Development and planning strategies – varied international approaches to urban sustainability

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ABSTRACT: This paper describes some of the varied approaches being taken towards sustainable planning and design in a range of urban setting from around the world. It is the result of a study undertaken to identify and collate information on good practice from which wider guidance might result. The main discussion describes and reviews some of the strategy level approaches that have been used in a range of cities, each of which has some level of environmental and sustainability planning. In each case there are significant differences, particularly in the focus of initiatives and in the level of control exerted by local government. The degree to which passive and low energy architecture results, as an output in each location will be examined with reference to built examples. The study shows that many good strategies and programmes already exist though the level of coordination might be improved. It also demonstrates that no single model provides the ideal solution and that pragmatic approaches that can command public understanding and support are the key requirement.

Conference Topic: 4 Energy and urban planning
Keywords: planning, strategies, urban, sustainability, buildings

1. INTRODUCTION

The success of passive and low energy architecture in infiltrating into the mainstream of design and construction of new buildings, and the modification of the existing building stock, depends on many factors. Some of these factors relate to the understanding and ability of designers to produce such buildings; some relate to the limitations of the construction team or availability of materials; some relate to the prevailing cultural and economic issues; and some relate to the national and/or local framework in which the buildings are located. The papers at this PLEA conference, as with many past conferences, will describe many good examples and analyses, particularly of individual buildings or small-scale schemes. It is this authors contention however that the successful continuation, replication and advancement of passive and low energy building also, and perhaps more crucially, depends upon the regional or local urban strategic framework that can support such development.

Of course it is also important to have good support at grass-roots level and to have the evidence of local exemplar buildings, however in order for passive and low energy options to become the norm, more is needed.

The importance of a strategic planning framework has been discussed at a previous PLEA Conference [1], and this paper develops ideas further. Here analyses are presented of some recent developments that have taken place in cities from around the world. In these analyses however, more than simply low energy concerns will be considered. Efficient use of energy in buildings, buildings that consume up to 50% of national energy requirements in a number of countries, is an essential component of future global sustainability, but it is not the only component. It is also important to see PLEA solutions within an overall strategy for sustainable development and efficient use of energy.

2. LEICESTER, UK

In the UK the city of Leicester has for many years been associated with an environmentally sensitive attitude to sustainability. In 1990 it was designated as the UK’s first ‘environment city’ and in 1992 its representatives had a high profile at the first Earth Summit in Rio de Janeiro. The City Council and other local bodies have attempted to incorporate strong environmental policies into their operation over the intervening period.

The role of local government in the UK is however somewhat limited with respect to implementation of policies for low energy architecture. National building regulations set standards for energy conservation and fuel use in buildings and they have been widely recognised as falling short of ‘best practice’ over the years [2]. Local governments have only the role of enforcing adherence to such minimum standards. It is not simple to introduce higher standards because of the perception of associated higher building costs, and the lack of interest from potential developers or purchasers of higher than standard buildings. As a
result local initiatives and strategies have to be based upon a combination of persuasion, coercion, information provision and development of supportive policies.

In Leicester such policies and frameworks have been produced and attempts are being made to incorporate these into new development. The improved frameworks have been aided by research at the local De Montfort University which itself possesses one of the UK’s iconic passive and low energy structures – the Queen’s Building (see figure 1).

![Figure 1: The Queen’s Building, Leicester](image1)

Leicester also has an active local environmental group – Environ – which acts to initiate and support sustainability and low energy practice. Adjacent to its headquarters is the Leicester EcoHouse (figure 2), which acts as a showcase for low environmental impact and energy efficient technologies. More importantly the local council has been attempting in recent years to promote good practice ideas into the mainstream of development, such as at Ashton Green. This is new eco-village planned to accommodate eventually about 3000 homes plus businesses and community facilities. Since the council owned the land on which development was to take place it was able to influence its evolution through negotiating higher standards and higher qualities with its developers. This involved site layout and planning (and thus microclimate), energy conservation, alternative energy supply systems, and methods of construction [3].

There have been delays in the implementation of the scheme which perhaps demonstrates that a strong will is required to push through alternatives to the normal procedure. Such alternatives are particularly required in the UK however because of the current prevailing attitudes that result in perhaps a slightly lower price but also in lower value/quality and higher energy solutions for building developments.

3. MELBOURNE, AUSTRALIA

Australia is a country proud of its natural environment however it is also a country with per capita energy consumption close to that of the USA. One of the reasons for this is undoubtedly the higher level of energy use in transport systems (both vehicular and airborne) as a result of the size of the country and distances between centres of population. A further difficulty that is particularly evident in Melbourne is the immense level of urban sprawl: low rise building carpeting vast areas of land well away from the city centre.

The City of Melbourne itself comprises only the central zone/business district of the wider metropolitan area, so the influence of the council is limited though there is also much local cooperation with neighbouring authorities. Over the last ten years there has been a major effort to reposition the city in terms of sustainability and environmental concerns. Part of this has been an attempt to focus on opportunities for growth of green or environmentally orientated businesses, with the local council acting to provide advice, support and examples of good practice. It has set in place policies to reduce greenhouse gas emissions, improve resource use and reduce waste. The city has also adopted procedures for ‘triple-bottom-line’ accounting in which not only is the economic analysis carried out to support decision-making but also social and environmental costs and benefits are included.

Inevitably a lot of effort has gone into transport issues even though the city is well served by an extensive public transport system with trams and light rail alternatives. It also has a policy for the creation of a sustainable built form for the city including low-energy solutions; an ‘Energy Smart Housing Manual’ is available to aid in the procurement and operation of low energy dwellings.

Financial support has been offered to help increase use of solar energy in buildings and the council has encouraged use of renewable energy sourced electricity. One prominent building to which roof-mounted photovoltaic modules have been applied is the historic Queen Victoria Markets (figure 3 shows this before installation of the array). It is somewhat disappointing however that despite all of
the effort and focus on environmental issues that there are few low energy building developments so far completed. There is some evidence of conflicts between state government and city level policies and regulations with developers reluctant to embrace major change. The city has worked hard to create a sense of altered focus through prominent events backed-up by policy shifts that have been well-publicised.

Figure 3: Queen Victoria Market, Melbourne

4. AUSTIN, USA

The USA is often held up as an exemplar of very poor action with respect to energy efficiency and environmental concerns. Whilst this may have some truth at national level there are many good examples of the very opposite at local and individual scales. One city that has some claim to be a leader in the United States with regard to energy issues is Austin, the state capital of Texas.

In the 1980s the community owned electrical utility was suffering from problems of increasing demand and as an alternative to building new plant capacity, the strategy of promoting energy conservation was adopted. This led to the initiation of the Austin Energy Star Program in 1985 as a rating scheme that allowed comparison of new buildings with the city’s energy code. The key to its success was good publicity and good public understanding; this led to high penetration into the market and improvement in energy performance due to public demand for high ratings.

By the 1990s the rating scheme had developed into the Green Building Program. This was a more wide-ranging assessment incorporating contemporary public interest in sustainability and quality of life issues.

Both schemes were funded principally by the electrical utility since it had an interest in controlling increases in demand and thus operating more efficiently. It has also funded grant schemes to improve performance of certain target groups/sectors.

Large amounts of information, guides and other materials have been produced to aid design of better more energy efficient and environmentally sensitive buildings. An example of the scheme’s effect is shown in figure 4 – the Gables Housing Project, which also includes water management as well as energy efficiency measures.

The various programs have been seen as complementary to the broader Sustainable Communities Initiative set up in the 1990s in Austin. Some of the benefits in relation to energy efficiency have undoubtedly arisen from the local autonomy and understanding that exists rather than as a result of imposed strict regulatory requirements. It seems that low energy solutions are not only good for the planet but also good for the pocket. The understanding has come about by taking a holistic approach considering all issues rather than just a narrow focus (which is common in many countries purporting to have more impressive environmental credentials).

Figure 4: Gables Housing Project, Austin (Austin Energy Green Building Program)

5. PORTLAND, USA

The city of Portland in the northwest of the USA acts as an interesting counterpoint to Austin. Here there is arguably a more visible and planned strategic approach to environmental issues, and the city sells itself to some degree on this perception. It is a good example of how sustainability oriented urban policies might be applied in practice.

The planned approaches began in the late 1970s as a response to the increase of oil prices and led to formulation of the Portland Energy Policy, the first such city initiative in the US. Over a period of years the strategies became more sophisticated and in 1991 the City Energy Challenge was set up. This had the aim of significantly reducing energy use in the city, and with the more recent development of a Global Warming Strategy the focus has followed the main environmental concerns but has also emphasised the cost savings available too.

The Climate Trust was set up as a means of transferring funds, effectively collected as taxes on conventional energy use, to projects dealing with carbon emissions abatement. Within the city this has had an important impact by releasing money to improve the energy performance of residential and commercial buildings. Portland has also been a strong advocate for the use of the LEED (Leadership in Energy and Environmental Design) environmental rating system for buildings that has been developed by the US Green Building Council.

In late 2000 the Office of Sustainable Development was set up by the City of Portland and
amongst its constituent elements were the Energy Division and the Green Buildings Division. The Energy Division concentrates on supporting energy consumption reduction across a number of sectors (including residential and commercial buildings); the Green Building Division supports a wider range of environmental initiatives for buildings and has established the G/Rated scheme, which is also linked to the LEED rating method.

A number of environmentally sensitive new building projects and refurbishments/redevelopments have been carried through, and have typically shown energy savings of 20% by comparison with conventional alternatives. One example is the Jean Vollum Natural Capital Center (see figure 5); this is the redevelopment of an 1895 warehouse as part of an ecologically focused ‘urban village’. It achieved a ‘gold’ standard on the LEED rating scale.

Portland has certainly created an image for itself as an environmentally aware location and a popular place to live – ‘San Francisco without the hassle or the expense’ as one commentator put it. It has the potential to achieve more however. Air conditioning is still widely used and despite the environmental emphasis of the city’s policies, only a relatively small number of buildings have so far passed through the LEED rating and achieved high scores.

6. MALMÖ, SWEDEN

The Nordic countries of Europe are often associated with more prominently positive attitudes towards sustainability. They are also perhaps countries in which more control over planning and development has been exerted. Certainly in Sweden, regulations were adopted several decades ago that have enforced policies for low-energy buildings. It would also not be unusual to find buildings that exceeded the minimum standard and though low energy design does not attract specific attention this is more because it is commonplace rather than because it is lacking.

In 2001 a major exposition of environmentally sensitive building was held in Malmö in southern Sweden. The site, known as ‘bo01 the City of Tomorrow’ involved the redevelopment of 18 hectares of waterfront area, previously used by industry, as a showcase of modern housing design. The project was also firmly based in the strategic planning of the city of Malmö. Twenty schemes were included showcasing the work not only of Nordic architects but also those from further afield. A ‘European Village’ of examples of housing from nine countries was also constructed close to the main site and extensive environmentally sensitive landscaping was carried out. Figure 6 shows a view of several of the schemes that faced on to the waterfront.

In all approximately 500 dwellings were constructed ranging from studio apartments to large multi-storey penthouses. A significant feature was the intrinsic acceptance of low energy approaches and the incorporation of sophisticated environmental monitoring and control systems in many schemes. A number of more novel approaches were incorporated such as in the green roofed house of figure 7.

The whole project was designed with the aim of being self sufficient in energy. Aquifer sourced heat pumps have been installed to provide for both heating and cooling. Some 1400m² of conventional and 200m² of evacuated tube solar collectors are also part of bo01 and the site is connected to a district-heating
scheme. Electricity is provided by a nearby grid-connected wind turbine and a small fraction of the total is provided by on-site photovoltaics.

Water and waste systems are sophisticated and novel and the whole environmental approach has been well planned to support the local city development strategies. Despite this there is also a sense that the site restrictions and the exhibition focus on showcasing architecture has meant some properties maximise view rather than low energy potential (for instance in the numerous examples of large west facing windows).

7. HONG KONG

Hong Kong and cities like it, especially those of the Pacific Rim which aspire to its and the West’s economic prosperity, present some of the greatest challenges both to sustainable development and to the provision of passive and low energy architecture. Some of these challenges relate to the climatic location of such cities and this can preclude the option for passive comfort conditioning solutions, but certainly more energy efficient options than are commonly employed could be used.

Hong Kong is in many ways a strong counterpoint to bo01. Its scale is vast by comparison and the planning strategies do not openly focus on environmental issues. It covers an area of approximately 200km² and has a population of 7.5 million. One might say that the main emphasis is on enabling development rather than controlling it and it is the necessity of the population’s requirements and the location of the city that enforces a number of activities that lead to environmental opportunities.

The topography of the city’s location restricts building to about 50% of the land area. There are many open spaces and parks though in its central areas it is ultra dense and ultra compact but this also offers some opportunities.

The density of inhabitant in occupied areas is very high ranging up to about 50,000 persons per square kilometre. This places great pressure on space and property prices are very high. It is quite common to find family apartments of only 40-50m² with many multi-use internal spaces. This ‘efficient’ use of indoor space means that although building services systems are required, including air conditioning, the density and smaller area results in lower energy use than might otherwise be the case.

Hong Kong is a relatively affluent city with a high per capita income but it also has a relatively low per capita energy consumption figure (about 20% of that of the USA). One reason for this is the compact nature of the city that integrates a well-planned road system and perhaps more importantly an excellent public transport systems. The combination of low fares and easy access means that less than 20% of journeys are by privately owned vehicles, reducing transport energy consumption significantly. Fares are kept low partly as a result of the costs of the public transport infrastructure being supported by private companies that provide stations in exchange for development rights over the premises. There are also numerous tall multi-storey developments that include multi-use space (residential combined with offices and retail premises as well as community facilities) high-rise urban villages in effect. Such buildings reduce the need for occupants to travel far to carry out many day-to-day activities.

The effective public transport systems are also supported by numerous elevated walkways, escalators and other pedestrian movement systems. These ease movement across roads and also help link parts of the city; indeed these 3-dimensional movement systems have helped in the regeneration of a number of areas by bringing people and activity to and through them.

In 1998 the Chief Executive of Hong Kong signalled a change in emphasis for the city whereby the key catchphrase for the future became ‘sustainable development’. The Hong Kong Institute of Architects has also organised a series of events and seminars as part of ‘greening of design’ with ideas and principles for the built environment. More recently a green building council has been established. Despite this there are still relatively few openly ‘green’ or low energy buildings in the city. One exception is the Verbena Heights development shown in figure 8. This was constructed in the early 1990s as a housing solution for low-income families. The shape of the blocks was modified from the usual to one that would enhance air movement thus permitting natural cross-ventilation and reducing the need for air conditioning. The shape also gives a better naturally lit environment and overall the occupants have given a good response to the initiative.

Figure 8: Verbena Heights Development, Hong Kong

There are still many problems in Hong Kong – waste, noise, air pollution, urban heat island effects, lack of natural light and ventilation – however in the way that the city has evolved it is making good attempts at addressing a number of sustainability issues. Its density is both a problem and an
opportunity. Unfortunately so far, though many issues have been addressed it cannot claim to be yet a champion of passive and low energy architecture.

8. CONCLUSIONS

One of the major findings of the work described here is that more sustainable and lower energy alternatives are possible in a variety of settings however at the present time the overriding issue in almost every case is the perceived cost of pursuing alternative building strategies. Taken over the lifetime of a building any additional costs are relatively small, and in any case, strong arguments can be advanced that good energy efficient design goes hand in hand with creating high quality internal environments that people prefer.

The incorporation of forward looking strategies that foresee the end of the current fossil fuel dominated era of human development also lends an element of future-proofing to design that reduces risks of higher environmental costs later in a building’s lifespan. High energy buildings that do not have the facility to work in harmony with their local climate run the risk of being uninhabitable, un sellable or unlettable in the future.

Pragmatic policies and initiatives should be favoured so as to enact all changes and benefits – though there are often more impressive changes that could be carried out these should not be waited for dogmatically. All solutions that yield benefits should be considered, especially if they are available and clear.

The examples presented in this paper are not perfect, nor could they ever be, however they do show that meaningful change and advancements can take place in a variety of settings. It is perhaps many commentators preoccupation with criticism that obscures the benefits in relation to sustainable development and passive and low energy architecture that can be delivered – even in small packages, the changes can be worthwhile.

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9. RECOMMENDATIONS

Cities and neighbourhoods provide the optimum level at which decisions can be taken to influence sustainable development and ultimately passive and low energy architecture. Strategies and processes for decision making therefore need to be developed and supported at this level.

City/neighbourhood policies and procedures must also link to supportive national, state or regional policies too.

Environmental accounting systems need to be extended and developers made more aware of the longer-term costs and benefits associated with different forms of development. There is also a need to distinguish between ‘sustainable development’ and ‘regeneration’. Business planning needs to incorporate awareness of future profits, costs and liabilities.

There is great need to raise public awareness and interest in the issues and more understanding is needed of differences in attitudes expressed in different countries and cities.

With these things in place it becomes possible to expand the market for passive and low energy architecture, making the alternative into the norm.

ACKNOWLEDGEMENTS

The help of Professor Edward Ng (of the Chinese University of Hong Kong) is gratefully acknowledged in relation to the provision of information on Hong Kong. The help of Clive Knights and the Austin Green Building Program is also acknowledged in relation to the images for Portland and Austin respectively.

REFERENCES


ANNEX - USEFUL RELEVANT WEBSITES

Leicester: www.environmentcity.org.uk  
www.environ.org.uk

Melbourne: www.melbourne.vic.gov.au

Austin: www.austinnenergy.com

Portland: www.portlandonline.com  
www.sustainableportland.org

Malmö: www.malmo.se

Hong Kong: www.hkia.net