currently considering the introduction of an underground public transport system.

13**Destiny Florida**

Location	North America – USA
Website	http://www.destinyflorida.com/
Size	Not yet known
Type	I - new development
Phase	1 - planning stage
Key Implementation mode	a - technological innovation

Plans for Destiny Florida, which aims to be 'America's first eco-sustainable city' were launched in 2008 by Pugliese Development Company. The new city will be located in the middle of the Florida peninsula and aims to offer its private residents an environmentally sustainable way of living. Based on projections that show Florida's population to double by 2050 and urban sprawl to replace most of the existing green space, Destiny Florida promises an urban environment, in which green space is preserved. Much of its 64 square miles of territory will be protected from development, following its principles of '4Cs': conservation, countryside, centres, and corridors. It is among the 16 cities included in the Clinton Foundation's sustainable cities initiative. It has signed up to a reduction of CO₂ emissions by 80 percent by 2050 compared with 1990 levels of a similarly sized US city.

14**Dongtan**

Location	Asia – China
Website	http://www.dongtan.cn/English/english.html http://www.arup.com/_assets/_download/8CFDEE1A-CC3E-EA1A-25FD80B2315B50FD.pdf
Size	Up to 70.000 inhabitants
Type	I - new development
Phase	2 - under construction
Key implementation mode	a - technological innovation

Dongtan was launched in 2005 as a flagship project of the Chinese government aimed at addressing the dual challenge of meeting the country's need for urbanisation while improving environmental performance. Located outside Shanghai at the mouth of the Yangtze river, the city is designed to consist of zero-energy buildings (ZEBs); a green-house gas neutral transport system; a self-sufficient water system; and fully renewable energy system. In addition, Dongtan aims to increase biodiversity through the wetlands surrounding the city. The project is developed by the Shanghai Industrial Investment Corporation (SIIC) and British engineering firm Arup (see also profile no 8). The first part was supposed to be finished in 2010 in time for the Shanghai World Expo, but has been delayed due to a combination of the world financial crisis and local political developments.

15**Ecociudad Valdespartera**

Location	Europe - Spain
Website	http://www.valdespartera.es/
Size	9,500 houses
Type	II - urban expansion
Phase	3 - implemented
Key implementation mode	a - technological innovation

Ecociudad Valdespartera was initiated in 2001 through a co-operation between the municipal and regional authorities of Zaragoza with the aim to convert decommissioned military barracks into social housing and public facilities. The new district of Zaragoza is designed to meet current Spanish sustainable building criteria. The design incorporates the features of the surrounding environment. Buildings are oriented towards the sun to optimise natural heating and to allow the use of solar panels; grey water is used to water gardens; and vertical wind shields protect from prevailing winds. Green spaces containing native species have been interspersed with the dense network of streets. The first residents moved into the new district in 2004.

16**EcoVillage at Ithaca**

Location	North America - USA
Website	http://www.ecovillage.ithaca.ny.us/
Size	60 houses
Type	I - new development
Phase	3 - implemented
Key Implementation mode	a – integrated sustainability vision/planning

Located in Upstate New York, EcoVillage at Ithaca promotes a more sustainable way of living for its residents and acts as an educational model. It aims to present an alternative to mainstream American urban living, by balancing a healthy and socially rich lifestyle with environmental sustainability. In addition to the residential dwellings, EcoVillage at Ithaca also includes organic farms, green spaces, offices and an education centre. Current projects under development include a wind power plant, biological waste water treatment and grey water recycling systems, bio fuel production, and a school.

17**Erlangen**

Location	Europe - Germany
Website	http://www.erlangen.de/en/desktopdefault
Size	100,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key Implementation mode	a - technological innovation

Located in Bavaria with just over 100,000 inhabitants, the university town of Erlangen is considered one of the most eco-friendly cities in Europe. Following the lead of other German cities, in particular Freiburg (see profile no 19), during the 1980s Erlangen introduced new policies to bring about more environmentally friendly transport and energy production. Under the leadership of the city's mayor, an extensive bicycle network was implemented, resulting in an increase in bicycle use of 75 percent. Several areas of the city have been pedestrianised, while the tram network has been extended. In 1989, Erlangen won the Top-Ecocity award of the Japanese national ecocity network.

18**Ferrara**

Location	Europe - Italy
Website	http://ferrara.comune.fe.it/
Size	130,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key Implementation mode	a - technological innovation

Ferrara, located in the province of Emilia-Romana, has mainly focused on one area of what it calls 'urban eco-transformation': using advanced technological innovation, the town has implemented a highly efficient waste recycling system, focusing on both waste separation and recycling. The city won an award by the European Sustainable Cities and Towns Campaign in 2003.

19**Freiburg**

Location	Europe-Germany
Website	www.friburg.de
Size	220,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key Implementation mode	a - technological innovation

Since the 1970s, Freiburg has developed a reputation as Germany's 'ecological capital'. In 1986, the city adopted a master plan for a sustainable city based on environmentally sustainable energy supply, resulting in advanced (solar technology based) energy efficiency and public transport programmes. In 1996, Freiburg passed the Climate Protection Protocol aimed at reducing CO₂ emissions by 25 percent below 1992 levels by 2010. Over a ten year period, CO₂ emissions were reduced by more than ten percent per capita. There has been a 100 per cent increase in public transport use, with up to 35 percent of residents being non-car owners. Several neighbourhoods are experimenting with passive energy houses using specially designed insulation and air-flow systems.

20**Glumslov**

Location	Europe - Sweden
Website	http://advantage-environment.com/byggnader/passive-houses/
Size	2,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key Implementation mode	a - technological innovation

Glumslov has become internationally known for its patented passive – or 'self-heating' – houses, which capture and retain heat based on design and insulation technology. Electricity and warm water are generated from renewable sources, mainly solar panels. Energy consumption per unit is approx. half of a comparable regular house. The Glumslov passive house system has been used as a model by city authorities elsewhere, such as the London regional authorities (including Thames Gateway, see profile no 57).

21**Gothenburg**

Location	Europe - Sweden
Website	http://www.inhabitat.com/2009/03/16/swedish-super-city-envisions-gothenburg-as-ecotopia/
Size	500,000 inhabitants
Type	III - retro-fit
Phase	1 - planning stage
Key Implementation mode	a - technological innovation

In 2009, plans were unveiled to transform Gothenburg into a 'super sustainable city', prompted by predictions of a significant population growth by 2020. The aim is to both 'green' and grow the city, while preventing urban sprawl. The dense, interconnected urban landscape would feature rooftop gardens providing locally sourced food, 'intelligent' water- and energy-harvesting roads, as well as solar panels and wind turbines. A zero-carbon 'personal rapid transit' system is envisioned together with rain-protected cycling 'highways'. The city government has yet to decide how and when to adopt these plans.

22**Greenwich Millennium Village**

Location	Europe - United Kingdom
Website	http://www.englishpartnerships.co.uk/gmv.htm
Size	3,000 houses
Type	II - urban expansion
Phase	2 - under construction
Key Implementation mode	a - technological innovation

Greenwich Millennium Village, located in South East London, is a Millennium Communities initiative launched by the UK government in 1997. The sustainable housing programme, led by English Partnerships (the UK's national regeneration agency), has involved the transformation of Europe's largest former gasworks into a new residential district. It opened in 2000, and by 2008 approx. one third of the total of 3,000 houses was completed. The aim is to cut 80 percent of primary energy use in its buildings by using modern materials and building techniques, with solar panels and wind turbines providing renewable energy. The project is scheduled to be completed by 2015, including a school, hospital and shopping facilities.

23**Gwang Gyo**

Location	Asia - South Korea
Website	www.mvrdv.nl
Size	77,000 inhabitants
Type	I - New development
Phase	1 - Planning stage
Key implementation mode	a - technological innovation

The plans for this new city, launched in 2008 as a joint venture between Daewoo Consortium and Gwanggyo municipality, are based on the 'dense city' concept by Dutch architects MVRDV. A self-sufficient city of 77,000 inhabitants located 35 km south of Seoul, Gwang Gyo will consist of a series of 'termite-shaped' buildings aimed at creating vertical green spaces to improve natural ventilation and reduce energy and water usage. The design follows the 'power centre' strategy used in contemporary Korean town planning, providing a centre for mixed public housing, retail, offices, and leisure/cultural facilities, linked in a nodular network to other urban centres. In 2009, the plans were under consideration for approval by the Gyeonggi provincial authority, with completion envisaged by 2011.

24**Hacienda Ecocities**

Location	Africa - Kenya
Website	http://www.haciendakenya.com/
Size	6,250 housing units
Type	II - urban expansion
Phase	1 - planning stage
Key Implementation mode	a - technological innovation

Hacienda Ecocity is currently being developed near Mombasa containing 6,250 housing units, with completion expected by approx. 2015. The project is a blueprint for a series of other developments catering mainly for middle class residents planned across Kenya, with the second to be located near Nairobi. Hacienda eco-city Mombasa is designed to be entirely self-sufficient for both residential and commercial areas in terms of renewable energy (including a solar power station producing 12 MW) and water supply. Waste water will be recycled using a special wetland and filtration system. The town is promoted to offer price stability, service reliability and security for its residents.

25**Hamburg-Harburg**

Location	Europe - Germany
Website	http://www.inhabitat.com/2009/08/19/eco-city-seeking-highest-rating-from-the-three-major-major-green-rating-systems/
Size	200,000 inhabitants
Type	III - retro-fit
Phase	1 - planning stage
Key Implementation mode	a - technological innovation

The Hamburg-Harburg harbour is the site of a large scale ecocity retro-fit project, which involves adapting the former port facilities and creating new office and residential space. The project was launched in 2009 and styles itself as 'Germany's first entirely sustainable creative-industrial corporate development'. Energy consumption is to be cut by 30 percent (compared with 2010 levels) through use of renewable energy (including wind turbines and solar water heating systems) and energy saving technologies and materials. Most buildings will feature green rooftops.

26**Hamm**

Location	Europe - Germany
Website	http://www.hamm.de/cgi-bin/
Size	180,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key Implementation mode	a - technological innovation

The town of Hamm in North-West Germany is known within the country as an eco-city pioneer, going back to the 1990s when it was chosen by the regional government as a model city for sustainable policy planning. In 1998, it was awarded the title of 'national capital for environmental protection'. The town has implemented a comprehensive sustainable transport system including bicycles, electric buses, trains and riverboats. It is also known for its stakeholder and public involvement in local decision-making.

27**Hammarby Sjostad**

Location	Europe - Sweden
Website	http://showcase.hcaacademy.co.uk/case-study/ecotowns-hammarby-sjstad-sweden.html
Size	35,000 inhabitants
Type	II - urban expansion
Phase	3 - implemented
Key Implementation mode	a - technological innovation

The sustainable regeneration of the Hammarby Sjostad brown field close to Stockholm was part of the city's 2004 Olympic Games bid. While the bid itself failed, work on Hammarby Sjostad has continued, with completion expected in 2015. The project includes an integrated transport system aimed at achieving 80 percent public transport by 2010 with the support of free ferry transport and a bio fuel carpool scheme. Solar panels on most buildings, and water and waste recycling systems are other features of this new district.

28**Hanham Hall**

Location	Europe - United Kingdom
Website	http://www.hanhamhall.co.uk/
Size	170-220 houses
Type	II - urban expansion
Phase	2 - under construction
Key Implementation mode	a - technological innovation

The regeneration of the area around a former hospital in suburban Bristol was hailed by its developers English Partnerships (the UK's national regeneration agency) as 'England's first zero carbon development', serving as a blueprint for the government's eco-towns (see profile no 43). Building firm Barratt was awarded the contract to build the development on the basis of its 'Green House' design, which meets the government's zero-carbon house building criteria for 2016. Hot water and electricity are to be produced by a community biomass boiler; waste collected and sorted in a nearby recycling centre; garden allotments made available to all the residents; and a car-share club scheme put in place. Work began in 2009, and the first residents are scheduled to move in at the beginning of 2011.

29**Heidelberg**

Location	Europe - Germany
Website	http://www.icdmuenchen.um.dk/en/service/menu/News/GermanysEcoCities.htm
Size	150,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key Implementation mode	a - technological innovation

Heidelberg is among the pioneers in Germany in terms of promoting urban energy efficiency and energy saving. Through the implementation of a rigorous CO₂ monitoring scheme, the old university town managed to cut green house gas emissions in public buildings by 35 percent by the early 2000s compared with 1993. Since then, new, more ambitious targets have been set with focus on encouraging residents and private businesses to cut CO₂ emissions.

30**Helsingor/Helsingborg**

Location	Europe - Denmark/Sweden
Website	http://www.ecocity-project.eu/DetailedProjectInformation_HelsingorHelsingborg.html
Size	140,000 inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key Implementation mode	a - technological innovation

This European Commission-funded initiative (see also profiles no 60, 61 and 66) brings together these two neighbouring Danish and Swedish towns in pursuit of sustainable urban development. The first, now complete phase of the project focused on increasing the energy efficiency of existing buildings. The second phase, currently underway, entails the building of several new developments according to strict energy efficiency norms. Various technological applications, such as solar panels and heat pumps for water heating, are being tested and compared. A new education centre with focus on renewable energy was opened in Helsingborg, alongside a new cultural centre in Helsingor. Future plans include a large biomass boiler.

31**Icheon**

Location	Asia - South Korea
Website	http://www.inhabitat.com/2009/08/31/foster-partners-to-design-south-korean-eco-city/
Size	320,000 residents
Type	I - new development
Phase	1 - planning stage
Key Implementation mode	a - technological innovation

Unveiled in August 2009 following a national competition, the plans for this new South Korean city promise to eclipse Masdar (see profile no 40) as the world's most sustainable city. The mixed-use development, which spreads across three sites interconnected by high speed rail, combines residential areas with an industrial zone. The latter is designed to attract technology firms and research laboratories specialising in environmental sustainability, especially developers of photovoltaic cell and wind turbine technology. As the city will be built on green field sites in an agricultural region, rooftops have been designed as gardens to substitute for lost land and to maintain biodiversity. The project, led by architects Foster & Partners, is due for completion within the next 10-15 years.

32**Johannesburg EcoCity**

Location	Africa - South Africa
Website	www.ecocity.org.za
Size	Initially 30 houses, with a further 60 planned
Type	I - new development
Phase	2 - under construction
Key Implementation mode	b - integrated sustainability vision/planning

Located in Ivory Park near Johannesburg, this programme was launched in 1999. It consists of a series of activities and projects centred upon the EcoCity concept, which aims to offer alternative strategies to mainstream development approaches and to showcase practical, community-based sustainability innovations combining environmental, social and economic elements. The EcoVillage project itself comprises three eco-houses (out of a total of 30 in phase 1) completed to date with support from Bioregional UK (see profile no 6). The project promotes indigenous gardens and permaculture, and grey water recycling (using a solar-powered pumping system) for land irrigation. Traditional local brick production promotes both economic and environmental sustainability, by creating employment and reducing reliance on imported cement. The completed project will feature a traditional African Kraal (homestead).

33**Kalundborg**

Location	Europe - Denmark
Website	http://www.symbiosis.dk/
Size	3,500 houses + industry
Type	II - urban expansion
Phase	3 - implemented
Key Implementation mode	a - technological innovation

Kalundborg pioneered the concept of the 'symbiosis industrial park', according to which businesses are co-located in such a way as to encourage the sharing of resources and, thus, increase resource efficiency. To date, 20 companies, including a fertilizer company, a pharmaceutical institute, and a gypsum and cement factory have set up business there. The industrial park and residential area are located around a clean-coal plant and a fjord. The companies draw on the by-products of the plant and the available sea water.

34**Kampala**

Location	Africa - Uganda
Website	http://enviro.org.au/enews-description.asp?id=788
Size	1,4 million inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	b - integrated sustainability vision/planning

Kampala has experienced many of the problems facing fast growing cities in developing countries, including traffic congestion, a lack of adequate housing and air and water pollution. In response, the municipal government initiated a programme of 'greening' the city. In the early 2000s, it introduced a series of bylaws – since implemented nationwide – promoting urban agriculture and food production, which transformed the local food supply system. The municipality also created national parks in and around the city, thus managing to control urban sprawl. Furthermore, it introduced a traffic congestion fee and an extensive bus network, in order to encourage public transport. More recently, it embarked on refurbishing two housing estates (Naguru, Nakawa) to provide modern, environmentally sustainable accommodation for 30,000 people. Kampala has become known as Africa's garden city.

35-40**Kitakyushu; Minamata; Obihiro;
Shimokawa; Toyama; Yokohama**

Location	Asia – Japan
Website	http://www.gov-online.go.jp/pdf/hlj_img/vol_0015et/04-17.pdf
Size	varied
Type	III - retro-fit
Phase	2 - under construction
Key implementation mode	b - technological innovation

In 2009, the Japanese government (Ministry of Environment; Ministry of Economy, Trade and Industry) selected Kitakyushu, Minamata, Obihiro, Shimokawa, Toyama and Yokohama from a total of 82 applications for eco-city development. The choice was made both on the basis of the six cities' track record as sustainability champions and their future plans. The initiative aims to encourage other cities to follow the example of the six eco-city developments.

Yokohama began to implement the so-called G30 programme in 2003, which aims to reduce waste by 30 percent by 2010. Civil society actors coined the slogan 'less waste, no litter – that's Yokohama culture', which has since been adopted by the city council.

Kitakyushu, a former industrial centre is in the process of transforming itself into a renewable energy centre, by turning its industrial base into solar farms. Several former industrial buildings have been turned into environmental sustainability training centres.

Toyama experienced a steep, 30 percent increase in CO₂ emissions between 1999 and 2003, twice the national average. In response, an electrified public transport system (including a light railway) forms the centre piece of the city's current emissions reduction programme.

Obihiro, which is situated in a biodiverse area, has initiated a reforestation programme around the city, including over 400 ha of previous agricultural land. Furthermore, the city's expertise in recycling agricultural and domestic waste will be used to create a regional waste recycling centre.

Minamata was known for many years as Japan's most polluted city. Since the 1990s, it has embarked on concerted sustainability action programme. It now has the country's most advanced waste separation and recycling system, with household waste separated into more than twenty categories.

Shimokawa initiated a large reforestation programme, as well as installed a wood biomass boiler operated by the city council.

41-46**Kottayam; Puri; Thanjavur; Tirupati; Ujjain; Vrindavan**

Location	Asia - India
Website	http://www.ecocities-india.org
Size	166,000 inhabitants
Type	III - retro-fit
Phase	2 - under construction
Key Implementation mode	b - integrated sustainability vision/planning

In 2001, Kottayam was selected by the Indian government as the first of six pilot eco-city initiatives aimed at carrying out various retro-fit adaptations to established cities. One of the key objectives of the Kottayam project is to improve the areas around the city, and in particular the sustainability of the city's rivers. Work began in 2005 to clean up the rivers and the adjacent swamps, to develop aquacultures, and to create more recreational areas. In addition, the aim is to implement advanced grey water and waste management systems across the city. A series of environmental indicators have been developed, in order to be able to measure the rate of improvement. The city will serve as a site of learning and training for (federal) civil servants as well as specialists in water and waste management.

If Kottayam proves successful, the other five designated eco-city initiatives in Puri, Thanjavur, Tirupati, Ujjain, and Vrindavan will focus on three main areas: improving sanitation in public spaces; making public transport more efficient and environmentally sustainable; and improving facilities and conditions for tourists.

47**Logrono Montecorvo**

Location	Europe - Spain
Website	http://www.e-architect.co.uk/spain/logrono_eco_city.htm
Size	3,000 homes
Type	II - urban expansion
Phase	1 - planning phase
Key Implementation mode	a - technological innovation

In 2007, the regional government of La Rioja launched its plan to create *Ecociudad Montecorvo*, an extension of its capital Logrono. The new neighbourhood aims to achieve a CO₂-neutral footprint by relying on renewable energy (solar and wind power). The linear urban layout is characterised by its compactness – occupying only ten percent of the 56 ha site – and a close alignment with the surrounding environment. In addition to retail and leisure facilities, the new district will feature parkland and a renewable energy research centre and museum. The onsite production of renewable energy is expected to make annual savings of around 6,000 tons of CO₂ emissions. The planning process was met with resistance from the municipal authorities. The first buildings are expected to be completed by 2013.

48**Loja**

Location	South America - Ecuador
Website	http://findarticles.com/p/articles/mi_hb6376/is_2_20/ai_n29330367/
Size	1,4 million inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	a - technological innovation

Loja, the capital of the Ecuadorian province by the same name for years experienced high levels of both air and aquatic pollution, as well as persistent waste management problems. In 1996, the city's newly elected mayor (Jose Castillo) embarked on a sustained programme of 'eco-transformation': measures were adopted to reduce air and water pollution, including the introduction of low polluting buses; all new buildings were required to include at least 20 percent green space; and a program of reforestation was initiated in and around the city. The city also gained a reputation for its advanced waste management and recycling system: a mandatory waste separation and recycling policy – now also including organic waste – was introduced and enforced by a penalty system, with the rate of recycling reaching up to 95 percent.

49**Malmo**

Location	Europe - Sweden
Website	www.malmo.com
Size	285,000 inhabitants
Type	III – retro-fit
Phase	3 – implemented
Key implementation mode	a – technological innovation

Following rapid economic decline in the 1990s and the subsequent shift towards a service-based economy, Malmo embarked on a concerted programme – including its acclaimed BoO1 harbour district – of urban regeneration according to sustainable principles and reinventing itself as 'climate'- / 'solar'- / 'eco'-city. Houses were retro-fitted to achieve up to 35 percent more energy efficiency; a new recycling system and a sustainable transport system (with experimental electric street cars) were initiated; and plans are currently under way to build two major solar thermal and photovoltaic plants. The city aims to be 'carbon-neutral' by 2020 and run on 100 percent renewable energy by 2030. Malmo is frequently held up as a model 'retro-fit' eco-city.

50**Masdar**

Location	Middle East - United Arab Emirates
Website	www.masdar.ae
Size	40,000 inhabitants & 50,000 commuters
Type	I – new development
Phase	2 – under construction
Key implementation mode	a – technological innovation

Launched in 2006, Masdar proclaims itself as the world's first fully 'carbon-neutral, zero-waste' city in the making. Situated on the outskirts of Abu Dhabi with governmental support, the project is an attempt to transform the Emirate into a global leader in sustainable energy technologies. The city's master plan mixes principles of traditional Arab architecture (providing natural ventilation and minimising heat impact) with modern high-technology innovation. Public transport will consist of a solar-powered 'personal rapid transport' system; energy will be generated by photovoltaic technology; water will be recycled through irrigation recovery; and waste will be incinerated to generate power and heat. The new city aims to become an international hub for renewable energy research and development, led by the Masdar Institute of Science and Technology (in cooperation with MIT, Cambridge USA). Work started in 2008, and the first buildings are scheduled for completion in 2011.

51**MenTouGou**

Location	Asia - China
Website	http://www.vtt.fi/uutta/2008/20080229.jsp?lang=en
Size	270,000 inhabitants
Type	II - urban expansion
Phase	1 - planning stage
Key implementation mode	a - technological innovation

The district of MenTouGou in West Beijing was selected by the Chinese authorities as a major growth area. Through a collaboration with VTT, a Finnish technical research organisation, work was begun in 2007 to retro-fit the existing neighbourhood and to build new housing and office space. There are two main foci: first, the use of advanced technology to achieve greater energy efficiency, reduced waste production, more efficient water management, and a low-emission public transport system. The second focus is on preserving the area's biodiversity. The latter is also expected to improve the city's reputation as a tourist destination.

52**Nieuw Terbregge**

Location	Europe - The Netherlands
Website	http://www.nieuw-terbregge.nl/en
Size	3,000 inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key implementation mode	a - technological innovation

The new neighbourhood of Rotterdam has been developed under the European Commission-funded RE-Start (Renewable Strategies and Technology Applications for Regenerating Towns) cross-national programme involving eight European countries. The aim of the programme, which started in the mid 1990s, is to reduce carbon emissions by at least 25 percent, while at the same time promoting high-quality living. In the demonstration project of Nieuw Terbregge, the houses incorporate energy efficient designs; both individual and collective renewable energy technology; and an advanced grey water recycling system. Furthermore, the district has implemented a programme of stakeholder engagement, including joint consultation with residents, developers and utility companies.

53-56**North West Bicester; Rackheath;
St Austell; Whitehill-Bordon**

Location	Europe - United Kingdom
Website	http://www.communities.gov.uk/news/
Size	Between 5,000 and 7,000 homes each
Type	I - new development
Phase	1 - planning phase
Key implementation mode	a - technical innovation

In 2009, the UK government announced plans for the first four in a series of new eco-towns across England to address the national shortage of housing. The decision to build four new towns (from originally twelve selected sites) followed a lengthy and at times controversial public consultation process. The new eco-towns are to be built on either brown- or green-field sites in Cornwall (St Austell), Hampshire (Whitehill-Bordon), Norfolk (Rackheath) and Oxfordshire (North West Bicester). Overall, the aim is to provide homes for around 30,000 inhabitants within a period of five years. The new eco-towns are mostly new-builds, although in some cases they will also incorporate some refurbished buildings. They are located in the proximity of nearby towns, in order to take advantage of existing public transport networks and amenities. The building process is supposed to involve 30 percent less green house gas emissions than traditional building processes. The towns will incorporate renewable (wind/solar) energy production and transport systems (e.g. electric vehicles).

57**Oslo**

Location	Europe - Norway
Website	http://www.iclei.org/index.php?id=9329
Size	520,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	A - technological innovation

Oslo counts among the early pioneers of urban sustainability in Europe. Building on the Local Agenda 21 principles, in 2001 the city adopted the so called 'Earth Charter'. It also introduced a city-wide carbon foot print monitoring system. Public transport has been made more environmentally sustainable using various experimental hybrid fuel technology solutions. A comprehensive recycling system was successfully introduced. In 2003, Oslo was awarded the European Sustainable City award. More recently, the city has extended its sustainability efforts to the redevelopment of its harbour area.

58**Portland**

Location	North America - USA
Website	www.portlandonline.com
Size	Over half a million inhabitants (metropolitan area over million)
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	a - technological innovation

For many years, Portland has been ranked as one of the greenest US cities. Early achievements include an integrated public transport system and the pedestrianisation of the city centre. The city established an integrated planning and sustainability office with focus on key areas including energy efficiency, waste management, and green building design. New buildings have to comply with strict regulations concerning building materials and greenhouse gas emissions, resulting in the largest number of LEED certified buildings among US cities. The city and regional authorities are noted for their strong land-use planning, including establishing substantial green zones in and around the city to control urban expansion.

59**Puerto Princesa**

Location	Asia - Philippines
Website	http://www.puertoprincesa.ph/index.php?page=gi
Size	200,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	b - integrated sustainability vision/planning

Puerto Princesa, the second largest city in the Philippines and an international resort, trades on its green credentials, in order to remain one of the leading tourist destinations in the region. Stringent laws are in place to protect the city's surrounding areas, in particular a UNESCO World Heritage underground river system. The city authorities also initiated an ambitious reforestation programme. In an effort to reduce CO₂ emissions, the ubiquitous tricycles, which serve as main transport means for the city's residents, have been converted to run on electricity and are sold for a quarter of the price of conventional tricycles.

60**Reykjavik**

Location	Europe - Iceland
Website	http://saveecodestinations.wordpress.com/2009/04/16/green-city-tour-reykjavik-iceland/
Size	120,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	a - technological innovation

Iceland's capital, where half of the country's population resides, is at the forefront of an ambitious national plan to turn the country 100 percent free of fossil fuel by 2050. The initial measures focused on public transport, with buses switched to hydrogen technology. More recently, new hydro- and geothermal plants have begun to be built. Since 2003 a network of hydrogen stations has been installed across the city, in an attempt to encourage the conversion of regular cars to hydrogen technology.

61**Rizhao**

Location	Asia - China
Website	http://www.rizhao.gov.cn/en/rizhao.asp
Size	3,000,000 inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key implementation mode	a - technological innovation

Rizhao, or 'city of sunshine', has a longstanding reputation for its environmental sustainability due to its status as a coastal resort with little heavy industry. With the appointment of a new mayor in 2001, the city embarked on its current programme of switching to solar power technology. A majority of houses have since been equipped with photovoltaic cells, while almost all households have solar water heating systems. All street and public lighting is solar powered. In addition to this retro-fitting, the city has also begun work on new neighbourhood developments using strict environmental standards.

62**Segrate / Milano Santa Monica**

Location	Europe - Italy
Website	http://www.milanosantamonica.it/
Size	2,000 units
Type	II - urban expansion
Phase	1 - planning stage
Key implementation mode	b - integrated sustainability vision/planning

This new neighbourhood of Milan is based on the concept of 'bio-architecture', promoting the design of the urban landscape in close alignment and harmony with the surrounding environment. The compact neighbourhood will only make up ten percent of the overall area, with the rest developed as green space to enhance biodiversity. Solar power and heating will provide electricity and hot water for the new houses. It remains unclear what (public) transport system is planned for travel into Milan city centre. The project, which is financed and developed by private bank Vegagest, is due for completion in 2013.

63**Sydney**

Location	Australasia - Australia
Website	http://www.cityofsydney.nsw.gov.au/Environment/Overview/default.asp
Size	4,300,000 inhabitants
Type	III - retro-fit
Phase	2 - under construction
Key implementation mode	b - integrated sustainability vision/planning

Based on two successive local government acts (1993; 1999), Sydney has embarked on a concerted sustainability programme addressing environmental, social and economic issues. Using various sustainability indicators, the city's use of resources is closely monitored. An environmental partnership between the city authorities and civil society groups was established; an extensive public information campaign on conservation and sustainability was put in place; and a household energy savings programme was launched. More recently work on White Bay, a new neighbourhood, has begun using strict environmental norms. There, local transport will be based on a new system of stackable electric mini-cars.

64**Songdo**

Location	Asia – South Korea
Website	http://www.inhabitat.com/2009/09/04/songdo-ibd-south-koreas-new-eco-city/
Size	75,000 inhabitants and 300,000 commuters
Type	I - new development
Phase	2 - under construction
Key implementation mode	a - technological innovation

Work on the new city of Songdo, a private initiative by New Songdo International City Development (NSIC; 70 percent owned by US and 30 percent by Korean companies) began in 2004, with completion expected by 2015. Some 40 percent of the overall area of 1500 acres will consist of green space, including a large central park modelled on New York. Other copies of famous city features will include Venice-style canals. Environmental features will comprise: an integrated public transport system; rooftop gardens; LED public lighting; renewable energy generation; an advanced recycling system; and the enhancement of biodiversity through protected green spaces. The city aims to become the largest LEED (Leadership in Energy and Environmental Design) certified private development in the world, with over 120 certified buildings.

65**Sonoma Mountain Village**

Location	North America – USA
Website	http://www.sonomamountainvillage.com/
Size	2,000 units
Type	I - new development
Phase	2 - under construction
Key implementation mode	b - integrated sustainability vision/planning

Developed on a derelict industrial site, Sonoma Mountain Village (SOMO, in Sonoma County, California) aims to become a leading urban sustainability development based on the notion of integrating the use of advanced technology with a design centred upon the needs of its residents and businesses. This includes a 'five-minute lifestyle' concept, whereby all public amenities and facilities should be located within a five minute walking distance, thus cutting down on emissions and improving the work-life balance. The new town development includes a business cluster, which is designed to attract new businesses with strong environmental credentials (one of its first companies is a steel frame producing company fully using renewable energy and recycling its waste). A series of sustainability education and events programmes is planned for residents. Work began in 2009, with the first buildings scheduled for completion in late 2010 and overall project completion due in 2025.

66**Sseesamirembe**

Location	Africa - Uganda
Website	http://www.sseesamirembe.com/
Size	200 sq miles
Type	I – new development
Phase	2 – under construction
Key implementation mode	b – technological innovation

Sseesamirembe Eco-City (or Lake Victoria Free Trade Zone) was initiated in 2006 by the Ugandan government, with financial backing from China (\$1.5bn; one of the largest Chinese investments in Africa to date). The development stretches an area of some 200 square miles, including multi-use urban developments, sustainable agricultural land and forests, green belts and nature reserves. It is planned as a low-carbon area providing a competitive operational base with efficient infrastructures, administrative support and high-tech services to attract new businesses to the region. The initiative incorporates principles of nature conservation, pedestrian-friendly, energy-efficient urban design and renewable energy production.

67**St. Davids**

Location	Europe - UK
Website	www.stdavids.co.uk
Size	1800 inhabitants
Type	III – retro-fit
Phase	3 – implemented
Key implementation mode	b – integrated sustainability vision/planning

St. Davids, the UK's smallest city, has gained a reputation for its green practices and policies. Following a sharp economic decline in the late 1980s/early 1990s, the city – led by civil society actors, including the Eco-City group – began to shift its focus to innovation in environmental sustainability and eco-tourism. With support from the National Lottery, it launched a programme to become the UK's first 'carbon neutral' city, by experimenting with and implementing various solar heating and photovoltaic, as well as water conservation and recycling, systems. It also runs an education and tourism programme, attracting on average half a million visitors annually. Revenues from this are reinvested in new sustainability technology innovation, including for example a recent study to test the feasibility of installing a tidal turbine in the Ramsey Sound that could provide the city with 100 percent renewable electricity.

68**Tajimi**

Location	Asia – Japan
Website	http://www.japanfs.org/en/mailmagazine/newsletter/pages/027839.html
Size	100,000 inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	c - civic empowerment

Tajimi is among the leaders in Japanese eco-city development, having won the national 'Top Eco-City' award as early as 2003. Its approach to urban sustainable development combines community involvement with transparent information on environmental impacts. New developments and the retro-fitting of existing buildings – using advanced sustainable technologies, such as rooftop gardens and solar panels – are carried out by prior public consultation. Characteristically, urban sustainability as a planning issue is integrated across all of the city's administrative departments.

69**Tangshan/ Caofeidian**

Location	Asia - China
Website	http://www.tangshan.gov.cn/
Size	3 million inhabitants
Type	III/I – retro-fit/ new development
Phase	2 – under construction
Key implementation mode	a – technological innovation

In 1976, an earthquake levelled Tangshan city, after which it was rebuilt according to higher sustainable standards than most other Chinese cities. In 2006, on the 20th anniversary of the earthquake, the Chinese President launched an initiative to consolidate the city as a pioneer for sustainable urban development. Industries that found themselves surrounded by residential areas due to the city's recent growth have been relocated to the periphery. At the same time, strict water and waste recycling requirements have been imposed on all industrial sites. A new district, Caofeidian, is being built to meet the demand for additional housing. It will feature renewable energy and energy conservation technologies. Migrant workers are provided with health care and educational support. Agricultural production in the city's hinterland has been encouraged to switch to non-pesticide methods.

70**Thames Gateway**

Location	Europe – United Kingdom
Website	http://www.communities.gov.uk/thamesgateway/
Size	Around 1.6 million inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key implementation mode	a - technological innovation

The Thames Gateway is Europe's largest regeneration project stretching along the river Thames, incorporating parts of London and the counties of Essex and Kent. The 'eco-region', as it is promoted, comprises urban, brown field and green space, and is to be developed according to economic, social and environmental sustainability criteria. The Thames Gateway Development Corporation (TGDC) was set up in 2000 as a strategic planning authority, bringing together over twenty local, regional and national authorities and organisations. It is in charge of the implementation of both large-scale projects, such as the Channel Tunnel rail extension and the Olympic Village, and smaller projects, such as the refurbishment of housing estates. In 2010, the Thames Gateway Institute for Sustainability was launched as a cross-institutional research and innovation centre to support the development of the region.

71**Tianjin**

Location	Asia - China
Website	http://www.tianjinecocity.gov.sg/
Size	350,000 inhabitants
Type	II – urban expansion
Phase	2 – under construction
Key implementation mode	a – technological innovation

Tianjin Eco-City is a new district of the historic city of Tianjin. It is being built with technology and expertise from Singapore, drawing on the two countries' previous experience of developing the Suzhou Industrial Park. While initially the district will derive energy from a waste incinerator plant, several other options for energy generation are under consideration, including clean fuel, renewable (solar) and geothermal energy. All buildings will conform to stringent energy efficiency standards. The district is planned to allow for up to 90 percent public transport, cycling and walking. Advanced water saving and waste management systems will be implemented. The existing wetlands around the city will be protected to enhance biodiversity. Work began in 2008 and is scheduled to take between ten and fifteen years to completion.

72**Toronto**

Location	North America – Canada
Website	http://www.toronto.ca/environment/index.htm
Size	2.5 million inhabitants
Type	III - retro-fit
Phase	3 - implemented
Key implementation mode	a - technological innovation

In the early 1990s, Toronto launched a concerted sustainability programme led by the city's environment office, with the main focus on the reduction of greenhouse gas emissions. By 2009, a reduction of 40 percent was achieved in comparison with 1990 levels, leading to the award of the Pollution Prevention Award by the Canadian government. Current plans are to reduce greenhouse gas emissions by 80 percent by 2050. Other significant initiatives have included a bylaw providing residents and businesses with incentives to install green rooftop systems.

73**Trondheim**

Location	Europe – Norway
Website	http://www.ecocity-project.eu/TheProjectTrondheim.html
Size	170,000 inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key implementation mode	a - technological innovation

As part of its participation in the European Commission-funded Eco-City programme, in 2005 Trondheim began a programme of retro-fitting residential and public buildings and designing new buildings according to stringent sustainability standards. 'Intelligent' meters in all new buildings help monitor energy and water consumption. Solar and biomass plants have been installed to produce renewable energy. A waste to energy system with an efficiency of over 75 percent is in place. The Eco-City programme also includes Tudela, Helsingor/Helsingborg and Zilina (see profiles 30, 61, and 66).

74**Tudela**

Location	Europe – Spain
Website	http://www.ecocity-project.eu/TheProjectTudela.html project.eu/TheProjectTrondheim.html
Size	30,000 inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key implementation mode	a - technological innovation

As part of the European Commission-funded Eco-City programme (see also profiles no 30, 60 and 66), Tudela has focused on improving energy efficiency and generating renewable energy. The latter includes an advanced, mixed energy system that concurrently harnesses wind, photovoltaic and thermal energy. Apart from retro-fitting many existing buildings, a new neighbourhood is under construction using sustainable building materials. Energy efficiency in the new buildings is to be achieved through the use of a sophisticated monitoring and demand-supply system.

75**Vancouver**

Location	North America – Canada
Website	http://www.vancouver-ecodensity.ca/
Size	570,000 inhabitants
Type	III - retro-fit
Phase	2 - under construction
Key implementation mode	a - technological innovation

In 2008, Vancouver City Council adopted the 'EcoDensity Charter', following two years of political and public deliberation on the future direction of urban planning for the city. The charter's key principles are sustainability, affordability and liveability. In practice, all applications for new developments must meet the Leadership in Energy and Environmental Design (LEED) standard. In addition, land to be developed will be rezoned so as to ensure the inclusion of substantial green spaces. The charter will be used to develop further action plans.

76**Vaxjo**

Location	Sweden - Europe
Website	www.vaxjo.se
Size	56,000 inhabitants
Type	III – retro-fit
Phase	3 – implemented
Key implementation mode	a – technological innovation

Vaxjo, known as one of Europe's greenest cities, has for the last two decades been engaged in an ongoing programme of sustainable urban innovation with focus on three main areas: shifting towards renewable energy, improving energy efficiency, and encouraging behavioural changes among its inhabitants. Originally, its interest in sustainability was prompted by the energy crisis of the 1970s and developed into various action programmes in the following decades. The process intensified following the adoption of the Local Agenda 21. In recent years, innovation has extended to waste treatment, organic waste-to-energy production, and improving public transport. The city council uses an 'eco-budgeting' process to integrate its sustainability agenda in all policy sectors.

77**Waitakere**

Location	New Zealand - Australasia
Website	www.waitakere.govt.nz/
Size	200,000 inhabitants
Type	III – retro-fit
Phase	3 – implemented
Key implementation mode	c – civic empowerment/involvement

New Zealand's fifth largest city, Waitakere was formed in 1989 through the amalgamation of the City of Waitemata and three neighbouring boroughs. At the heart of its early mission was to make Waitakere an 'eco-city' based on blending Agenda 21 principles with traditional Maori values. Existing buildings have been retro-fitted to render them more energy efficient and improve grey water recycling. At the same time all new buildings have to meet strict energy efficiency standards. Public grants are available to residents for installing solar panels.

78**Wanzhuang**

Location	Asia – China
Website	http://www.arup.com/Projects/Wanzhuang_Eco-city.aspx
Size	400,000 inhabitants by 2025
Type	I - new development
Phase	1 - planning stage
Key implementation mode	b - integrated sustainability vision/planning

Wanzhuang Eco-City aims to be a model for bridging the urban-rural gap in China. Building on an existing village infrastructure in the Wanzhuang region, the new urban development seeks to preserve, harness and enhance the established local traditions and agricultural knowledge. The existing villages will be incorporated in the new network of urban centres, thus preserving the social fabric while providing new development opportunities. The site was selected by the Chinese government in the mid 2000s, and is being developed collaboratively by Shanghai Industrial Investment Corporation (SIIC) and international engineering firm Arup (see also profile 14). The project is expected to be completed by 2025.

79**Zilina**

Location	Europe – Slovakia
Website	http://www.ecocity-project.eu
Size	85,000 inhabitants
Type	II - urban expansion
Phase	2 - under construction
Key implementation mode	a - technological innovation

Zilina has associate status in the European Commission-funded Eco-City programme. The aim is to encourage knowledge transfer from eco-city development taking place in Helsingor/Helsingborg, Trondheim and Tudela (see profiles no 30, 60, 61). Zilina has initiated the construction of a new eco-neighbourhood.