

## 2.2 Review of Eco-District Development

In order for The Baroque on Lamma to become a successful eco-district, it is crucial to understand the details of existing eco-district attributes. The strategies employed by these eco-districts are unique, since they are dependent upon local climate conditions and the area they are situated in. From the twenty eco-districts, five were chosen that were most comparable to the Baroque on Lamma project in terms of area, residence and comprehensiveness of sustainable technologies employed. The following sections will provide a description of each project, and an overview of the sustainable features employed. The five chosen eco-districts are:

1. Kronsberg, Hannover, *Germany*
2. Freiburg, Vauban, *Germany*
3. Hammarby Sjöstad Stockholm, *Sweden*
4. solarCity, Linz-Pichling, *Austria*
5. Beddington Zero Energy Housing Development, South London, *UK*

### 2.2.1 Kronsberg, Hannover, Germany

12 years of planning and construction works has been done to develop the district of Kronsberg in the City of Hannover. At the time of its conception, this project was only one of six in Europe that addressed the sustainable development vision. A holistic view regarding aspects of energy, water, transport, construction practice, greening, social cohesion and equitable development were addressed.

Construction	:	Ongoing
Location	:	Hannover, Germany
Type	:	Mixed Residential
Site Area	:	1,200ha
Flats	:	3,000 (Expected 6,000)
Residence	:	6,600 (Expected 15,000)



#### Key Green Strategies : Energy

- District Heating by decentralized CHP in cellars
- Passive design of houses, south facing windows
- Houses have super insulation and assessed for thermal bridging using multi-dimensional heat flow programs
- South facing windows collect solar energy
- Three wind power plants

#### Transportation

- Use of private car is discouraged by provision of extensive footpaths and cycling paths, as well as a new tram station linking the district to the city centre

#### Materials

- City of Hannover imposed strict regulations on construction practices
- All construction waste sorted
- Excavated soil must be reused on site

#### Social Infrastructure

- Provision of different apartment sizes, privately financed apartments, apartments to rent, and publicly subsidized apartments were carefully planned
- All citizens played an important role throughout the planning process, as an advocate was appointed to discuss issues and share opinions

## 2.2.2 Vauban, Freiburg, Germany

Vauban boasts surplus energy houses, as each house' photovoltaic system generates more energy than it consumes. With optimized passive house design, and environmentally friendly materials, the pricing of the houses are still within a reasonable market price.

Completed	:	2005
Location	:	Freiburg, Germany
Type	:	Mixed Residential
Area	:	38ha
Flats	:	1,800
Residence	:	5,000



### Key Green Strategies : Energy

- District heating provided by wood chip burning and cogeneration (CHP) and solar collector
- Waste heat from these processes is used to provide hot water
- 100 houses meet the passive house standard

### Transportation

- Restricted car access in the community
- Extensive walking and cycling paths are provided, 5,000 bicycle parking spaces and 500km of bicycle paths
- A tram links the district to the Freiburg city centre
- All necessary amenities are within walking distance

### Social Infrastructure

- A variety of housing types, such as duplex or five story apartments allow a greater social diversity
- Adaptive planning procedure was adopted, the development scheme takes place in four stages with two years in-between each
- Different housing forms, such as private or subsidized housing provided
- Streets are lined with trees, and are mostly used as social gathering spaces

### 2.2.3 Hammarby Sjöstad Stockholm, Sweden

Extensive soil decontamination was carried out to ensure compliance with the requisite standards. Only sustainable materials were used in the construction of Hammarby. There is also an extensive waste separation program which starts at the building level. Food waste, combustible waste and papers are separated by the tenants themselves. Block based recycling centres handle glass, plastic, metal, electrical and old furniture. Area based waste mostly consists of hazardous waste which must be dealt with at the environmental information centre. The information centre not only provides the district with area based waste recycling, it also offers training sessions and exhibitions on new sustainable technologies.

Construction	:	Ongoing
Location	:	Stockholm, Sweden
Type	:	Residential
Area	:	160ha
Flats	:	11,000
Residence	:	24,000
Key Green Strategies	:	<u>Energy</u>



- Heat insulation, energy-efficient windows, energy efficient appliances
- District cooling takes place via waste product from a heat exchanger from the waste water treatment plant
- Waste heat, combustible waste, and solar cells are the main sources for district heating
- The biogas produced from the waste water treatment plant is used as fuel for buses, garbage trucks and taxis

#### Transport

- Personal transport via private car has shown significant decrease, number of journeys taken via public transport has increased. Co2 emissions reduced by 2,373 tonnes per year

#### Water

- Reduced water flow and dual flush toilets were installed to reduce water consumption
- Storm water retention is done through use of green roofs, canals and gutters
- Rainwater and snowmelt is collected and treated on the streets themselves, by designing two tanks, one for settling and the other for draining
- Lifecycle analysis (LCA) conducted for determining suitability of using nitrogen in the wastewater for agriculture, and potential chemical energy in wastewater

#### Habitat and Ecology

- Extensive green public spaces and green corridors are linked to a Nature reserve and a forest
- Attractive environments for wildlife including insects and birds were created

### Culture and Leisure

- Provision of a library and cultural centre enhance cultural vibrancy
- Ski slope and sports facilities are also provided to encourage a healthy and active lifestyle

### Social Infrastructure

- Input from authorities, administrations were actively involved throughout the course of the project

## 2.2.4 SolarCity

SolarCity, as its name suggests, relies heavily on solar energy. However, it encompasses all areas of the term including: designing buildings based the principles of solar architecture, utilizing active and passive solar energy, expose users to sun to increase mental and physical health, social warmth, social energy, and integrating nature with leisure. However, the cost of solar technologies is quite expensive, so only individual infrastructure buildings had incorporated solar electricity generation. Solar hot water was applied throughout the entire district though. Beyond the principles of energy, air, waste and water, the project aimed to protect nature, provide adequate recreation, and allow the two to complement each other.



Completed	:	2005
Location	:	Linz-Pichling, Austria
Type	:	Residential
Area	:	60ha
Flats	:	1,300
Residence	:	3,000
Key Green Strategies	:	<u>Energy</u>

- One-third of the solar energy is used to provide hot water to the residents, the remaining portion is generated by district heating
- Active and passive solar energy as well as CHP with natural gas and biomass are used to generate electricity
- The waste heat from these processes is used to provide hot water
- Housing and infrastructure are all designed based on solar architecture, combined with bioclimatic design to reduce the need to use air conditioning

- All buildings have a large southern facing facade, and are heavily insulated
- Low energy construction combined with solar collectors allows the buildings to require less heating than conventional homes

#### Waste Water

- Goal of solarCity was to be wastewater free
- 100 homes have urine separating toilets to use the urine as fertilizer
- Grey water is fed to a sand bed filter, and led to the stream
- Rainwater is managed through hollows, and reservoirs

#### Social Infrastructure

- Mixed forms of legal tenure
- Diverse age groups as well as availability of many different forms of activities ensure social cohesion

#### Recreation

- A landscape plan carefully outlines the different types of recreation that can be performed at different areas
- The multi-functional use of outdoor spaces is unique as it combines aspects of greening with water

## 2.2.5 Beddington Zero Energy Housing Development

BedZED is Britain's first urban carbon neutral development comprising of 99 homes which focus on sustainable living by implementing the principles of renewable energy, green transport, eco-conscious construction, as well as water and waste recycling. These measures are crucial in reducing the eco-footprint since 5% of energy generated globally is used to construct buildings and 45% is used during building occupancy. Simply incorporating different design techniques with available technologies, it is possible to reduce the energy consumption of buildings. This is not only environmentally friendly, but cost effective for the tenants.



Completed	:	2002
Location	:	Wallington, South London, UK
Area	:	1.6ha
Residence	:	220
Architect	:	Bill Dunster
Awards	:	Shortlisted for Stirling Prize 2003 2001 UK Solar Award

Key Green Strategies : Energy

- Utilizes solar and biomass as the main alternative power sources

- Electricity is generated from 777m<sup>2</sup> of high-efficiency mono-crystalline PV panels in conjunction with Combined Heat and Power (CHP) Plant which runs on chipped tree surgery waste
- The waste heat from these processes is used to provide hot water
- Energy efficient appliances are installed

#### Waste

- Construction waste set targets to reduce its weight sent to landfill
- Waste generated during occupancy was targeted to be reduced by 60% by encouraging recycling and composting practices
- Impressive 50% recycling rate, even though recycling bins are only provided at the perimeter of the site

#### Materials

- Embodied carbon of the materials was minimized as much as possible by sourcing most of their materials within a 35 mile radius of the site
- Other materials were reclaimed or recycled

#### Transportation

- A method used to discourage travel is the option of having grocery food delivered to the customer through online purchase
- No supermarkets provided nearby, to encourage residents to grow their own food
- Carbon arising from personal transportation was discouraged by planning mixed-use development
- Decreased car ownership due to availability of cheap and convenient green transportation options
- Provide suitable public transport, and provision of walking and cycling paths

#### Water

- Using water recycling and conservation strategies
- Install water efficient fittings and appliances
- Wastewater treatment used to reuse water for toilet flushing and irrigation