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STATUTORY IMPLICATIONS FOR A SUSTAINABLE URBAN FORM: PRINCIPLES AND PRACTICE FROM AUSTRALIA

1. Introduction

The principles of planning and sustainable design are now well known throughout the world. In general, they follow the Rio Declaration of 1992 and specifically local Agenda 21. The Rio declaration sought to provide guidance in the form of policy principles at the supra national level of government. It also recognised the need to articulate the broad principles into strategic objectives coupled to programs at the regional and local levels of government. Planning schemes in most countries now incorporate a range of policy prescriptions that are intended to control and guide development so as to deliver sustainable environmental outcomes. This paper will outline principles of sustainable design and planning with reference to one of the earliest examples of a comprehensive zero-emission estate in London: BedZED. The paper will then examine the Victorian Planning Provisions and objectives, Melbourne Australia to ascertain how they comply with the 12 Green Guidelines discussion paper (2015). It will conclude by identifying some of the strengths and weakness of the policy prescriptions and provide comment on the need for an empirically based research agenda to measure the effectiveness of sustainable planning and urban design principles.

2. Sustainable environmental planning and urban design

(a) Sustainable environments

Environmental awareness generally emerged in the 19th and early 20th centuries. The National Parks legislation enacted by the Roosevelt government was an outcome of this movement. It was the 1960s, however, that brought serious environmental issues to public attention. Carson's *Silent Spring* (1962) emerged as the seminal work of the 1960s and described the indiscriminate use of pesticides. It was instrumental in bringing environmental issues to the forefront of public and political consciousness. The corollary was the need to protect as the natural environmental as fundamental to human health the quality of life. The first Earth Day took place in 1970 and was followed in 1990. A new sense of awareness

and urgency about environmental problems was established and a sense that unconstrained economic growth had to be limited/curtailed. This environmental consciousness trickled down where the less well-off were seen as visibly affected leading to environmentalists becoming more equity conscious. From this point on the environmental movement started mobilized information (Rocky Mountains Institute). (Hawken P. Lovins A. and Lovins H. 1999). Pollution and ecology later entered lexicon of planning and business but was not well known in social, economic and political discourses until the 1992 Earth Summit at Rio de Janeiro, Brazil (Commonly known as the Rio Declaration 1992).

(b) Urban Planning

Planning emerged from the impacts of 19th century industrialisation, particularly Britain. People moved from agrarian lives into factory towns and as cities expanded this led to fear and revulsion of the 19th century metropolis, which culminated in the public health acts and first town planning act of 1909.

While modern technology made possible for exciting new urban forms there was a strong reaction against the slum. Social solidarity was considered possible only in cities that bring people together. And housing projects were seen to fail inhabitants if they were too poor to lead a decent life.

Innovative thinkers about the problems of large industrial cities to emerge were: Howard – an ardent cooperative socialist; Wright – a Jeffersonian democrat; Le Corbusier – a Revolutionary syndicalist.

Although the plans represented abstract ideas in the case of Howard and Le Corbusier they were, nevertheless, underpinned by philosophical positions. Wright – individualism: the ‘decentralized city’; Howard – Cooperation: the ‘garden city’; Le Corbusier – faith in organization: the ‘radiant city’. One of the most influential thinkers in the 19th century was Geddes - a positivist who applied scientific method and the forerunner to the rational planning methods of the 1960s/70s. General systems theory was introduced by von Bertalanffy (1950) to North America in the 1960s. This method was introduced into government decision-making in 1960s/70s, which saw planning as cyclical process (McLoughlin 1969; Chadwick 1970). Later in the 20th century, plans were seen as ‘blueprints’ for the future form of towns – statements of ‘end-states’ that would one day be reached. (Taylor 1998: 14).

Hence planning was considered a rational process: Generally, it consisted of the problem definition, formulation of goals, policies and alternative policies, evaluation, implementation and monitoring (Faludi 1970). This process is still present today where in

most countries there is a dual planning system with policy driven strategic plans coupled to a statutory/regulatory process.

Strategies are written in the form of general policies/statements/objectives. Hence, they contain 'open ended' catch of all type phrases. Local plans contain more specific policies and regulations within the general framework set out in the above policies/strategic plans. Strategic plans reflect a general position on a range of issues without getting too involved in detailed prescription. On face value, the strategic-statutory interface then may seem fairly straightforward, even obvious. The reality, however, is far more complex because of the need to interpret policy objectives when applying them in specific locales/contexts.

This refers to the hermeneutic or problem of interpretation. Hermeneutics is the science and theory of interpretation. It is used in history, jurisprudence and other disciplines, which analyse objectified results of conscious human activity. Briefly, the object is to explain a text preceding from its features, both objective (grammatical meaning of words and their historical variations) and subjective (the authors' intentions). In the urban planning context, what often occurs, there are interpretations of strategic policy objectives without a proper knowledge of the underlying research on which the policy/strategy is based.

(c) Sustainable urban design

In broad terms the drive towards a more sustainable planet can be divided into two broad policy agendas: mitigation and adaptation. The first refers to climate mitigation: "An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases." Climate adaptation refers to "the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damage, to take advantage of opportunities, or to cope with the consequences." (The International Panel on Climate Change [IPCC2014]). Adaptation is defined as the, "adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation." (IPCC 2014).

Excessive consumption is considered as a major contributor to the rapacious demand for natural resources (Weizsacher 1997). Wackernagel and Rees (1996) described this in blunt terms: "If everybody lived like today's North Americans, it would take at least two additional planet Earths to produce resources, absorb the wastes, or otherwise maintain life-support".

Ecological footprints are relevant here. They can be defined as the land required to feed cities, supply them with timber and many other products, reabsorb their carbon dioxide emissions by areas covered with vegetation, treat and store wastes in such a way as to prevent environmental harm (Wackernagel M. and Rees W. 1996; Smith M. Whitlegg J. and Williams N. 1998).

The reality of ecological footprints is that excess consumption in the developed world can only be maintained at the expense of under-consumption of the developing world. (Wackernagel and Rees 1996). Giradet (1996) studied energy flows in Hong Kong – the city with the highest concentrations of people on the planet. They saw cities as representing ‘huge sinks’ in the global movement of materials and energy and noted that little or no effort is made to convert their large one way flows into circular flows to make cities more environmentally efficient.

Environmental efficiency can be increased in several ways such as efficient building design, solar orientation, energy efficiency, recycling, better use of materials and public transport system etc. Of critical importance, here, is the provision of information to businesses and households about how to implement environmental strategies to bring about such efficiencies.

In this respect demand management is important. It requires a subtle response to planning where basic objectives are met rather than some derived demand. The transport sector is a case in point where environmental limits are accepted and public transport, cycling, walking etc. are encouraged as alternative modes of transport. The opposite to demand management is the ‘predict and provide’ method. This is prevalent in road planning where congestion is approached generally by improving or providing new roads and management systems (This is why it is known as ‘predict and provide’). The United Kingdom Royal Commission on Pollution 1997 rejected this approach. The adaptation of the urban environment has now found its way into planning and urban design in many cities around the world.

(d) Exemplary sustainable development

One of the earliest comprehensive sustainable design projects is the Beddington Zero Energy Development (BedZED). Completed and occupied in 2002, it became UK’s largest mixed-use sustainable community.

Fig 1. BedZED Estate, South London



Source: Ewa Stachura archive

BedZED is located in the London Borough of Sutton, on the suburban fringe of the city of London. It is situated on 'brownfield' site close to Hackbridge train station. There are 100 homes per hectare (if you exclude the sports pitch). The project was initiated by BioRegional and ZEDfactory and developed by the Peabody Trust. Existing community lies mainly to the west of Bedded.

Project aims and objectives were there will be no use of fossil fuels, a 50% reduction of the energies used for transport, a 60% reduction of the domestic energy compared to the average British households, a 90% reduction of the heating needs and usage of renewable energies.

Hence the design concept was driven by the desire to create a net 'zero fossil energy development', one that will produce at least as much energy from renewable sources as it consumes. Only energy from renewable sources is used to meet the energy needs. Development therefore was designed to be carbon neutral - resulting in no net addition of carbon dioxide to the atmosphere. BedZED was unusual in that it tackled carbon emissions not only in domestic and office energy use, but also the embodied impact of construction. This includes the carbon emissions arising from the use of building materials, personal transport, food and waste. Other issues concerned water, quality of life and strengthening of the local economy. Such a holistic approach makes BedZED one of the most coherent visions of sustainable living in the world. The buildings used super insulation, double and triple glazing and high levels of thermal mass. It required investment in more construction materials than standard houses. But the strategy reduced the embodied impact of the scheme by 20-30%.

Hence despite the use of extra materials, BedZED is in line with standard UK housing CO₂ emission rates (Chance T. 2009; BedZED 2009).

The above BedZED example could be described as an exemplary model of a ‘green’ estate. It was ambitious in terms of its scope to develop a fully zero-emission sustainable housing development. But this type of project is not mainstream in the sense that it sets the standard for all the future urban forms.

3. A green agenda for urban sustainability

A discussion paper titled *12 Green Guidelines CDBC’S Green and Smart Urban Development Guidelines (2015)* sets out three key categories for adaptation: Urban form, transportation, energy and resources. These categories are claimed to be measurable and practical and concisely describe the foundations of sustainable urban development, namely:

- Urban Form—Urban Growth Boundary, Transit-Oriented Development, Mixed-Use, Small Blocks, Public Green Space.
- Transportation—Non-motorized Transit, Public Transit, Car Control.
- Energy and Resources—Green Buildings, Renewable and Distributed Energy, Waste Management, Water Efficiency.

These categories constitute together 12 green guidelines as shown in Fig 2 below:

Fig 2. 12 Green Guidelines

<p>1. Urban growth boundary Every city should establish an enforced urban growth boundary (UGB). The UGB should be set based upon a rigorous analysis of ecological sensitivities, environmental capacity, and the efficiency and productivities of various land uses. The boundary can expand beyond the existing urban footprint only if there are no suitable infill locations as indicated by an intensity of urban land use of at least 10,000 residents per square kilometer.</p>	<p>7. Public transit All new developments must be within a 500-meter radius of a bus or rapid transit station. For the city as a whole, at least 90% of developments should be within 800-meter radius of a public transit station.</p>
<p>2. Transit-oriented development Cities should be built around their public transit systems. The area within 500-800 meters of major transit stations, such as the metro or bus rapid transit (BRT), or within 500 meters of nearest bus or transit stops (in case BRT or Metro is not available) should have FAR at least 50% higher than the</p>	<p>8. Car control Every city should have a strategy to cap car use. Where high-quality transit exists, there should be limits on parking.</p>

<p>average of the district. For big cities, at least 70% of residents should live in TOD areas characterized by convenient mass transit service. Great accessibility (pleasant walking amenities to transit system within a 500-meter radius) must also be offered.</p>	
<p>3. Mixed use All residential units should be close to at least six kinds of amenities within 500-meter radius of building entrance (amenities include schools, post offices, banks, retails, clinics, activity centers, restaurants, etc.). The job-resident ratio (the number of people employed divided by the number of residents) should be between 0.5 and 0.7 over every commuting district, which should have a spatial area that is no more than 15 km². Normally, these commuting districts are bounded by physical barriers for pedestrians.</p>	<p>9. Green buildings At least 70% of buildings should be MOHURD One-Star, 20-40% of buildings should be MOHURD Two-Star, and 5-15% of buildings should be MO- HURD Three-Star within any development.</p>
<p>4. Small blocks Blocks should be less than or equal to 2 hectares and 70% of the blocks should comply with this standard. Exceptions made for industrial areas.</p>	<p>10. Renewable and district energy Every project should analyze the potential for district energy, such as combined heat and power (CHP), waste to energy, and waste heat re-use. There should be 5-15% local renewable energy generation for residential areas and 2-5% for commercial areas.</p>
<p>5. Public green space Publicly accessible and usable green space should comprise 20-40% of the construction areas (residential area should be at the higher end of this range). All residences should have accessible public space within 500 meters.</p>	<p>11. Waste management All buildings should have waste classification facilities. All household waste must be sorted and collection of hazardous waste must be prioritized. At least 30-50% of waste should be composted and 35-50% recycled or re-used.</p>
<p>6. Non-Motorized Transit There should be dedicated and connected walking paths of at least 10 km in length per square kilometer, and dedicated and connected biking paths of least 10 km in length per square kilometer in urban areas.</p>	<p>12. Water efficiency All buildings must have 100% adoption of cost-effective water saving appliances, and green spaces surrounding buildings must adopt low water-use plants. All water consumption should be metered and at least 20-30% of water supply must be recycled from either wastewater or rainwater.</p>

Source: *12 Green Guidelines CDBC'S Green and Smart Urban Development Guidelines* (2015)

The above green guidelines indicate the broad scope of in the adaptation of the urban form. While the list is comprehensive, it is still incomplete because there is no remark of recycling materials that can save embodied energy. The guidelines are also limited to the planning and development of more conventional new housing estates and do not deal with retrofitting existing housing estates built in earlier periods. However, they are relevant to the Australian example outlined below.

4. Statutory provisions for achieving sustainability – the Melbourne Case

Planning objectives in Victoria are set out in the *Planning and Environment Act 1987*. They include provision for the fair, orderly, economic and sustainable use and development of land; the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity; facilitate development in accordance with the objectives set out in the planning policies and objectives.

Planning and environment principles are embedded in the policies. Hence the schemes have a strong policy focus where is an intention set out in the strategic vision. The corollary is a logical progression from the policy basis to the land development application decision. It is also stated that local municipal provisions must assist in exercising discretion and promote performance rather than narrow regulation. It is also required that planning schemes be clear to users and be easily identified on a planning scheme map.

Fig. 3 Melbourne Australia

	
<p>Stock image Melbourne Source: https://travel.virginaustralia.com/au/destinations/ [Accessed 3 December 2016]</p>	<p>Source: Google Earth [Accessed 3 December 2016]</p>

Across the Australian State of Victoria, a standard set of provisions apply and the permit is the principal instrument of development approval. Local provisions must not conflict with the state provisions. Planning principles are achieved through the Victorian Planning Provisions (VPPs) under the auspices of *Planning and Environment (Planning Schemes) Act 1996*.

All Victorian planning schemes include a Municipal Strategic Statement, local planning policies and a selection of zones and overlays, including maps.

The planning scheme maps show how land is zoned and whether it is affected by an overlay. The ordinance sets out the zone and overlay requirements. Each planning scheme also includes other state-standard provisions and definitions.

It is also stated that a planning scheme is not a static document and will change over time. An amendment to a planning scheme must be formally approved and gazetted before it can become law.

The VPPs require planning authorities when making decisions to:

- Promote good urban design to make the environment more livable and attractive
- Ensure new development or redevelopment contributes to community and cultural life by improving safety, diversity and choice, the quality of living and working environments, accessibility and inclusiveness and environmental sustainability.
- Require development to respond to its context in terms of urban character, cultural heritage, natural features, surrounding landscape and climate.
- Require development to include a site analysis and descriptive statement explaining how the proposed development responds to the site and its context.
- Ensure sensitive landscape areas such as the bays and coastlines are protected and that new development does not detract from their natural quality.
- Ensure transport corridors integrate land use planning, urban design and transport planning and are developed and managed with particular attention to urban design aspects.
- Encourage retention of existing vegetation or revegetation as part of subdivision and development proposals.

NB: The VPPs also stipulate that the following policy guidelines be considered in decision-making: *Design Guidelines for Higher Density Residential Development* (Department of Sustainability and Environment, 2004); *Activity Centre Design Guidelines* (Department of Sustainability and Environment, 2005); *Safer Design Guidelines for*

Victoria (Crime Prevention Victoria and Department of Sustainability and Environment, 2005); *Urban Design Charter for Victoria* (Department of Planning and Community Development 2009).

The above general objectives have been included under specific subheadings in relation to the urban form. These are shown in the Fig 4 below.

Fig 4. VPP objectives and descriptors

Objectives	Description
Urban context and design	<p>Development must take into account the natural, cultural and strategic context of its location.</p> <p>Planning authorities should emphasise urban design policies and frameworks for key locations or precincts.</p> <p>A comprehensive site analysis should be the starting point of the design process and form the basis for consideration of height, scale and massing of new development.</p> <p>The public realm, which includes main pedestrian spaces, streets, squares, parks and walkways, should be protected and enhanced.</p> <p>Recognition should be given to the setting in which buildings are designed and should integrate the landscape.</p> <p>Ensure the design of subdivisions achieves attractive, livable, walkable, cyclable, diverse and sustainable neighbourhoods.</p>
Respecting heritage	<p>New development should respect, but not simply copy, historic precedents and create a worthy legacy for future generations.</p>
Architectural quality	<p>New development should achieve high standards in architecture and urban design. Any rooftop plant, lift over-runs, service entries, communication devices, and other technical attachment should be treated as part of the overall design.</p> <p>A desirable balance of sunlight and shade should enhance enjoyment of the public realm.</p> <p>This balance should not be compromised by undesirable overshadowing or exposure to the sun.</p>
Energy and resource efficiency	<p>All building, subdivision and engineering works should include efficient use of resources and energy efficiency.</p>
Personal safety	<p>New development should create urban environments that enhance personal safety and property security and where people feel safe to live, work and move in at any time.</p> <p>Landmarks, views and vistas should be protected and enhanced or, where appropriate, created by new additions to the built environment.</p> <p>Pedestrian spaces design of interfaces between buildings and public spaces, including the arrangement of adjoining activities, entrances, windows, and architectural detailing, should enhance the visual and social experience of the user.</p>

Source: Authors' own elaboration

The VPPs state that subdivision, in relation to the development of new residential areas and redevelopment of existing areas, should be designed to create liveable and sustainable communities by: a) contributing to an urban structure where networks of neighbourhoods are clustered to support larger activity centres on the regional public transport network; b) creating compact neighbourhoods that have walkable distances between activities and where neighbourhood centres provide access to services and facilities to meet day to day needs; c) creating a range of open spaces to meet a variety of needs with links to open space networks and regional parks where possible; d) providing a range of lot sizes to suit a variety of dwelling and household types to meet the needs and aspirations of different groups of people.

Moreover, the VPPs make it imperative to reduce car dependence by allowing for convenient and safe public transport together with safe and attractive spaces and networks for walking and cycling. In this respect subdivision layouts must be designed to allow easy movement within and between neighbourhoods. There must also be a convenient and safe road network. In addition, it is necessary to create a strong sense of place so that neighbourhood development emphasises existing cultural heritage values as well as a well-designed and attractive built form and landscape character. Native habitat must be protected and enhanced.

Environmentally friendly development must include improved energy efficiency, water conservation, local management of stormwater and wastewater treatment, less waste and reduced air pollution. Neighbourhood facilities must be accessible to people with disabilities. Activity centres must be developed to integrate housing, employment, shopping, recreation and community services. They must also provide a mix and level of activity that attracts people, creates a safe environment, stimulates interaction and provides a lively community focus.

The table below will adopt the 12 Green Guidelines (See Fig 2 above) to make a comparison with the VPP objectives and to make comments about their effectiveness.

Fig 5: Comments: Green Guidelines and Victorian Planning Provisions

	Green guidelines	Victorian planning provisions (vpp)	Comments
1	Urban growth boundary	√	The Melbourne urban area has clear growth boundary. The growth boundary was subject to rigorous land use studies.
2	Transit-oriented development	?	There is a clear emphasis for public transport. But the VPPs are vague on detail and do not include references to the subdivision layout, for example, to achieve this objective.
3	Mixed use	√	Local shops, schools etc. are included. But not entirely clear as to job-resident work ratio and local catchment.
4	Small blocks	√	Strong emphasis in planning policies
5	Public green space	√	Provision for open green space in subdivision design.
6	Non-Motorized Transit	√	Encouraged in VPPS. Not entirely clear how this is to be implemented
7	Public transit	√	Provision for public transport but a little light on detail.
8	Car control	√	There is a preference for the non-car mode of travel. But not made entirely clear what this means.
9	Green buildings	?	The VPPs do not deal with this requirement. There are simply vague references to good design. But little directions about what this means or how it can be achieved.
10	Renewable and district energy	?	VPPs do not contain any provisions in this respect.
11	Waste management	?	Not mentioned in the VPP provisions.
12	Water efficiency	√	VPP provisions contain reference to water efficiency measures.

Source: Authors' own elaboration

While generally the table shows the VPPs include reference to many of the categories set out in the 12 Green Guidelines set out above, they nevertheless indicate a lack of detailed descriptive information. In many cases, there is insufficient explanation and a lack of clear directives on what the objectives mean and how they should be implemented. This leaves a lot of discretion to the planning authorities in relation to interpretation and application of the provisions. And while discretion is encouraged, it can also lead to inconsistency in applying the provisions. This is the hermeneutic problem mentioned above.

5. Conclusion

The concept of sustainable development is extremely broad and somewhat open ended. Hence it is very slippery in terms of how to define it in exact terms. The 12 Green Guidelines outlined above generally capture the complexity and scope of the adaptation process for delivering a sustainable urban form. In the Melbourne case, the VPPs do contain urban design and planning the principles of sustainable development. But they lack directives, however, in terms of how the objectives can be achieved and carried through to implementation. What is interesting here is that the knowledge learned from the BedZED project has not been fully accounted for in the policy framework for sustainable design. This especially concerns subdivision layout, building orientation and solar energy and waste management. This brief overview sets an agenda for empirical research into the effectiveness of policies and objectives in achieving a sustainable urban form. It suggests a case study approach where performance measures can be measured. This will then provide detailed information for the development of more effective policies and objectives that can deliver programs to bring about a sustainable urban form.

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Abstract. *This paper examines the sustainability concept and its use in planning policies and regulations to guide future urban development and urban design. It provides a brief historical overview starting with the Rio Declaration and the imperative concerning the need for adapting the urban environment for efficient use of renewable resources. The paper includes an outline of planning and its transition from industrialism to the rational planning process. It refers to the well-known BedZED zero emission projects as an example of a comprehensive sustainable housing estate. Finally, the discussion paper “12 Green Guidelines” is used as a basis to compare the sustainable urban design regulations in the Victorian Planning Provisions (VPPs) for Melbourne, Australia. A cursory evaluation of the VPPs has found them to be vague with little detail and directives on how they can achieve sustainable design outcomes. Consistency in decisions is also rained because of the problem concerning discretion and interpretation. The paper concludes with a proposed research agenda for measuring the effectiveness of sustainable design principles in terms of outcomes that can deliver an environmentally efficient urban form.*

Keywords: *planning, urban design, policies, sustainability, rationality, green guidelines, rational planning, interpretation*