Review commentary

Sustainability Assessment and Urban Systems
By Peter Newman

The paper claims to argue the need to listen to and tell stories about sustainability. Stories imply a past yet the paper is innocent of any understanding of the histories of urban development or of the institutional, political and economic contexts in which urban areas in Australia developed.

In its second paragraph the paper assumes that sustainability is unproblematic and then appears to trivialise the issue by offering illustrations of the alleged general understanding of it. The author offers no evidence for the claim that families buying a house consider social, environmental, and economic factors in any way that remotely connects with most commonly accepted notions of sustainability. No evidence is offered about whether buyers consider the embodied energy in their houses or how they might take it into account. No evidence is offered about how they might assess the environmental consequences of the way energy or water may be used in their houses or how they might account for the wastes they produce. Nor is any evidence presented about the way they assess social and economic issues that might be expected to arise for themselves or the community in the way they use their houses.

The illustration of the way families allegedly take into account the social, environmental and economic consequences of their decisions about where to send their kids to school is equally limited. Given that at least 38 percent of households now send their children to schools other than the one closest to them, no evidence is presented to support the claim that families consider the impact on either the local or wider community of their decision to send their children to any school other than the one nearest their home. There is no evidence of the impact on the environment of decisions made by households to send children by public transport or private car to schools beyond the nearest one. No evidence is presented about the costs to the community incurred by families in sending children to schools other than the nearest one. If anything the fact that they lobby for and obtain substantial subsidies in the costs of transport to and from their chosen schools suggests that they do not take the environmental costs into account. Nor for that matter do they appear to highly value the benefits they or the community derive from having schools with children from all walks of life or religious affiliation.

In its third paragraph the author wrings his hands over the way governments allegedly lag behind the man or woman in the street in their understanding of what sustainability assessment is or how to assess it. The author says that it is one of his jobs to break through what he describes as an impasse which he asserts is due to the ‘entrenched silos of disciplines, professions and institutions which make such obvious decision-making difficult’. He offers no argument or evidence of the way the impasses is identified or how it might be removed.

He offers no analysis of:

i. What is meant by sustainability (he implies that sustainability gives equal weighting to social, environmental and economic factors although does not say so – he ignores the issue of whether a definition of sustainability that does not privilege the environment is not an oxymoron),
ii. What is meant by assessment or how the various elements to be considered in examining the sustainability of urban systems are to be assessed and what weighting should be given to each element,
iii. The present institutional structures including the 'silos of disciplines', professions public or private organisations and the ways in which they allegedly create the impasse to which he refers or how they might be reconstituted to facilitate better assessment of sustainability.

The paper asserts that there are three types of sustainability assessment which are relevant to the assessment of urban systems yet does not reveal how the three types of assessment differ.

The first type of assessment, **Sustainability Assessment of Complex and Strategic Projects** is a simple story of what was proposed in developing a Sustainability Strategy for Western Australia. The account includes a listing of 7 'Foundation Principles' and 4 'Process Principles' as sustainability principles proposed in the WA Strategy and reports that they were applied to 42 areas of government, one of which was sustainability assessment. A list of 9 'Criteria' to be used for sustainability assessment in the Strategy is provided but no indication is made of why they were chosen, how any of them are to be measured or how the net balance of them is to be weighted. The story acknowledges that the proposed framework for decision making is a challenge for any government and has not been adopted in WA. The storyteller acknowledges that little economic analysis is done and that 'all social assessment has been stripped from the bureaucracy'. Although he does not say it we must assume that he is referring to neo-classical or environmental economic analysis rather than ecological economics.

One confusing aspect of this story is that having told a tale of unrealised ambition and deep criticism of government the storyteller goes on to say that 'Politicians are used to having to address the full bottom line on projects'. It might have been helpful if the story was enriched by concrete examples.

Another source of confusion lies in the claim that there is a large political imperative for sustainability assessment yet the language and institutions for doing so are lagging behind. No explanation is provided of why, in our system of government, this alleged gap between government and its administration is allowed to continue. If the story is accurate and government is being thwarted in its ambition to introduce rigorous sustainability assessment by an uncooperative and recalcitrant administration we might expect to be told of evidence of tension between executive and administration. No such evidence is tendered. One could be forgiven for beginning to suspect that the Chair of the Sustainability Roundtable is simply complaining that he cannot mount an argument powerful enough to convince his bureaucratic colleagues that they should depart from

their own rigorous approaches to their administrative responsibilities to follow his ill defined prescriptions.

The next chapter in this saga relates to **Sustainability of Policies, Programs and Plans**. Here we are told that there is a major thrust in the international literature on the importance of environmental assessment to the evaluation of the sustainability of policies, programs and plans and that questions are raised 'about why the other elements of the triple bottom line should not also be included in any strategic analysis of the future'. The author again eschews the opportunity to explore what might be meant by 'triple bottom line' or how its elements might be measured and summarised. He instead sticks to his story telling mode by providing a superficial and simplistic commentary on the history of urban planning then offers passing commentary of contemporary planning exercises for a number of Australian cities that is again devoid of evidence.

At this point the story becomes confusing as the author digresses to explore the contribution of **Politics and sustainability assessment in planning**. The discovery that politics and political processes are important is used as a literary device to segue into the author's pet beef that car dependence is central to arguments over the sustainability of the city. Here he implicitly manages to confuse a city's area or spatial footprint with its ecological footprint. The author's frustration that others do not automatically agree with his simple nostrums is palpable. He cites an exercise in manipulation and control recently conducted in Perth involving 1100 people that produced 'Vision priorities' as evidence that the public interprets more radically options for overcoming alleged car dependency than do the public servants and planning bureaucracies. He evades the question of whether the 1100 people involved in the little piece of theatre can be described as 'the public' which might be a reason 'the public servants and planning bureaucracies' have not snapped to attention and tried to make sense of the conflicting ill defined priorities that allegedly flowed from that exercise.

The author's preoccupation with cars and their alleged disadvantages is interesting because he never seems to understand that the demand for car usage is a derived demand. It is not the result of some physical determinism but is a consequence of deeply held desires of people to see what is over the hill, to be engaged in activities (including those of a wide range of 'communities' in which they have interests) beyond walking distance of their dwellings, to be able to travel when they want, where they want, with whom they want under conditions of security and comfort of their choice. Their ability to do so is of course also limited by their income. The congestion resulting from this expression of choice is more a function of the scale and structure of the city than any form of transport or source of energy for it.

At no stage in the story does the author explore the relative environmental impacts of different forms of transport for our cities nor does he explore the ways in which different sources of power for transport services might have better implications for environmental sustainability than the way the present array of transport services are powered.

The vision priorities that arose from the dialogue the author refers to makes no reference to the extent to which the present city imports food, water, energy and raw materials and exports its waste. It offers no vision of how these fundamental aspects of cities should be approached. The story does not indicate how a city can be encouraged to produce more of its own food (in the way it used to) with consequential reduction in monocultural food production using less insecticides and herbicides. Neither does it indicate how our cities can be made water independent with consequential reduction in environmental stress on the ecosystems from which water is now extracted or on the ecosystems into which wastewaters are now discharged. Nor does it explore ways in which our cities can be made more energy independent, their reliance on raw materials can be reduced and greater use made of recovered, recycled materials.

At the least we have to be sceptical of statements of vision priorities that go to the heart of the sustainability of the city yet do not refer to basic sources of environmental stresses.

It is interesting that the author hints at the political influence from 'within and outside government over land development' that must be read as a comment on the way those in a market system based on private ownership of land seek to protect their 'rights' in real property yet he fails to discuss this central element in the causes of environmental stresses or, indeed, of the problems of distributional aspects of the operation of our cities.

The author acknowledges the need to develop sustainability indicators but apart from saying that the list of indicators becomes unmanageable contributes little to the debate on which indicators might most usefully be adopted. He might for example have focused on ways we might develop indicators of per capita total and renewable energy consumption for different areas of the city, he might have argued how these measures could be used to explore the greenhouse gas production of different areas within the city. He could have argued for measures of spatially disaggregated per capita water consumption for different kinds of development and shown how a policy of water independence in those areas could reduce water pollution. He could have argued for measures of waste production for different areas of the city and shown how different strategies for coping with waste generation and management could both minimise resource use and maximise resource recovery from the waste stream. He does none of this but asserts that understanding the urban system will invariably include an emphasis on transport infrastructure and urban design.

The difficulties created by the implicit definition of sustainability adopted by the author leads him to assert that as some social issues are not quantifiable because they are 'about values and world views' (as though the others, including the environment, are not?) we should make greater use of stories to reconcile different approaches to sustainability assessment.

The difficulty with this approach is that it depends on who is telling the story. It provides no guide to consistency or translation from one set of conditions in one place and time to another set of conditions in another place and time. Rather than reducing conflict it will increase it. It is of course the perfect way to claim that only the story teller is fit and able

to draw together the various strands that might be taken into account in determining whether something is sustainable. This approach certainly means that the holders of the 'truth' are the only ones who can pronounce on what is acceptable - a sort of quasi post-modernist contemporary statement of 'I am the Light, I am the Way'. We have moved past that stage in our social evolution.

The paper then proceeds to a discussion of **Regional planning and sustainability** in which the author attempts to apply the idea of 'story' to a region. The discussion is an account of various alleged attempts to develop regional sustainability assessments without exploring the details of any of them or of proposing how we might do so for an Australian city. The paper claims that 'the model of a regional plan that sees the city in its bioregion and seeks to minimise its ecological footprint while simultaneously improving its quality of life, is at the heart of this approach to sustainability assessment.' There is a superficial attraction to the notion that we must take account of a city's bioregion in exploring its sustainability but the paper appears to accept that aggregate level data is appropriate for detailed policy analysis and it never explores the locational and spatial dimensions of the origins and nature of environmental stresses. Nor is there any acknowledgement that cities exist in a highly centralised but globalised economy where they are made vulnerable to the decisions made in other places. Moreover, there is no acknowledgement that many of the outcomes are artifacts of the measures constructed. This is illustrated by the Author's citation of a study in British Columbia which he claims concludes that 'communities that are developing smarter and with less dependency on automobiles, also tend to be associated with a higher quality of life, and seem to be more adept at attracting the leading edge sectors of the economy'. There he goes again pushing his anti car line with no evidence and with no discussion of the relevance of the Canadian experience for Australian conditions.

The paper finally returns to the third type or sustainability assessment **Sustainability Assessment in Buildings and Developments**. This is a story about the statutory planning system and the development of the so called BASIX system for assessing the sustainability of traditional houses in New South Wales. The author does not appear to recognise the problematic nature of the system or of its lack of a rigorous research base. He acknowledges that monitoring is an 'issue on all urban sustainability issues' (sic) but does not point out that there is no monitoring as an essential part of the BASIX system. Moreover, although he acknowledges in passing that, whether the claimed benefits of the certification of houses is achieved or not depends on the behaviour of the members of the household, he makes no attempt to discuss how household behaviour might affect the objects being pursued under the BASIX system. He rather asserts that only the level of savings is uncertain.

In the discussion of certifications systems he does not refer to the considerable literature critical of the various systems that have been adopted or proposed nor does he summarise the experiments that have been conducted to explore the benefits of sustainable designs. He tells stories of the attractions of the triple bottom line approach to sustainability yet fails to explore whether the adoption of systems like BASIX or national building codes

that are justified on their environmental merits do nothing more than increase housing costs.

The conclusion to the paper is a series of assertions and exhortations that do not flow from rigorous argument based on evidence presented or summarised cogently. The best that can be said is that the author offers no coherent argument about what is meant by sustainability or how its achievement might or should be measured. What this story offers is akin to inviting the reader to subscribe to the idea that assessment of sustainability is some special process in which only the anointed can understand the issues, evaluate the indicators and stories of sustainability and communicate the truth.

This is not consistent with a rigorous scientific exploration of the issues arising from a consideration of sustainability.

An Alternative Approach to Sustainability Assessment and Urban Systems

Transition to Sustainability

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Proposition 1. Urban areas are complex adaptive systems. Whether or not any or all of them are regarded as sustainable at a given time is a function of the knowledge of the people who live in them or of those responsible for their government and their administration about the level of environmental stress they are subject to or produce at that time.

Proposition 2. Any system that imports all its energy, all its water, all its raw materials, all its food and exports all its waste cannot be regarded as sustainable except in some ultimately trivial definition.

Urban areas have a special problem because at any sensible level of analysis – meaning at the level of a recognizable, politically independent entity - under present conditions they are unsustainable. The problem is to determine the nature and level of their unsustainability.

Abstract
The debate over sustainability has been constructed too broadly with the result that little progress has been made in making cities less unsustainable. This paper advances some reasons for this lack of progress. The paper argues the need to expand the notion of human rights to include rights in the environment. It explores the role of urban planning in reducing environmental stress. It suggests that rather than attempting to embrace all aspects of sustainability it may be more tactically appropriate to select a small number of aspects of urban living on which empirical evidence of the behaviour of households and individuals can be built up to enable the development of a planning system in which targets and the means of measuring progress in achieving them can be set. The paper concludes with an outline of the necessary features of any systematic assessment of sustainability.

Introduction

In 1992 *Sustainability* was defined as 'the ability of a natural, human or mixed system to withstand or adapt to, over an indefinite time scale, endogenous or exogenous change indefinitely' (Dovers and Handmer 1992, 275).

The word *sustainability*, however, has come to mean what speaker and listener want it to mean. On some estimates it is now differently defined in 150 pieces of legislation in Australia alone. Some argue that this is a strength, that there is value in the lack of precision. We might accept that there is indeed such a value in democracies in public

processes of debate, but this should not preclude striving for consensus on what might be meant by sustainability in particular contexts or at different times.
The lack of precision in definition may have led governments to appear to create uncertainty, confusion and ambiguity among residents and developers. The lack of precision is also not a strength in the English legal system, which inevitably seeks to establish clarity and reduce ambiguity. If the political planning system in a market economy in which land is privately held does not provide definition or give meaning to the notion of sustainability, the courts will.

The lack of specificity may also partly explain why pursuit of sustainability objectives has had high levels of public support yet fails to gain the political traction needed to make the society more sustainable. This problem has been made worse because of the tendency to expand the notion of sustainability to cover notions of economic and social sustainability.

While there is a sense in which this desire to embrace all aspects of society is understandable, and even desirable, the expansion of the concept from focussing on ecological sustainability to include social and economic sustainability leads to problems of complexity and scale that have the effect of reducing its potency. The expansion of the notion to include consideration of economic and social sustainability implies that the three considerations are in some way of equal importance. Those who promote such a 'triple bottom line' view of sustainability appear to be suggesting that there is some way in which we can pursue ecological sustainability that does not require fundamental changes to social and economic behaviour. They argue the need to find some 'balance' that will satisfy everyone. This approach may be the result of delusion but borders on willful deception.

The lack of specificity may also provide the 'excuse' or opportunity for different groups who, while agreeing that sustainability is an important objective, may take conflicting positions in response to specific initiatives. That is, the lack of specificity may serve to create confusion and uncertainty leading to political paralysis. The uncertainty is reflected in the fact that there are few community-agreed measures of whether the society is more or less sustainable than it was. The lack of specificity also allows proponents of a continually expanding economy to 'hijack' the concept and use it to ensure that the environment serves their ends.

These issues are compounded in Australia where the political and business cycles are short and there are few areas of public life in which pluralism is encouraged or practiced. The popular media for example pays little attention to environmental issues except when some 'critical' event occurs. There is little public debate over many issues except in highly polarised, fragmented debates where a 'winner take all' approach applies. While there is a high degree of consensus in the scientific community that climate changes are occurring as a result of human agency and that society must take steps to reduce energy consumption and pollution, there is little public consensus over what actions are necessary. There appears to be even less agreement on issues of resource depletion, biological diversity or threats to the survival of various animal or plant species.

This is a special problem in urban policy where State governments have succumbed to pressures for short-term investment decisions and where the effectiveness of planning systems have been reduced over the last two decades (Gleeson and Low 2000). The Federal three tiered system of government and the historically structured distribution of administrative power within the Federal and State governments underscores the difficulties of developing a coherent consensual approach to sustainability (Stilwell and Troy 2000).

Compartmentalisation of knowledge and political power

One consequence of this lack of consensus is that different arms of government rationalise their decisions about development or investment in infrastructure services with scant regard for the impact of their actions on one another's actions or on the community as a whole. The different arms of government exhibit all the failings in decision making identified by scholars studying megaprojects (FlyvBerg et al 2003, Altshuler and Luberoff 2003) especially in underestimating the resulting environmental stresses.

Government Ministers act as though they lead competing principalities. This is particularly evident in urban areas but may be observed in rural policy or in policy relating to exploitation of natural resources. Ministers and their Departments often then act as though they desire to restrict or control the flow of information and knowledge. One illustration of this may be found in relation to transport infrastructure investment where the idea that we can have 'sustainable transport' systems without first constructing policies to create sustainable cities appears to dominate investment decisions.

A large element of the explanation for this 'silo' approach to policy lies in the history of settlement of Australia and the rise in each of the States of powerful engineering bureaucracies in the development and management of roads, railways, ports, water supply and sewerage systems. In the struggle for political power, rural interests often prevailed or held the balance of power, enabling them to secure their objectives. Roads, bridges and irrigation dams were built in rural areas (Lloyd 1988) to meet the demands of sectional interests. This investment often stimulated growth in activities that exacerbated the environmental stresses to which fragile rural ecosystems were subjected – the exploitation of water resources provides the best illustration of this process.

City ecology was no less affected. Urban water supply and sewerage systems were developed to provide potable water and remove wastes to improve the public health (Dingle and Rasmussen 1991, Lloyd, Troy and Schreiner 1992). The development of these water supply and sewerage systems paid no regard for the rain that fell on urban areas, thus creating the storm water run-off problems that now bedevil most Australian cities. The development of these ‘big pipe in – big pipe out’ systems also created major stresses on the ecosystems from which water is sequestered to supply the city and on those where the 'waste water' is discharged to the environment.

Another set of difficulties arises from the process of policy formulation, adoption and administration. There are four kinds of issues that arise: ideology, fear, process of policy formulation and administrative confusion.

Ideology

The most obvious problems are those that arise in the systems of political thought that predominate in market economies and which give little or no recognition to the complexity or behaviour of natural systems (Rees et al 1993, Stilwell 2000, Stretton 1999).

To the extent that the complexity or behaviour of ecosystems is accepted in the dominant paradigm or that there is recognition that the 'externalities' of contemporary economic activity causes serious environmental stresses we nonetheless search for simple economic mechanisms to ameliorate them. There appears to be little understanding in the central economic departments of government that complex adaptive systems that occur in nature may fail to respond to economistic solutions. There is also a notion that if the time taken for a crop to grow or for a natural process to 'mature' is long that it has no or only a small 'present value'. Such arguments have been made, for example, in relation to the growth of hardwood forests. This approach also fails to take account of the health or survival of the ecosystems from which a resource such as timber might be extracted – focussing on the 'value' of the wood in them does not 'see' the trees or the complex biota of which they are an integral part. We adopt a policy of using market instruments such as the notion of tradable pollution rights, rather than reduce pollution. It is as though the market for such trades is stable and will produce consistent and prolonged beneficial outcomes.

We have constructed theories of individual human and social behaviour based on narrowly conceived notions of rational behaviour that assume simple responses to economic signals (Self 1993). We construct measures of economic well-being that count positively activities which add pollution and or reduce bio-diversity or deplete non-renewable resources. That is, the very measures adopted to measure progress are themselves 'corrupted'.

Fear

The second kind of difficulties have their origins in fear that pursuit of sustainability objectives by constructing environmental regulations simply creates free rider problems because individuals or corporations feel they may gain some competitive advantage by non compliance with regulations. The weak or dispossessed may also not approve policies to reduce environmental stress out of fear that such policies will further disadvantage them or prevent them from making the progress they desire.

There is also fear that a nation may decide not to endorse or enforce environmental regulations for fear that its economic competitors may not also move to reduce pollution or greenhouse gas production, thus putting its economy at risk or, in the case of less developed countries, that they are being required to limit their development or compensate for the environmental stresses created by developed countries.

Process of Policy formulation

The nature of the process of policy formulation may also create difficulties in the pursuit of sustainability objectives. Models of the process range from assumptions of a simple linear relationship between the creation of knowledge and the formulation of policy to more complex models that are based on the creation, validation, dissemination and adoption of knowledge as an iterative process (Edwards 2002). One of the weaknesses of all models is that they tend to ignore the politics of the process of policy formulation. They all assume that once knowledge is created and disseminated it will directly influence policy formulation. Even the most sophisticated models do not appear to acknowledge the possibility of the collapse of ecosystems, the degree of uncertainty or unpredictability of the outcomes of ecological processes or of communal responses to them.

Political influences in policy formulation and implementation may be expressed in part as the contestability of knowledge. The greenhouse gas debate provides a useful illustration of the way in which the knowledge of energy consumption and its relationship with global climate change and therefore of sustainability is challenged. The challenge, however invalid or of minor importance, may then be used by powerful interests to rationalise their refusal to formulate policy informed by knowledge accepted by the overwhelming majority of scientists. It is not that there is lack of knowledge about the relationship between energy consumption and greenhouse gas production but that the forms of debate may be used to raise doubts about the relationship in a way that ensures that policy initiatives to reduce greenhouse gas production are not taken. Further, the debate may be influenced by the misperceptions and misunderstandings that arise because of differences between the natural and social sciences in the way they identify problems and the way they develop knowledge.

The process of policy formulation may also be shaped by the responses of citizens to different aspects of implementation. Citizens may, for example, respond readily to proposals to reduce vehicle emissions or to make vehicles more efficient as a way of reducing greenhouse gas production but then demand motor vehicles with a greater array of ‘features’ that lead to greater energy consumption.

The inertias, rigidities and cultures of the institutions that would be affected or required to implement policy initiatives and by the politico-administrative framework within which they are to be taken may also shape the policy process.

This suggests that the process of policy formulation is less ordered, more episodic and unpredictable than hypothesized. That is, radical changes cannot be expected especially, especially in the short term, where the pursuit of sustainability objectives involves changes in the operation of large network services.

Administrative confusion

In the mid 1970s the notion of environmental impact assessments was 'imported' into urban and regional development decision making from the United States of America which had weak urban planning and development controls. In Australia the planning

system was developed in each State in the Federation to try to produce 'scientifically based' land use planning of urban areas and regions. The system took account of environmental concerns but historically these had been weakly expressed.

The introduction by the Australian Federal Government in the mid 1970s of the need for an Environmental Impact Statement (EIS) to be produced before development permission was granted was simply grafted onto the existing planning and development control process and became a burden which often led to stasis. Partly in response to Federal Government pressure State governments also adopted EIS processes rather than restructure their planning systems to ensure that environmental issues were explicitly considered in planning decisions. This introduced confusion into decision making when project based environmental impact assessments were introduced into what had hitherto been a strong urban and regional planning system which conferred rights in property. The corruption of the project based approach and the delays engendered by the EIS process led to significant political opposition and ultimately to its breakdown as corporations sought to incorporate the process and thereby neuter it. The EIS process was also compromised because of the widespread realisation that there was no follow-up to determine whether performance conditions specified in EIS based approvals were met. Finally, the fact that developers were required to provide their own EIS statements devalued the procedure.

Subsequent attempts to develop the notion of strategic environmental assessment (SEA) (Marsden and Dovers 2002) recognised the contest that had developed with the older planning traditions and the newer environmental advocates but have so far not resolved the tension. Traditional planning has adopted much of the language of concern of environmentalists but has generally not developed strong evidence-based policy analysis to buttress it and demonstrate its *bona fides* in pursuit of sustainability, moreover, most planners have little training in or understanding of environmental issues.

Transition to Sustainability

While sustainability is seen by some as problematic and by others as unattainable, the majority view among natural scientists is that it is imperative that nations must adopt a strategy of transition to sustainability by attempting to systematically reduce environmental stresses. Although environmental stress in the regions is highly significant nowhere is this strategy more important than in cities, given their central roles as major sources and locations of environmental stress

In pursuing the transition to sustainability, general economic settings and mechanisms, including the suite of pricing strategies and taxes, are important. However, planning tools and aids to decision making are needed which will complement general mechanisms and allow the introduction of location and space issues into the consideration of policy options and development proposals. This may be difficult in contemporary democracies in which citizens have been led to accept short-term perspectives on major issues. That is, because of the expectations of the citizenry, governments may find it difficult to give weight to policies and programs that require long term commitment and are necessarily

of a transitional nature. The lack of a pluralistic approach by governments to environmental issues appears to compound these difficulties.

One task, then, is to progressively invest the word and concept of sustainability with a new social meaning. Another is to develop a planning system in which sustainability issues can be considered systematically and democratically in the planning and development of cities and their regions.

In developing such a planning system there is no 'end point'. We must accept that we are engaged in a dynamic process by which we set goals and targets which we strive to meet over a specified period knowing that the goals and targets will be continuously revised in the light of new scientific knowledge and understanding. That is, the notion of 'sustainability' will be incrementally, progressively defined and we will periodically arrive at new consensual definitions. This means we need to develop a planning system in which there is no one 'true state of sustainability' but rather a range of conditions under which human life can be felicitously sustained. In all of these conditions we must accept that without reshaping consumption we run a high risk of creating conditions inimical to the sustenance of human life.

An important element in the planning system would be to develop techniques and processes for choosing between short term issues and longer run concerns in what is inherently a radically uncertain social and physical environment in which the knowledge base changes continuously.

Such a planning system requires the development of trust between citizens and government.

Trust and the development of environmental regulations

Over recent decades, governments have introduced a large number of programs designed to meet environmental objectives, addressing community concerns at environmental degradation yet also seeking to regulate aspects of individual and social behaviour as they relate to that degradation. These programs have met with varying degrees of success, often depending on the effectiveness of the intersection between broad sectional concerns on the one hand, and the reach of compliance and regulation on the other. Increasingly, a participatory ethic – of the ‘stakeholder’, the ‘steward’, the 'responsible citizen' – has been fostered to improve the effectiveness of these programs, and to acknowledge the limitations (political and budgetary) of direct state intervention. Equally, there has emerged an awareness of the need to develop a popular sense of the linkage between the ‘science’ of environmental assessment, the ‘technique’ of environmental management, the ‘economy’ of costs and benefits associated with such regulation, and the ‘citizens’ or ‘communities’ invested with a willing environmental conscience, and expecting protection of their quality of life. The issue of trust has been central at each stage of this process. It informs attempts to establish and control these relationships, and to mediate this range of interests and identities.

We have an obligation to explore the extent to which the success of programs is a function of the level of trust between citizens and their governments, as transacted across the various levels of agency. It might not be fruitful to attempt to measure the level of trust in general terms, but rather to investigate the creation and role of trust in these contexts, and the origins and extent of threats to it. The focus should be primarily on the extent to which the element of trust can lift issues of environmental governance above matters of risk management and conflicting interests, integrating them into exchanges and behaviours which are effectively taken-for-granted.

A feature of environmental regulation is that compliance rarely brings a direct personal benefit. Environmental regulations and programs are for a public good which is often hard to measure, and the benefits of which may only be realised at collective or systemic levels, in later generations, or which are distributed across a variety of spatial scales, often including wide socio-economic disparities. Such programs rely for their success on a high level of trust by citizens in the foresight and integrity of their governments, and on agencies which act within governmental regulation on a contractual or advisory basis. They also place considerable emphasis on citizen compliance in practices which are difficult to monitor and reform, both because of the remoteness of benefit, and a reliance on an ethic of conscience and participation.

It is difficult to separate trust and accountability or notions of fairness in the administration and delivery of programs or enforcement of regulations. Support for and compliance with waste collection and recycling programs and with industrial air pollution regulations are complex issues. We may see trust as a 'cheap' way of obtaining compliance in the case of waste collection and recycling programs. Compliance with industrial air pollution, regulations designed to reduce toxic or injurious emissions relies more directly on contractual obligations of corporations, although trust may play a significant part in the support of citizens for their government's efforts. That is, trust is an integral part even in enforced compliance. But even here corporations whose activities may be subjected to industrial air pollution regulations may still want citizens to trust them to act as 'good corporate citizens' committed to behaving in the public interest. Initiatives to develop trust by citizens in them might then be rational behaviour by corporations whose long-term objective is to minimise formal regulatory controls.

Environmental programs or regulations are typified by processes which take a long time to demonstrate their benefits - they are also often justified in terms of their benefits to later generations, although present populations may also benefit. The processes by which benefits are delivered are often obscure, requiring trust by citizens in the knowledge or integrity of others. The beneficiaries are often hard to identify and are diffuse. Those responsible for framing regulations or developing programs and then delivering them may be hard to identify and in any event may change. The political representatives who develop the political agendas which lead to the adoption of environmental programs and regulations will almost certainly change. The managers of corporations will also change. That is, the efficacy of environmental programs and regulations and compliance with them requires trust in the continuity of policy and shared values. But trust cannot simply be a function of historical relationships. It is also related to perceptions of accuracy,

accessibility and relevance of the information available to the public. Trust has to be continuously earned and demonstrated. This is difficult to achieve and maintain in areas such as sustainability where the benefits of policies and programs may take time to be realised and especially where the benefits may be indirect or intangible.

Principal-agent theories may provide some explanatory power in the role trust plays in developing environmental programs and regulations and achieving compliance with them. Yet the complexity, the need for continuity to achieve the benefit sought and fluidity of the mix of principals and agents may be too great to rely on such theories for robust explanation of the nature or role of trust. It will be difficult to identify how trust can be identified as a factor in the roles played by an individual who can act as principal and agent on the same issue such as the experts who work for corporations which produce industrial air pollution.

Environmental Rights as human rights

There are well developed arguments about the rights, duties and obligations of citizens (Marshall 1977, 1981), Turner 1986) but they do not extend much into rights to live untroubled by the environmental stresses occasioned by others although Turner (pp 91, 98 - 100) identifies the expansion of citizenship rights 'brought about by social movements which in fact have the consequence of ascribing rights to nature and the environment'. In spite of this little emphasis is placed on the rights of non-humans to live untroubled by the environmental stresses caused by humans. Consideration of 'externalities' discussed by economists tends to focus on the immediate and direct effects of a policy, program or project but rarely explores their indirect effects or outcomes. Such considerations tend to be very narrowly defined thus leaving out the more general or systemic effects of an initiative. Currently the focus on addressing ‘externalities’ is generally expressed in terms of the tradability of pollution rights. It is as though a level will be found that meets the need to satisfy the desire of individuals to protect themselves from the environmental stress produced by that specific form of pollution. Such considerations of pollution rights are often expressed in rights to property but are rarely couched in terms of the ability of ecosystems to accommodate the stresses (Gray and Gray 1999). One limitation of this approach is that it is confined to consideration of the rights of owners of real property with the result that a significant minority of citizens who own no real property have no effective way of taking action to protect themselves from the environmental stresses caused by others. We note, however, recent attempts to chart the evolution of concerns over property rights to a broader concern with human rights (Gray 2002, Zarsky 2002).

Consideration of 'externalities'

Most democracies are predicated on the notion that citizens have a right to express their political preferences by voting, in secret. Voting rights are not legitimately tradable. That is, a significant aspect of the society is regarded as being beyond the market system. Other freedoms are similarly regarded as fundamental and beyond the market (Capling et al 1998). Relations between nations may be shaped by whether these rights are respected. There is a number of international conventions which have been established to

try to ensure that relations between nations are conducted on reasonable and equal terms. The convention governing labour relations, for example, is designed to ensure that workers are not exploited. Moreover, there is a mechanism to investigate claims of exploitation. Although the International Labour Organisation is not particularly successful in eliminating exploitation the convention could provide a useful model on ways in which environmental conditions could be monitored and sanctions recommended against those countries that flouted agreed pollution or global warming targets or who allowed their populations to be subjected to various environmental stresses.

Currently however, the 'right' of freedom of trade appears to be pre-eminent and enables powerful corporations and nations to establish the terms and conditions under which weaker nations conduct their affairs. Embargoes may be and have been erected to limit civil engagement, including trade, with nations that refuse to observe basic human rights identified in the treaty establishing the United Nations. This precedent offers opportunities for nations to exert pressure on other nations to comply with environmental regulations to pursue sustainability. One avenue for exploration is the way in which knowledge of sustainability could lead to regulatory frameworks that enabled nations to protect their own environment, minimise the exposure of their population to exploitation and environmental stresses and minimise their contribution to processes that have deleterious effects on global climate or other transboundary issues.

The loss of support for the notion of ‘public goods’ symbolised by the privatisation of urban services and the consequent dissolving of collective responses to the demand for them has been cogently documented by Graham and Marvin (2001). One implication of their analysis is that there is an urgent need for the development of a new approach which takes account of the rights of individuals and the way they are affected by the environmental consequences of the neo-liberal provision of urban services.

There is thus a need to contest narrow economistic views of property rights and to explore issues of rights of access to potable water and clean air etc. Development of the notion of sustainability would also need to engage more in exploring the rights of later generations to not be challenged by nature which has been compromised by the changes wrought on it by the pursuit of ‘new’ science or of changes resulting from excessive exploitation of resources.

Public debate over sustainability might best be engaged in challenging the contemporary 'race to the bottom' that inheres in current policies and practices in exploitation of resources. The public must also be engaged in developing knowledge about the nature of institutional reform needed to pursue sustainability objectives. This would include developing knowledge about the nature and form of institutional structures needed to secure and maintain international cooperation in the transition to sustainability as well as development of the instruments needed to pursue such an objective. The failure to engage in exploration of these issues helps explain why little progress has been made in implementing the Kyoto protocol under which Australia would be required to reduce its emission of greenhouse gases.

Urban planning

The Australian planning system is built on a land-use zoning system that is rigid, passive and negative. It is rigid in the sense that the limited analysis of economic and social activities and the relationships between them that are summarised in land use plans and their associated zoning codes is costly to undertake and the preparation of the resulting plans is time consuming with the result that the plans are often out of date at the time they are produced.

The system is passive and negative in the sense that land use zoning may indicate what activities might be permissible on a parcel of land but it implies few requirements for action. The plans usually do not prevent existing uses being continued regardless of their social or environmental consequences and do not require landowners to undertake socially desirable developments. The planning system confers and builds on notions of private property rights that privilege private over collective rights with the result that it also tends to lead to litigation by proponents of development taking issue with decisions by planning authorities to protect public interests.

It has always been difficult to say with certainty that particular intensities or arrangements of uses would lead to specific outcomes. The categorisation of land into different uses was, at best, only ever a crude approximation of the nature of activities, the connections between them and the 'externalities' associated with them. Land use planning was used as a crude surrogate for the precautionary principle in pursuit of these goals. Planners were, for a time; able to convey confidence that their prescriptions and recommendations about the uses to which specific pieces of land should be put would produce the felicitous social, environmental and economic outcomes collectively sought. A great deal of regulation was justified and built on this expression of trust and there is no doubt that it frequently produced congenial results.

Recently, however, the notion of scientific planning has been unpopular. Urban planning which has never been central in government decision making was even more marginalised. The public appeared to lose faith in politicians and instruments of government. The role of government was challenged and large areas of administration and service provision were deregulated or privatised. For a variety of reasons, not all of them due to the fallibility of planners, the land use planning practices followed were not able to cope with changing demands to accommodate growth or with the simultaneously increasing concern over environmental issues (Troy 2000).

How should we respond to this situation? How should the threads of the frayed town and regional planning system be pulled together to weave a stronger web which takes fuller account of environmental issues in the pursuit of environmental, social and economic goals?

Path dependency

Over the next twenty years the inherited form and structure of cities will largely affect the provision of urban services in them; their provision will also, of course, be affected by the characteristics of the present investment in them. This is not to say that planning for

transition to sustainability is governed by the path dependency created by a city's past pattern of investment in buildings and structures - the physical fabric of the city - or in the rail rolling stock, vehicle, or ferry fleets. It is simply that recognising the significance of the past helps identification of the difficulties that must be anticipated and planned for in proposing how urban services may change or be changed. It also helps in the assessment of the environmental benefits that may be expected to flow from such changes.

Although the process of urban change is generally slow the change in some areas may be rapid. That is, the form of development in critical areas of the city may change very rapidly and certainly much faster than the capacity of the present forms of infrastructure that supports them can. This inevitably leads to stresses in the systems and tends to distort the patterns of investment in urban infrastructure. These stresses are magnified because current land use planning approaches cannot provide an appropriate assessment of the nature or magnitude of the changes or whether they are more or less sustainable.

Planning for sustainability

A new approach is needed which integrates the concerns of the social and natural scientist and the measures they can provide of the environmental effects of exploitation of resources with those of the urban planner who can facilitate the introduction of social, economic and aesthetic considerations into the expression of development choices.

The components of an ecologically sustainable future for cities can only be achieved by deliberate transitions from current practices to different ways of acting. One way of facilitating the transition would be to develop a different approach to the planning for and accommodation of the activities carried out in the city.

This implies departure from the present approaches to land use planning to one which would allow planners to assess alternative development strategies for the physical fabric of the city, for investment options in urban services and in the structure and operation of manufacturing, warehousing and retailing (that is, it is predicated on a return to a new 'modernist' notion of planning). It also implies both increasing the awareness of people at all levels to the importance of ecological sustainability and the need to elevate ecologically sustainable objectives to the centre of decision making designed to achieve them - this requires a philosophy of participation in decision making and it privileges knowledge of the behaviour of ecosystems.

Sustainability discussions usually result in articulation of a long list of concerns, many of which are also beyond individual action/behaviour. There is a need to select measures that can be used to change individual and social behaviour and/or be developed as a planning tool. It may be better to limit the scope of concern and try to reach agreement on a limited number of processes known to affect environmental sustainability. That is, it may be necessary to accept some simplification or reduction in complexity in order to develop consensus on initiatives to make cities less unsustainable.

The word 'transition' suggests that we need to facilitate the expression of a range of interpretations of the existing situation in a city before we can begin to evaluate possible alternative directions for their growth and management. The word implies a state of flux, of development over time. It means a preparedness to accept that there are different problems which may emerge in making the transition from the present to the alternative futures to make them more sustainable and that it will be necessary to identify and adapt to the problems in different ways at different times.

As part of this transition we choose here two aspects of consumption known to affect sustainability. The significance of energy and water consumption is that they affect, or have the potential to affect, the form and structure of the city whereas the connection between urban form and structure and other sustainability objectives appears to be weaker.

Energy Consumption

Making cities less unsustainable in terms of consumption of energy from non-renewable sources would also have the effect of achieving other sustainability objectives, such as a reduction in air pollution, the reduction in resource use and depletion and the protection of bio-diversity.

There is a lack of data, information, research and understanding about the energy consumption of our cities. On the one hand, there are detailed data available about these matters for individual consumers - households, businesses and factories, although there is little systematic examination of the socio-economic factors affecting those individual measures of consumption. On the other, there are broad constructs about the energy demands of cities.

In between the very specific and detailed scale of the individual building and consumer and the abstract and collective dimensions represented in the city as a whole, little is known about how particular parts of the city use energy. It is vital to clarify this in order to construct a more accurate, comprehensive picture of how the whole city uses energy. It is also essential to inform crucial policy decisions about further extensions to the city and important changes to existing urban areas in terms of density of development, land uses and transportation arrangements and how reduction in energy consumption should be shared.

Filling this void in our understanding would enable key decisions about energy use to be integrated from the scale of individual dwellings, buildings and consumers to issues about the location, density and type of development and change for the city.

We could make a similar argument about water consumption.

Centralisation

All the major Australian cities were established by government decision. They were first the centres of colonial power and they grew in a radial incremental manner. As a consequence they are all highly centralised with a strong radial structure. This

centralisation of the city raises a profound and, to some extent, unavoidable paradox. There are social and economic benefits to be derived from a degree of centralisation of activities and social investment in cities. However, pressure for centralisation produces demands for more people to be at the centre of economic and political power and influence. These demands in turn become demands for tall buildings to provide accommodation for the commercial and governmental activities we pursue. They may also become demands for tall buildings for residential accommodation

It is also clear that at some point in city growth alienation, anomie, segregation and diseconomies of scale arise. The question is: What is that point and how do we recognise it? We also must acknowledge that the point will vary from city to city and depend on the topography and geology of its site.

In small cities there are clear benefits from centralisation but as the size of the city increases the structure of the modern city is the main source of its inefficiency reflected in increasing per capita energy consumption. The greater the degree of centralisation of the city and therefore of its urban services, the greater the inefficiency.

Continued focus on the development of the CBD leads to continuously increasing demand for urban services, including especially, transport. Increased centralisation forces travel through the centre even of those who do not have the centre as their destination. This in turn leads to the kind of congestion problems now experienced on road and rail networks in many cities.

We desire a degree of centralisation in our urban life but the challenge is to find the degree which gives us the best trade-off in terms of the sustainability of the city. Cities can be made less reliant on highly centralised energy and water cycle systems so the task is to work out how to produce such a felicitous outcome.

Part of the transition task is to develop a new planning paradigm, one which leads to a high degree of local participation in the planning and development process and is predicated on the notion that the transition to sustainability will be facilitated by a greater degree of local autonomy and independence in networked services than is currently the case.

Environmental Targets

Governments and environmental groups have tended to focus on pursuit of global targets for reduction in consumption of non-renewable energy and therefore greenhouse gas production. They have tended to focus on simple market mechanisms. General targets and market mechanisms are important but to achieve environmental targets we must employ mechanisms that allow greater discrimination in the use of location-specific measures. We have to be able to direct the development where we want it to occur and be of a form we want in order to minimise the degree of unsustainability. To achieve the changes in behaviour that are necessary, especially those relating to reduced consumption of energy and water and reduced production of waste we must encourage individuals to 'own' responsibility for achieving the reductions sought. This will best be achieved by

identifying how their behaviour affects consumption and how they might modify it. Local targets, prices and regulations needed to achieve them are more likely to result in behaviour modification because people can more readily understand how their own behaviour relates to local environmental stress.

We need a new approach which recognises at once that we must look at the way a city develops and is operated to identify potential ways to reduce energy and water consumption.

The paradox in this is that in modern economies the data exists that enables us to construct measures that could be used to convert information into knowledge.

What do we know?

In a 'free economy' in which land is privately held emphasis on property rights may introduce difficulties in pursuing the public interest, including the public's interest in reducing environmental stresses. Although, as noted above, the concept of property rights is evolving thus potentially giving greater weight to consideration of the public interest (Gray 2002).

National and international targets have been set for greenhouse gas emission targets but these aggregate measures are targets that are contested and too removed from individuals or communities to affect their behaviour

In Australia property records have been created to ensure accurate records of who owns what real property. As many of the services provided in urban areas are based on the relative wealth of individual property owners similar records are employed to generate information to assess the liability of each property owner for levies and taxes to pay for the provision of services and facilities. Such records are maintained by independent agencies and are accurate as at the close of business each day.

Water and power companies maintain property based accounts of the consumption of their individual consumers. The files are maintained accurately to the last quarter's consumption. The ‘current account’ holds up to 10 consecutive quarters of recent consumption and includes estimates of the daily average consumption for each month.

The national census of population and dwellings is conducted every five years, has a reputation for high levels of accuracy and the data is available on a small area basis.

The basic data thus exists in the form of data sets that are regularly collected (the census) or are continuously maintained (property, water, electricity and gas consumption) to enable the construction of small area water and energy consumption profiles, and therefore of greenhouse gas production. These profiles may be expressed in terms of the water and energy consumption (including the embodied and operational energy consumption for the built form and infrastructure such as transport) for different types of development. That is, the data exists to enable the measurement of energy and water consumption for different parts of the energy and water cycle networks.

Are these measures practical? A pilot study conducted in Adelaide indicates that it is feasible to efficiently measure embodied and operational energy consumption of different kinds of development (Troy et al 2003). The same study indicates that it is feasible to present measures of water consumption for different kinds of developments, (Troy and Holloway 2004).

In such an incremental approach the notion of what should be encompassed under sustainability will eventually be broadened. Because the survival of human life depends on the continuation of an appropriate environment, ecological sustainability is valued above all else. Accepting this valuation does not mean that other issues such as equity are trivial. It is important in developing the policies and programs pursued in any transition to sustainability to ensure that equity is a major consideration. For example, setting targets for energy and water consumption would need to take cognisance of the equitable needs of all members of society. This means that in making the transition from the present to a more sustainable future a major consideration would be ensuring that any costs of the transition were shared equitably. An obvious aspect of such an approach is that governments might have to develop programs to underwrite the changes in employment, in production and management resulting from the pursuit of sustainability. Governments might also have to stimulate employment in activities that were more beneficial for sustainability.

What can we do?

We can begin by translating national greenhouse gas emission targets to local levels. We can nationally set targets for individual cities and regions according to the proportion they contribute to national emission levels in the knowledge that we can develop the data to monitor the production of greenhouse gas from them. Using the information thus generated we can assess the efficacy of a variety of programs and policies designed to reduce energy consumption and therefore greenhouse gas production. We can thus begin the process of reshaping the demand for energy and do so in an equitable way. The targets and criteria of performance would have to be made public and clear. The precise mix of measures each city or region took to reach the nationally agreed targets would vary and would be developed as the outcome of local political processes. There is a danger of micro-political contests and accentuation of inter-city and inter-regional conflict but this could be reduced if a new inclusive planning process was developed and if a more open debate about environmental issues was encouraged.

The long tradition of a quasi-judicial performance and needs-based redistribution of financial resources between and within States in Australia suggests that such sharing of the burden of meeting targets is feasible providing the objectives, information and assessment processes are transparent and removed from day-to-day political contest.

We can similarly translate water consumption targets to local levels and in the process identify areas in which it would be apposite to re-shape the demand for water and to pursue water independent forms of development. One of the immediate benefits of this approach is that it would reduce the demand for investment in water and sewerage

networks and would reduce environmental stresses at both the extraction and disposal ‘ends’ of the water cycle.

We cannot rely on simple economic measures such as tariffs because of the inelastic demand for some level of consumption for each household. One way of de-emphasising the economistic elements in the debate over sustainability would be to construct a new metric that drew more on 'physical' measures such as measures of water and energy consumption. Such measures would serve to place in perspective the preoccupation with tradable pollution rights.

We can choose a limited 'set' of measures of water and energy consumption knowing that they will change because we will:

a) need to change targets
b) be able to increase the range of measures to secure reduction in consumption.

Rather than focus mainly on sites of production of energy we need to focus greater attention on sites of consumption if we are to make people more aware of changes in their own behaviour as way of moderating demand and more responsible for achieving the appropriate reduction in demand. That is, we need a planning system that is more interventionist; one that is designed to sensitively and systematically reshape the demand for energy and water. Such a planning system would lead to greater efficiencies in the supply of energy and water services (Guy, Marvin and Moss 2001). The system might even need to recognise that private ownership of land carries with it obligations as to its use as well as rights.

Conclusion

The public debate needs to engage more with the issues raised by natural and physical sciences about ecological sustainability. There is a need to explore ways in which known sources of environmental stress may be reduced and the risks of 'unknown' sources avoided. This would require the local engagement of communities to encourage appropriate changes in behaviour or to resist introduction of policies, processes and products which carry with them significant environmental risks because the consequences of their introduction are not well known. Such an approach would necessarily mean greater emphasis was given to the application of the precautionary principle and would mean less haste and more speed in the adoption of much of the product of modern science, as well as greater caution in the adoption of 'solutions' that appear ‘rational’ in economic terms but the consequences for the environment of their adoption remain to be explored. It would also mean developing strategies and techniques for reducing or eliminating stresses that only manifest themselves with experience.

In devising policy political leaders also need to explore ways of countering the effect of extra-territory control of infrastructure services and investment to ensure they are provided in an environmentally sustainable manner.

The current definition of sustainability is too all encompassing to gain political traction. To pursue sustainability it is necessary to select a small number of aspects of

consumption known to affect sustainability and to develop measures of consumption that may be used to assess progress in pursuing sustainability objectives. The same measures may be used to assess the efficacy of urban planning policies and programs in achieving those objectives. It is suggested here that measures of energy and water consumption would be apposite as targets and as estimates of progress in pursuing sustainability.

Once experience is gained in establishing energy and water consumption targets, and in achieving more sustainable behaviour, trust between governors and governed could be expected to increase. Progress in reducing energy and water consumption could then be used as a model to be employed in pursuit of other aspects of sustainability.

Privileging ecological sustainability would still mean that planning must be seen as an iterative process in which the uncertainties of outcomes and of relationships between consumption and environmental stresses are continuously resolved in the light of new knowledge.

It is important to acknowledge that much of the data to establish targets and assess progress in pursuit of sustainability is currently routinely collected. It wants simply the will to analyse the data and use the information thus produced to better understand how to modify behaviour to make the society more sustainable.

In summary the features of any systematic assessment of sustainability are:

1. A clear statement of what is meant sustainability.
2. The measures employed in assessing whether or not an activity or concentration of activities is sustainable should be defined.
3. The information used to develop assessment measures should be routinely collected and be at a scale relevant to the activities being assessed - in the case of urban systems the information should be spatially disaggregated.
4. The provenance or accuracy of the information should be able to be critically reviewed or corroborated.
5. The process by which different elements being assessed in measuring sustainability should be transparent.
6. Where different elements of sustainability are being considered the relative weighting accorded each element should be made explicit.
7. Assessment proposals must be congruent with the specific political and institutional setting in which they will operate, and within which we will evolve understanding, expertise and enhanced institutional capacity for integrated assessment.

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