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PLANNING THE GREEN CITY

Nicholas Low

SUMMARY OF

ACTIONS TOWARDS SUSTAINABLE OUTCOMES

Environmental Issues/Principal Impacts

- To avoid 'greenwash' it is necessary to be clear what 'sustainability' means. Whilst it is within human power to change human society, naturally evolved systems can only be degraded – as is happening today – or sustained. The term 'sustainability' therefore applies only to the virtue of conserving the natural environment. Other terms apply to the virtue of an economy (efficiency), society (justice) or culture (integrity).
- Cities cannot be self-sustaining, but they can be 'green' – that is reducing their impact on the environment.
- The basic goal is to reduce cities' impact on the carbon cycle (Gaia) because what happens to the carbon cycle governs the capacity to achieve every other goal of eco-system conservation.

Basic Strategies

In many design situations, boundaries and constraints limit the application of cutting EDGe actions. In these circumstances, designers should at least consider the following:

- To achieve the basic goal, cities will have to be retrofitted to reduce their impact on the environment, especially their carbon emissions.
- Key regulatory institutions such as the Building Code of Australia will have to be reformed in order to provide a new 'level playing field' for all actors in the building industry.
- Since transport is critically important to the sustainability of cities, it must be subject to comprehensive planning with the basic goal in view.
- Strategies need to be designed to overcome the institutional barriers that resist change of policy. Architects and planners can provide 'champions', but a champion institution is also necessary in order to cross disciplinary and bureaucratic boundaries, such as a Commission for Urban Sustainability.

Cutting EDGe Strategies

- Transport must be viewed as an integral element of the green city. Planning a green city cannot succeed in meeting the basic goal without planning a green transport system.
- Land use planning that manipulates zoning to control densities is of limited use in planning transport.
- The green city requires well funded, fully integrated public transport systems capable of competing on convenience and service quality with the car. New institutions are needed to install such systems, including allocating funds from road building to public transport.
- The task of planning requires not just a multi-disciplinary approach, but trans-disciplinary understanding.

Synergies and References

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ENVIRONMENT DESIGN GUIDE

PLANNING THE GREEN CITY

Nicholas Low

This paper builds an argument that is developed more fully in the book The Green City, Sustainable Homes, Sustainable Suburbs. *It starts with a discussion of the meaning of 'sustainability' and the global ecological crisis our world confronts. The discussion then turns to the strategies cities need, and the barriers to innovative policies. Finally the paper shows that tactical solutions have already been demonstrated around the world. Architects and planners can play a major role in carrying forward the agenda of 'the green city'. Town planning will have to change; removing barriers to green policies and engaging in urban transport as well as land use planning. Above all, planning the green city demands institutional and not just policy change, and a more real multidisciplinary approach.*

1.0 SUSTAINING GAIA

1.1 Sustainability?

People get confused about what 'sustainable' means. One response is to write succinct dictionary-style definitions of 'sustainable development'. That only confuses the matter further because so many people write so many different definitions. The meaning of 'sustainable' has been diluted by including under its rubric almost everything regarded as desirable: a prosperous life, a cohesive community, a pleasant place to live and work, a thriving culture, fairness, justice, efficiency. All of this is rolled up together in the multiple 'bottom line' of sustainability – economic, social, environmental, cultural. To torture the English language in this way solves no problems. What is this 'bottom line'? Why should we speak of the earth in the language of business?

So let's get back to why people started worrying about sustaining something in the first place. That worry was a pivotal moment of the last century. Before it the most prominent buzz-word was transformation – of nature, economies, societies, cities, art and architecture. In all this turmoil it started to dawn on people that what had to be sustained, what humanity really could not do without, what we were dangerously and unwittingly transforming was the planet's ecology. Before the advent of space flight, few people were aware of the planet as a closed ecological system floating in the universe, protected from the assaults of hurtling interplanetary bodies and solar radiation by a blue atmosphere. The image of the Earth from space instantly made that awareness public property. From then on it was never forgotten. We have words for parts of this remarkable global eco-system: the atmosphere, the stratosphere, the tropopause, the ionosphere, the oceans, the land and the biosphere. We have no common word for the whole earth. Perhaps James Lovelock's word 'Gaia' is appropriate? The 'climate' describes the earthly impact of Gaia at work. Climate change is one symptom but not the essence of the problem. There is little doubt that Gaia is now being transformed through the overwhelming short-term genetic and economic success of a single sub-species: *Homo sapiens*.

Figure 1 gives a highly simplified account of one aspect of the human impact on Gaia. It shows the likely future annual amount of carbon gases that will be dumped into the atmosphere in fifty years time, radically unbalancing the carbon cycle, unless human societies act quickly to reverse current trends.

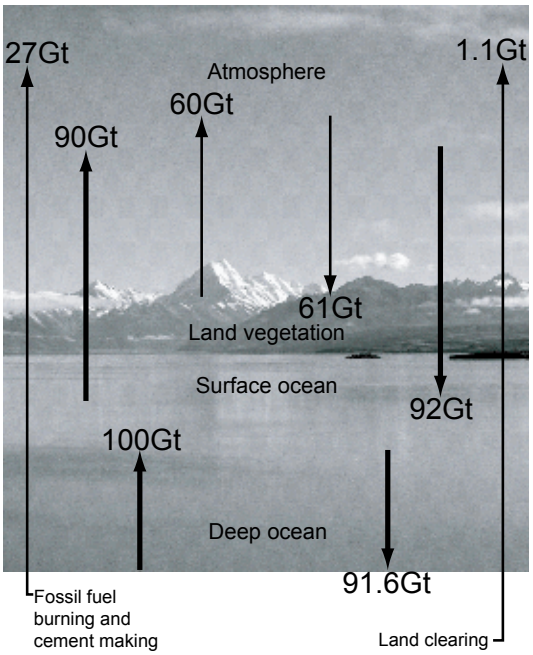

Figure 1. The carbon cycle. Natural exchanges and human impacts in a 'business as usual' scenario for 2059 (based on scenarios used in *Climate Change 1995: The science of climate change* by JT Houghton et al, Cambridge University Press)

So let's use words meaningfully and talk once again about economic prosperity, social justice, cultural integrity, and ecological sustainability. These virtues all need to be achieved, but in practice they conflict more than coincide.

1.2 What is 'green'?

Cities are not, and cannot in any real sense be 'self-sustaining'. The world's regions and the cities they support are the most efficient system ever devised for consuming and transforming the environment. The term 'polycentric urban region' has been coined to describe the interwoven networks of cities emerging in parts of Europe. But while we are thinking big, we might as well acknowledge that there is an emerging worldwide, interdependent network of agricultural and industrial regions and cities, something like a filiated and parasitic fungus over the surface of the globe whose cities are mushrooms and whose spores are people, a 'polisystem' (system of poloi from the Greek). The cities themselves must be considered but the transport

arteries connecting food and materials to their point of consumption must not be neglected.

Not all cities are connected to this polisystem: some parts are more closely connected than others. Being connected is widely regarded as a key condition of economic prosperity. But although cities in the polisystem cannot be sustainable, they can reduce the impact they make on the natural environment, including its sources of materials and sinks for waste. They can also do so at a rate that prevents irreversible damage to Gaia. We still have time to act. 'Green' seems a reasonable term to describe a city heading in that direction – continuously reducing impact rather than increasing it (the faster, the greener). If humans are truly '*sapiens*', that is wise, they will make all cities green.

1.3 The basic goal

The first and most basic goal of sustainability, because it affects the Earth's capacity to achieve every other goal of eco-system conservation, is to reduce cities' impact on the climate system. The Sustainable Development Commission of the UK has recently set the target of a 50 per cent reduction in greenhouse emissions from buildings by 2050 and a 50 per cent reduction in greenhouse emissions from road transport by 2025 (both on a base year of 1990). The Intergovernmental Panel on Climate Change has set a global average target of 60 per cent reduction on the base year of 1990 by 2050 (Houghton, 1997). Climate stability cannot be traded off against economic growth because climate stability is a condition of global economic growth in the longer term. But at present Australia is increasing emissions, and the longer we leave the task of reduction the harder it will be to achieve.

2.0 BROAD GREEN STRATEGIES

To achieve the basic goal, Australian cities need to be retrofitted for sustainability. Making new buildings more energy efficient – and therefore reducing their greenhouse emissions – is just part of the answer. The larger part is converting the existing building stock and the existing transport system to reduce greenhouse emissions by 60 per cent on the 1990 benchmark. Energy consumption by residential buildings accounts for about 11 per cent, commercial buildings for about 10 per cent and road transport for around 15 per cent of greenhouse gases emitted within Australia – in all around 36 per cent of the total[1].

2.1 Buildings

In a recent article in the *RIBA Journal* Jan-Carlos Kucharek discusses the debate now raging in Britain between environmentalists and conservationists. The former say that retrofitting the city to mitigate climate change will mean demolishing large numbers of Victorian-era, energy wasting buildings, and rebuilding to today's energy-saving standards. The latter protest that such action will destroy Britain's architectural heritage.

The existence of such a debate shows that climate change is being taken seriously in Britain. It is not yet in Australia. The 'star rating' systems we have here are certainly an improvement on no energy standards, but they do not provide an indicator of how much energy is saved by a particular building. Oxford University's Environmental Change Institute is talking about the '40 per cent House', a dwelling that reduces energy consumption by 60 per cent. If we are serious about climate change we need measurable targets and indicators. A great deal could be done to convert existing dwellings, including many built in the last five years, into '40 per cent houses'.

The Building Code of Australia (BCA) is still in the process of being updated to reflect the goal of sustainability, and this process should be brought to a rapid conclusion. Architects and planners should demand radical reform of the BCA for sustainability. But even if the BCA includes measurable targets for buildings, regulation will not be enough. Planners and architects have a responsibility themselves to learn about sustainability and promote sustainable practices. The system of building and the system of movement in the built environment must be considered together: land use and transport.

2.2 Road transport

Greenhouse emissions from road transport are on track to increase in Australia by more than 60 per cent above 1990 levels by 2010. Coherent plans to reduce greenhouse emissions from urban transport are lacking. As with buildings, measurable emissions targets must be set. They are not included in any of the States' transport plans. The Victorian Government has set itself the target of a modal share of 20 per cent of travel on public transport by 2020. This is a small but positive step in the right direction. But it is not a sustainability target, and the published transport plan, containing little commitment to public transport investment, does not inspire confidence that even that modest goal will be achieved.

One fortunate event for the environment is the rising price of oil. A rising oil price acts like a global carbon tax, reducing consumption and affecting almost every aspect of the urban environment. Whether the peak of oil production is already occurring now or will occur in twenty years time matters little (see http://www.peakoil.net). The fact is that the oil price is on an escalator that will only top out (at a much higher level) when demand comes back into balance with supply. Underlying the market trend is the reality that it is no longer economical for the oil corporations to plough money into increasing production because to do that would mean selling off what is left too cheaply. So rebalancing cannot be done by increasing supply but only by reducing demand. The market is for once giving signals that reinforce the primary sustainability goal. It is also fortunate because

[1] These figures were based on data from the National Greenhouse Gas Inventory 1995 and the 1999 reports on residential and commercial buildings emissions downloaded from: http://www.greenhouse.gov.au/buildings/publications/emissions.html.

the slowly rising oil price (apart from sudden spikes from extreme weather events like hurricane Katrina), compared with the jarring price shocks of the 1970s, will give us a little more time to adapt. It is already affecting fuel consumption and encouraging people to buy smaller cars and use public transport. But governments must plan quickly to make quantum leaps in improvement to the alternatives to car travel.

2.3 Barriers

There is no powerful and well-resourced, independent environmental 'champion' in Australia like the Sustainable Development Commission in the UK able to inform and target policy at specific industry sectors. The Australian Greenhouse Office has been absorbed into a government department (Environment and Heritage), operates on a tiny staff and minimal budget and has no brief to advocate bold and far reaching change. Finding out how much greenhouse gas is emitted by end use – for example residential and commercial buildings and uses, and urban transport – proves a major challenge. True, this is not a simple calculation because under the UN protocols figures are normally collected only for point of production emission sources rather than point of consumption as in buildings and transport modes. But the Commonwealth should nevertheless do the sums each year and publish the results in a policy-relevant form.

There is no serious incentive structure for energy saving. So incentives will have to be created by the Commonwealth. This will have to be a national system to avoid States competing against one another to reduce standards. Through the Council of Australian States the Commonwealth should take the lead in creating energy saving targets that penalise profligate domestic and commercial energy users.

Looking further into the future, the possibility of individual carbon trading needs to be considered seriously (as it is being in the UK). The Sustainable Development Commission has raised the possibility of everyone being allocated a certain annual emission account recorded on an electronic 'carbon card'. Heating, lighting, and travel expenses (petrol, air travel) would also contain an emissions bill, deductible from the emission account. Once the full allocation had been drawn down no more emission-generating activities would be permitted, but the person could top up the emissions account by buying more from someone who has not used their account in full. It is easy to see that this would involve a transfer of resources from someone who travels constantly, goes to overseas conferences or on overseas holidays, lives in a large house using fossil fuelled energy for air conditioning and heating to, say, an old age pensioner, who does not travel much and has a well insulated house or relies on green energy sources.

Meanwhile Australian public policy on urban buildings and transport continues to travel for the most part on paths set down in the 1930s and '40s. Town planning, which really should have final responsibility for all aspects of urban development, has been denied engagement with its most crucial aspect: transport infrastructure and service. Planning remains confined to the domain of land use zoning, whilst what is needed is comprehensive transport planning. Making optimum use of the extensive fixed rail systems of our cities, integrated with feeder bus services, is a planning task that town planners are prevented from undertaking by institutional rigidities. What is needed is a national Commission for Urban Sustainability in which architects and planners would be encouraged to collaborate to find and introduce comprehensive, innovative policy solutions to the current unsustainability of cities[2].

3.0 CUTTING EDGE TACTICS

3.1 Buildings

Tactical responses are much better developed in Australia than broad strategies – except perhaps for the assessment tool BASIX which has had a strategic impact on new housing in NSW. Local governments such as the Cities of Melbourne, Sydney and Adelaide are employing a range of micro-policies to reduce greenhouse emissions and improve the environment. In the suburbs, the Cities of Moreland in Melbourne and Leichardt in Sydney have embedded greenhouse mitigation goals in their planning schemes and policies. All new or renovated dwellings in Leichardt, for example, must be equipped with solar hot water heating. The City of Adelaide has adopted the goal of reducing greenhouse emissions from office buildings in the CBD by 15 per cent by 2015.

Many of the urgently needed tactical responses have already been addressed in previous EDG notes, and it is worth noting here that planners need new tactical skills in persuasion and getting micro-programs up and running. Here I want to discuss in greater depth two issues that have already been foreshadowed in previous notes: zero emission housing and transport for the dispersed city.

3.2 Zero emission housing

There is no technical reason to prevent all new suburban estates being 'zero net carbon emissions' in operation. About 20 per cent of lifetime energy from housing comes from embodied energy in construction, so that too must be considered. Troy et al, taking both embodied and operational energy into account, provide evidence that total per capita energy consumption of inner urban residents in Adelaide (with more compact housing) is higher than some outer suburban (less compact) areas. So increased urban density may not be such a critical variable in sustainability (Troy, *et al* 2003).

BedZed in London is perhaps the most highly studied example. It can claim to be a 'zero emission' development mainly because its use of energy for heating and cooling is kept to a minimum through excellent passive solar design and very high R value insulation (Figure 2). Heat exchangers in the wind-driven domestic

[2] This is also the recommendation of the House of Representatives Standing Committee on Environment and Heritage: *Sustainable Cities*, August 2005.

ventilation system recover up to 60 per cent of the heat in outgoing stale air (Figure 3). Kitchens are fitted with energy-saving appliances and low-energy lighting. It is estimated that residents can expect to reduce their need for energy by up to 60 per cent and for heat by up to 90 per cent. The remaining energy needs are met by a combined heat and power unit, consisting of a standard truck-sized diesel engine running on biogas generated by clippings from the parks and gardens in the London Borough of Sutton (recycling rather than adding new carbon to the atmosphere).

Figure 2. BedZed – detail of insulation of exterior walls (photograph by Nicholas Low of model by architect Bill Dunster)

Figure 3. BedZed, showing the ventilation system

The power plant is housed in a large shed (Figure 4). The system does not require high tech design. In the low density, high greenery suburbs of Australian cities there is plenty of opportunity for biomass energy to be used. But the energy plant must be built into the design of the estate, which itself must be built to good passive solar standards.

In the Västra Hamnen (Western Harbour) development in Malmö, Sweden (initiated for the 2001 European housing Bo01 exhibition) a variety of zero emission energy sources are used. Warmth is extracted by heat pump from an underground aquifer and from the sea water, as well as being generated in large-scale solar collectors (1400 square metres). Electricity for the neighbourhood is generated by a single wind power station in the North Harbour a kilometre away, and by a limited array of photovoltaic cells (120 square metres).

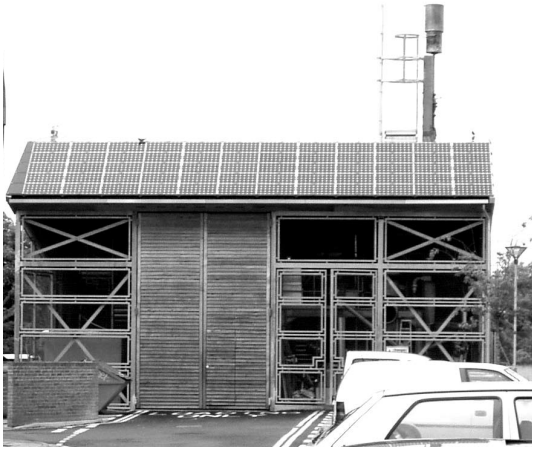

Figure 4. Bedzed, the power shed

Figure 5. The Västra Hamnen development in Malmö. High efficiency solar collectors on the walls of an apartment block.

Biogas (mostly methane) from the city's waste is used to heat homes and power vehicles. In addition, the homes in the district are built according to passive solar design principles, so they have minimal energy demands for heating. All the power sources on site are connected to the city's energy and district heating- cooling grid. The 100 per cent renewable energy equation is based on an annual cycle. At some periods the neighbourhood borrows from the city and at other times the reverse, but over a year it achieves a zero net fossil fuel balance (figure 5).

Three collateral issues are the additional cost of strong emission-saving measures; the structure of Australia's building industry, and the prospect of attaching retrofitted housing to local zero-emission energy grids. There is not space here to enlarge on these issues. But note that each one of them requires architects to look beyond design.

3.3 Transport for dispersed cities

Much urban planning effort has been focussed on urban consolidation, and creating 'compact cities', in which higher density development is directed to places close to train stations and other public transport nodes (transit cities). Success in the land use planning side of the transport-land use equation depends on two things. The first is design that respects local heritage and makes it easy for people living in the surrounding area to walk, push prams, shopping jeeps and wheelchairs or cycle to the station, and, if cycling, to store their bikes safely. Evidently this good design requirement extends to the bike and footpaths in the surrounding residential area. Walking is transport, and high quality walking space is essential to the success of the green city (Figure 6). The second is keeping high-density development out of areas not well served by public transport. If the aim is simply to help property developers make money, neither of these goals will be achieved. Particularly worrying is the activity of the Victorian Rail Track Corporation whose sole objective is to make profits from the sale of its assets: land and airspace around railways.

The real challenge, however, is to provide a high quality of public transport service for *dispersed cities*. Paul Mees's wonderful book, *A Very Public Solution* shows how this can be achieved. But, except for Queensland, Australian governments have been excessively wary of engaging with him. Being a lawyer by training he does not deal often with the design side. Yet design is crucial. For the dispersed city the mode most capable of rapidly moving large numbers of people must be used to maximum advantage: railways. Sydney has a network of over 830 kilometres of suburban rail line, Melbourne 670 kilometres, and Brisbane about 400 kilometres. But the railways must be fed by a local bus system as well as bike and foot paths. The timetables of trains and buses must be rigorously coordinated. It should be possible to step off a train straight on to a local bus serving a five kilometre radius (Figure 7).

Not surprisingly, however, the main onus for good transport planning falls on the transport side of the equation. Unless a better transport service is provided in Australia's metropolitan areas, public transport use will not increase anywhere near sufficiently to meet the sustainability goal. Some cities are better placed to achieve this than others. In Sydney there is still a powerful consolidated public transport corporation in public hands that can conduct effective planning. In Melbourne public transport is radically fragmented and rail infrastructure and service sadly neglected.

But world's best practice in urban transport could be achieved in all major cities if the money spent on unnecessary and unsustainable motorways was transferred to public transport.

Despite this, the Victorian Government, to its great credit, has taken seriously the task of bringing regional and intercity railways into the twenty first century. Although arguably not the first priority for public transport

Figure 6. A walking city centre, Montpellier, France

Figure 7. Transport interchange, Perth, WA – railway and feeder bus service

improvement, the Spencer Street Station is a magnificent project with an international quality of design. The State will for the first time get a permanent structure as the main terminal of the intercity and regional railway network. Improvement of the regional rail system is also absolutely necessary. Both are enormous and complex projects that will be built at modest price (yes you read it correctly) and within a fair time span. The press reception of these projects has been outrageously biased against them. Hardly a murmur is raised when more than $2 billion is spent on 30 kilometres of new motorway in Melbourne's Scoresby corridor – or $5 billion on a ridiculous tunnel system for Brisbane, but spending $1 billion upgrading hundreds of kilometres of track, including signalling and rolling stock, a system that was at the point of dangerous breakdown, is the constant target of sniping journalists.

CONCLUSION

Only a few words can be spared here. Architects should not only *do* good design, they also need to get involved in shaping the context in which good design becomes possible. Good design is not just aesthetic but means achieving reduced environmental impact of building materials, plans and processes. Architects need to make friends with planners, and influence them. Planners need to understand what makes a sustainable building. Planners also need to be allowed to take on new tasks beyond land use regulation. Planners need architects to read widely and critically, becoming conversant with the urban institutional context of governance. Architects and planners should demand from governments hard facts about the performance of their policies. They should engage with sociologists to check survey methods, and they should apply a critical eye to words in order to eliminate 'greenwash', the rhetoric that conceals 'business as usual'. Planning and designing the green city is at every level a multi-disciplinary task.

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BIOGRAPHY

Nicholas Low is Associate Professor of Environmental Planning in the Faculty of Architecture, Building and Planning, at the University of Melbourne. He is the author or editor of eight books, the latest of which (with Gleeson, Green and Radovic) is *The Green City, Sustainable Homes, Sustainable Suburbs* (UNSW Press, 2005). He is a member of the RIBA and Fellow of the Planning Institute of Australia. His book (with Brendan Gleeson) *Justice, Society and Nature* (Routledge, London, 1998), won the Harold and Margaret Sprout Prize of the International Studies Association (USA) in 1998 for the best book published on ecological politics.

E npl@unimelb.edu.au.