

Planning and design strategies for sustainable low energy development in Seoul, Korea

A. Pitts and K. Kim

University of Sheffield, UK

ABSTRACT

This paper describes a component of ongoing research that deals with planning and design strategies relevant to sustainable and low energy development. In this paper the particular status of the city of Seoul in Korea is investigated and analysed. The situation that applies in the city is a combination arising from national policies, city level interpretation and local level action. Seoul is compared to several other cities and the actions being taken. Information and assessment in a number of key environmental areas is presented including water, wastes, air quality, ecology, transport, energy and the built environment. Although the built environment is an important component of low energy and sustainable design it is not the only component. The argument is advanced that support from strategic actions and planning processes is necessary to provide a wide ranging infrastructure that is required to enable the production of low energy and passive architectural solutions. Such solutions cannot and should not be isolated from other sustainability orientated actions and must be coordinated under an umbrella of policies and strategic planning; and where necessary legislation. Some of the particular initiatives in Korea are described in more detail with reference to developmental and renewal schemes.

1. INTRODUCTION

Seoul is a dynastic capital city boasting more than 600 years of rich history. However, in recent decades the focus has been on economic as well as cultural development with the city evolving into a modern metropolis covering

over 600 square kilometres. The Republic of Korea has experienced an 'economic miracle' over the last 40 years with a rapidly growing economy. This rapid growth has also brought problems associated with urbanisation and industrialisation however. Between 1990 and 2002, emissions of carbon dioxide from combustion increased by 93% (OECD/IEA, 2003). Carbon emissions are approximately 8 tonnes per capita on a national basis.

The population of the city of Seoul now exceeds 10 million with over 3.5 million households; average density is a little in excess of 17,000 people per square kilometre. The city is subdivided into 25 autonomous districts (or Gus) which further subdivide into 522 local areas (or Dongs). This interesting sub-divisional responsibility may be an important element in enacting sustainable development since it allows local neighbourhood involvement. Traditionally, administrative operations in Korea have been tightly controlled but systems are now changing with more public interest and involvement.

Geographically the city is split almost exactly in two halves (north and south) by the Han River. There are also a number of significant mountains and smaller peaks around and within the city boundaries. The climate of the country is generally temperate with the Seoul varying between northern continental and southern oceanic resulting in hot and humid summers (average August temperature 26.2°C) combined with cold and dry winters (average January temperature: -2.1°C).

2. KOREAN NATIONAL ACTIONS

The rapid rise in pollution levels in Korea asso-

ciated with is economic boom has meant that environmental issues have moved up the political as well as economic and social agendas. In the late 1980s a change in mood was signalled by the upgrading of environmental policies, the enhancement of the state's Environmental Agency and the inclusion of a responsible cabinet minister in the government. The National Government also started to adopt sustainable development policies following the Earth Summit of 1992 and since 2004 further more far reaching national strategies have been in preparation due for implementation in 2006. It has also ratified the Kyoto Protocol with commitments up to 2018.

The approach to sustainable development in Korea has a strong element of strategic planning within a framework that allows cross-sectoral approaches and which also separates as appropriate at national, regional and local levels. Long term economic development has also been linked to environmental policy by the Basic Environmental Policy Act, 1990. Certainly the government wants to improve environmental performance but it also wishes to create and maintain a strong economy.

The government has a 10-year long-term sustainable development plan (Green Vision 21); the first plan was from 1996-2005 and work is underway for its successor. There is also a mid-term plan (2003-2007) and a series of smaller sectoral based strategic plans. There is a National Action Plan for the Implementation of Agenda 21 and it is interesting to note how well integrated this planning system appears to work in Korea.

The Green Vision 21 scheme has also led to policies related to energy technology and conservation. In recent years the previously centralised and closed administrative decision making process has begun to be opened up to greater public participation. There have also been a number of initiatives under the Local Agenda 21 banner, particularly in Seoul, which is perceived to suffer from relatively severe pollution problems.

National plans of particular significance are:

- *The Korean System of Integrated Environmental and Economic Accounting* – this adds environmental accounting onto the existing national accounting system;

- *The Ten-Year Plan for Energy Technology Development*, which includes action on energy conservation, new and renewable energy, and clean energy sources;
- *Basic Plan for Restructuring of the Energy Supply Industry*, which includes alternative and renewable energy sources.

Overall there is a strong focus at national level on: promoting environmental industries; green budgeting; energy technology development; and measures to improve air quality. National level strategies have recently been well summarised by Volkery for the International Institute for Sustainable Development (Volkery, 2004). Buildings are not specifically identified; however they are intrinsically covered by a number of developing technologies areas and by urban and other planning mechanisms. The previous Minister for the Environment did however identify the need for 'changes to paradigm, towards environmentally friendly architecture'. He stated a belief that sustainable architecture was based on a harmony between regional and international styles, nature and architecture, and technology and architecture. He also promoted a green approach to design based on saving energy, saving resources, use of recycling, preservation of ecology, and development of environmentally friendly settlements (Kim, 2000)

An interesting umbrella organisation that helps to promote and support the environmental agenda is Green Korea United (Green Korea United, 2005), though it also takes an overtly political stance on a number of issues. It has 40 staff and 15,000 members and one of its missions is to promote eco-villages and a sustainable society. It is worthy of note that in some ways there are already a number of local or grass-roots organisations working to push forward the sustainable development agenda.

3. THE CITY OF SEOUL

Introduction

The City of Seoul has been supportive of improvements to sustainability and environmental pollution through a series of policy and strategic decisions. A great deal of the latest information on its policies and actions can be found through the city's website, Seoul Vision 2006 (Seoul Metropolitan Government, 2005), which also

includes many relevant subsections dealing with green approaches such as Seoul Green Vision 21. These programmes clearly fall into line with national policies and strategies but develop them onto a more urban scale.

The City sees itself as ‘A municipal administration with the environment as top priority – consideration of the environment as top priority in all divisions including urban planning, housing, and transportation’ (Seoul Metropolitan Government, 2005). It has made important advances but there are still areas to be pursued or developed.

4. PLANNING STRATEGIES AND INFRASTRUCTURE

In order for sustainable and low energy development to take place it is necessary for a supportive infrastructure to be created. This is based around sound strategic planning that links urban, neighbourhood and building design scales. This can then deliver opportunity for economic, social and environmental sustainability. Figure 1 illustrates this schematically and is described by Pitts (2004) elsewhere in more detail.

Strategies must address a number of coordinated areas: energy, transport, water, wastes, ecology, the built environment, and linking these, assessment and information.

Korea is highly dependant on imported fuel sources to meet energy needs – it is the sixth highest oil consumer and fourth largest importer in the world (Ministry of Commerce, Industry and Energy, 2003). This heavy reliance on imported fuel is something of an Achilles heel, yet

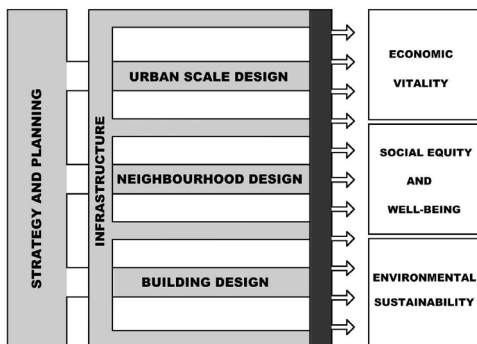


Figure 1: Strategic linkages necessary for sustainability.

its plans for renewable energy source development seem rather modest with a target of 5% by 2010 (it was 1.4% in 2002). More investment and exploitation is probably called for. A new plan was introduced in 2003 for developing technologies and disseminating information in relation to renewables. More specific information is expected to be released during 2005. Major areas already selected for development are: hydrogen fuel cells, photovoltaics, and wind power. Five energy self-sufficient green villages also now exist as exemplars.

The major issue with regard to transport in Seoul has been the remarkable increase in vehicles from a mere 60,000 in the 1970s to over 2.4 million by 2000. Gas powered vehicles have been introduced particularly for public transport and goods wagons. There are major problems with the number of vehicles however and though faster and more accessible public transport systems are being introduced there are still difficulties. The density of occupation within the city should mean that public transport systems are more viable. The city might look to other Pacific Rim areas for ideas and inspiration but there will be no easy solution.

Air pollution has been recognised as a major issue in Seoul for some time; the local topography causes trapping of pollutants in the city. Filtration of vehicle exhaust fumes is now obligatory and polluters are policed by local *environmental vigilantes*. These strategies enabled the city to meet WHO air pollution limits in 1999. Private transport accounts for over three quarters of all use and diesel powered vehicles have been identified as causing particular problems. Air pollution regulations have been further tightened since 1999 and compressed/liquefied natural gas powered vehicles have been encouraged.

The main source of drinking water for Seoul is the Han River and its tributaries. Water consumption has doubled since 1960 and this is now stretching the system’s abilities. Major upgrading and replacement programmes are underway. Legislation has meant that the general quality of the river water has improved particularly because of the prevention of discharges and treatment of waste water. One problem is abstraction from underground sources which have become polluted over the years; only perhaps 30% is now suitable for drinking. Policies

to improve the situation have, by necessity, to involve other cities within the catchment area. A large amount of money is currently being spent to address these issues and also includes the enhancement of river frontage and the encouragement of wetlands. Future options include better on-site treatment and use of reed beds and other systems.

Seoul produces vast quantities of wastes, the amounts of which have been somewhat restrained by the volume based charging structure that was enacted in 1995. The majority of waste is still disposed of in landfill (about 55%) but recycling is now a very close second at about 40% of totals – an increase of 60% between 1994 and 2000. Incineration of some wastes is an area of disposal currently being further developed as a large fraction of waste is combustible. Recycling efficiency is encouraged by the division of materials into about 8 main categories. Manufacturers are also shortly going to be obliged to both design products for recycling and also take responsibility for collection and processing of the recycled materials.

Seoul has many areas of forest and other green areas within its boundaries. Green zones make up about 40% of the land area and there are a large number of parklands, but mainly located in the outer areas of the city. In order to redress the balance a programme of green park expansion was carried out in the late 1990s. This involved disused sites in inner city areas being converted to green spaces. A civic campaign to plant 10 million trees was also encouraged.

As part of recent developments the city has been encouraging green self-sufficient villages and the use of renewable energy sources on building developments that exceed a certain size. Unfortunately there are still many problems as there is an increasing demand for housing which is being met at present by the building of new commuter communities in large scale satellite developments around the outskirts of the city. There has been an increased focus on building quality in the last 5 to 10 years however. Overall, built environment deserves much increased attention in the future in order to deliver long term objectives of meeting sustainable development targets.

One way of improving standards and also of informing and influencing public opinion in re-

lation to the built and natural environments is to introduce information programmes and assessment schemes that attempt to provide environmental ratings. In Korea the Green Building Council has been given the task of introducing a *Green Building Rating Scheme* (GBRS), the current state of development is described on the council's website (GBC Korea, 2005). The assessment is utilising some of the elements of the Green Building Challenge methodology; though it remains to be seen how effective this will be.

An environmental assessment method, KOEAM 2000 is also being developed by the Housing and Urban Institute of Korea. It is being used to provide a valuable indicator for new building development in several category types. Its main components assess: land use and transport; energy, materials and resources; ecology; and indoor environment.

Environmental impact assessment tools for high rise apartments have also been developed recently. This includes passive design strategies, building materials, energy consumption. It has also been revealed that the Ministry of the Environment is considering the introduction of a green building certification scheme in association with green labelling.

In other parts of the world an approach of developing assessment tools and dissemination of information has had a number of benefits and occasionally been very successful. These approaches offer much and should be encouraged in Korea.

5. ENVIRONMENTAL INITIATIVES IN SEOUL

5.1 Introduction

This section describes three contemporary projects being undertaken in Seoul that are linked to sustainable development and show how the strategic approaches can reap benefits. In some cases these have been limited, though it is also the case that many ideas are relatively new and require both public acceptance and understanding as well as designer expertise.

5.2 *Cheonggyecheon Restoration Scheme*

Cheonggyecheon means 'open stream' and quite aptly summarises this project which relates to the open river course that flowed through Seoul.

This stream was instrumental in the early development of the city but over the years its course had been modified and between 1936 and 1961 it was gradually completely covered over, partly in an attempt to reduce flooding and provide environmental benefits. In the covered form it proved to be an even worse health risk however and in the last two years a significant proportion of it has been reopened together with the demolition of a roadway that had run above it. The renovation has been remarkable and has been internationally exhibited and is a key signpost that the city is addressing environmental issues in a major way. The new areas around the water course have had many beneficial effects though there have been concerns from businesses in the area that trade will be reduced. As the project comes to completion this is yet to be evaluated in economic terms.

5.3 Nanji-do Restoration Project

The Nanji-do area was a major landfill site for 15 years to 1993; indeed the filling continued till a hill of height 95 metres and 2 kilometres length had been created! The problem was tackled in the 1990s with first stabilisation and then housing scheme development. Sustainability strategies are now intrinsic to the future development of the area – riverside gardens and landscapes are planned and the buildings will be designed and constructed to be low energy and sustainable.

5.4 Sangam/Digital Media City Project

Close to the Nanji-do site is a further larger development of what has also in effect become Seoul's Digital Media City. Both projects are in fact part of new-millennium development projects for the city. Sangam involved an international design competition for the area, which at 390,000 square metres is 30% larger than the Greenwich Millennium Village project in the UK. Over 4,000 new dwellings are being developed with the main theme of sustainable urban housing (consisting of energy, environment, ecology and humanity components). As the scheme is not yet complete one can only make observations based upon the submitted proposals.

In terms of energy, the development is rather unambitious; there are few passive measures planned and the renewable energy sources are to

be used, apparently, only for water circulation and outdoor lighting. There seems to have been a perception that costs of inclusion of more radical design would have been too high – this is disappointing. In environmental design, there has been more success in terms of reducing pollution and wastes and encouragement of natural features and public open spaces to satisfy demands from the high density dwelling occupants. Ecology and landscape seem to be well treated with linkages to the natural green spaces of the area. The human component is being addressed by proposals to enhance ‘identity, diversity, community and participation’. Perhaps one of the reasons for less than optimal performance is the focus on the media city economic opportunities being developed.

6. INTERNATIONAL EXAMPLES

In the following examples there are brief descriptions of interesting developments being taken forward in other parts of the world, and from which ideas might be fed in to the system of Seoul.

The City of Leicester in the UK has pursued sustainable strategies for a number of years; it was the UK's first *environment city*. It has had to work within a limited national framework that has not always been suited to its ideals. Over a period of about 20 years it has managed to foster good environmental principles and to utilise planning guidance and legislation where possible. It is now beginning to have a more significant impact with more favourable national government policies. A number of buildings exemplify its approach such as the well known Queen's Building at De Montfort University.

Austin is the state capital of Texas. It has pursued low energy and latterly sustainable development policies for sometime. The impetus for this came from the introduction of energy saving measures to reduce demand for electricity, rather than investing in major new power plant. Building energy efficiency was initially targeted though many other areas are now covered by the Austin programmes. All areas are very well described on websites.

In Melbourne, Australia, the City Council has for some years pursued a policy of encouraging green businesses, At the same time it has

been employing triple bottom line accounting principles (economic, environmental and social components all assessed together). It has also been using council activities as exemplars of good practice to encourage wider commercial and community understanding.

Portland, Oregon in the USA has also been very active – it has been a keen supporter of the LEED Assessment Scheme for buildings (Leadership in Energy and Environmental Design). It has an active green building section and has initiated a number of worthy developments and regeneration projects with low-energy and sustainability themes.

Malmö in Sweden recently hosted the bo01 City of Tomorrow Exhibition with a focus on environmental development of an old dockland area of the city. The exhibition created much interest and though it was not as financially successful as predicted, it did act as an international showcase for new ideas and technologies.

Hong Kong which is a much nearer neighbour than others mentioned here also has lessons from which to learn. It is very efficient – particularly in terms of transport systems and has also recently been making good use of an authoritative environmental building rating scheme (HKBEAM).

7. CONCLUSIONS

It is the contention of the authors that a key instrument for the advancement of sustainable, low energy building is the strategic planning and policy decision making process. This strategic planning must work particularly well in order to link from national to local scales. The city or urban level is perhaps the key: it must be informed and directed by national policy but must be able to reflect and communicate down to local levels. It is vitally important the general public do not externalise responsibility for sustainability to a national level whilst retaining to themselves personal rights. The two must be linked – often members of the general public believe they have choice as to whether to accept or reject measures associated with sustainability – this is false – the only choice is between which of the alternatives they prefer.

Seoul is an almost unique and advantageous position in terms of the way its strategic planning and policy development procedures oper-

ate. At present they are influencing moves towards lower energy and more sustainable development, but this needs to be optimised to have the most beneficial and long term affects.

REFERENCES

- GBC Korea, 2005. Green Building Rating Scheme, Green Building Council Korea website: <http://www.gbc-korea.co.kr/> (accessed 14 Feb 2005)
- Green Korea United, 2005. Green Korea United, website: <http://greenkorea.org/english/> (accessed 14 Feb 2005)
- Kim, M.J., 2000. Changes of paradigm to eco-friendly architecture, translation from AIK periodical Architecture, 2000
- Ministry of Commerce, Industry and Energy, 2003. Towards a 2010 Energy Policy, Korea 2003.
- OECD/IEA, 2003. CO₂ Emissions from Fuel Combustion 1971-2001, 2003 Edition, Organisation of Economic Co-operation and Development and International Energy Agency, Paris 2003.
- Seoul Metropolitan Government, 2005a. Seoul Vision 2006, website: http://english.seoul.go.kr/gover/initiatives/inti_01vis_0101.htm (accessed 14 Feb 2005)
- Pitts, A., 2004. Planning and Design Strategies for Sustainability and Profit, Architectural Press, 2004.
- Volkery, A., 2004. Republic of Korea Case Study: Analysis of National Strategies for Sustainable Development, prepared for International Institute for Sustainable Development (available from website: http://www.iisd.org/pdf/2004/measure_sdsip_korea.pdf (accessed 14 Feb 2005).