'Sustainability' is a term that has become very popular in the media and in academic circles in recent years. It was not widely used before the late 1980s. This should be a warning that it describes a concept that is socially determined rather than something that exists as a self-evident given. It is now fashionable as much because of the context in which the term has been invented as the content of what is imagined by it.

It may seem unscientific to approach 'sustainability' in this manner, at the very time that a more analytical focus is needed on something apparently so fundamental. It is, however, the purpose of this chapter to place in context the science required, as well as to suggest that science is always prosecuted in pursuit of something. In the case of 'sustainability', the identity of that something is both more elusive and more important than might at first sight seem obvious. In fact, there is nothing obvious about sustainability. What does the term mean? What is it that is to be sustained? Why is it to be sustained? This chapter attempts some answers to these questions through the construction of a model of sustainability. In turn, some understanding of the questions is essential to answering another: how do we determine the appropriateness of particular management strategies?

These are 'content' questions, yet the way in which we respond to them is also a matter of context. In the 1970s there was concern about resource limits to growth and pollution. But many issues that are seen today as central to 'sustainability' were not then considered to be important. For example, before the mid 1980s there was little debate about tropical rainforests, even though the processes that have since been held responsible for their destruction were all then much in evidence. But rainforests had not yet become the metaphor for threatened global survival that they now represent. In less than a decade 'sustainability' has rendered them topical, fascinating, and highly valued, in sharp contrast to the threatening, disease-ridden, climatically challenging 'jungle' that they often were previously seen as in Western imaginations (Arnold 1996).

'Sustainability', then, is a socially constructed concept. Rather than describing a series of absolute scientific truths, it is instead a convenient description of a process of coming to terms with what has to be done to contain the extent of human impacts on the environment. This process is the product of scientific research, of popular dissemination of research findings, and of academic and political debate.
about the consequences for natural systems of ever-increasing levels of production and
consumption, and of the likely consequences for production and consumption of envi-
ronmental regulation. The more strongly sustainability is pursued, the greater the
challenge it poses to society. In this regard New Zealand holds no especially virtuous
place, despite the widely accepted image that the country is some sort of green par-
adise. There is a lot of evidence to suggest that many economic and social practices
here have not been, and are not currently, environmentally sustainable.

The next section of the chapter seeks to sketch the context of historical trends of
landscape transformation in New Zealand and their effects, as well as that of key sci-
entific works that have contributed to the discourse of sustainability. In the third sec-
tion a model of environmental sustainability is developed, based on identification of
preconditions, principles, and goals for the process. The fourth section discusses
management strategies, from those of the indigenous Maori, and those promoted by the
Resource Management Act, to an examination of the distinction between weak and
strong paths to sustainability. This distinction is then illustrated with a case study of
cities, chosen because most people live in urban areas, so that it is in urban areas that
management for sustainability may ultimately have its most wide-reaching impacts.
The chapter concludes by posing the question: why does sustainability matter now?
The answer has to be based on considerably more than uninformed sentiment.

**Contexts for sustainability**

A prominent historian has described how, throughout the twentieth century, adher-
ence to beliefs in 'progress took it for granted that the growing domination of nature
by [people] was the very measure of humanity's advance' (Hobsbawn 1994, p. 261).
Such beliefs have been grounded in interpretations of 'development' as constant bet-
terment, indicators of which include growing levels of wealth, per capita incomes
and possessions. The recent discourse of sustainability (based on the idea that we can
live well, but within the material limits of a finite planet) has therefore been contest-
ing a pervasive discourse of developmentalism (the belief in material growth, at all
costs, as the means to improvement). The notion of 'discourse' is central to
understanding this chapter. It means a social framework of intelligibility or a way of think-
ing that uses a specific language, vocabulary, and explanatory framework in often
taken-for-granted ways. Particular discourses enable people to make sense of their
activities and their relations with others, including nature.

In New Zealand, one of the roots of developmentalism is the experiences of nine-
teenth-century colonisation. The language of colonising was often celebratory. For
example, when Palmerston North was established as a small settlement in the bush,
clearance of the trees for primary production was seen as synonymous with survival
and then prosperity. 'Although the smoke may inconvenience us and the charred
avenues offend the eye,' said the Manawatu Times in 1877, 'we must accept all thank-
fully as a mark of local progress.' This is exactly how most Pakeha settlers interpreted
the landscape transformations of the period. The left-hand side of Figure 25.1 sum-
marises the process in diagrammatic form, in which the extension of the grassed area
is a surrogate—or substitute—measure for the removal of native bush. A characteristic of landscape change in New Zealand, as in other lands of recent European settlement, was its speed. As one geographer remarked, what had taken twenty centuries in Europe and four in North America, had occurred in barely one here (Cumberland 1941).

Geographers were, however, aware of some of the environmental results of the domination of nature, and brought these to wider attention. Kenneth Cumberland and Lance McCaskill were both well known in the 1940s and 1950s for their expertise on soil erosion and its impact on production potential. Andrew Clark (1949) detailed the ‘invasion’ of the land by human-induced introductions of flora and fauna. We now know that up to 85% of New Zealand’s original lowland forest and wetland has been

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**Figure 25.1** Landscape transformation in New Zealand. The left side shows the theme from a developmental perspective; the right side from a wider environmental perspective, illustrating that which is obscured by the first perspective as well as that which is in response to it. (The left side is modified from L. Molloy (1980), with statistics updated from New Zealand Pocket Digest of Statistics, Department of Statistics, Wellington (various dates, 1982-1991) and Annual Review of the New Zealand Sheep and Beef Industry 1994-95, publication no. 2085, New Zealand Meat and Wool Board’s Economic Service, Wellington. The statistical basis for the right side is derived from New Zealand Official Yearbooks (various), for national parks and Maori land after 1910; Maori land figures up to 1910 are from A. Ward, National Overview, vol. I, Waitangi Tribunal Rangahaua Whanui Series, GP Publications, Wellington, 1997.)
replaced: wetlands were still being drained at the rate of nearly 12,000 hectares per annum between 1954 and 1976. The consequences are much more extensive than previously realised, particularly in terms of the loss of biodiversity due to clearance of habitat and competition from introduced species. Up to 800 native species and 200 subspecies are now considered threatened; of endemic land bird species, 74% of those that survive today are in this category (Taylor & Smith 1997).

Reactions to these trends in New Zealand for long fell into two broad categories. First, management of land and production was modified in order to maintain or boost productivity. Strategies included the development of new stock varieties and research into 'carrying capacities' (i.e. the level of use that could be made of land without undermining its productive capacity). Hence the trend to increasing productivity illustrated in Figure 25.1. Second, increasing amounts of the national land area deemed not to be productively usable were set aside as the 'conservation estate' for purposes of landscape preservation and recreation. Neither reaction fundamentally questioned developmentalism; arguably both were adaptations of it.

More profound responses were occurring internationally, particularly by the 1970s. Perhaps the best known was the Limits to Growth report (Meadows et al. 1972). It used a quantitative computer model to predict the course of variables such as population, pollution, food per capita, and life expectancies over the next century. Some were sceptical of its predications of resource exhaustions by the 1990s (which have not been borne out) and societal breakdown in the twenty-first century. A more recent update, Beyond the Limits (Meadows et al. 1992), has been criticised for reliance on the same model (Hayes 1993). But among scientists the premise of both reports, that growth cannot carry on indefinitely within the confines of a finite system, is now widely accepted.

Other authors used equally memorable figures of speech to challenge the discourse of developmentalism, and hence to establish a foothold for a competing discourse of what we now know as 'sustainability'. Kenneth Boulding coined the metaphor 'spaceship earth' to undermine the assumptions of the 'new frontier' of unfettered technological optimism of the early 1960s. E.F. Schumacher (1973) is remembered for Small Is Beautiful, in which he pointed to the false assumptions of using natural capital (i.e. irreplaceable assets such as minerals) as if it were income (i.e. rapidly regenerating). The term 'Silent Spring' is always linked to Rachel Carson (1962) as the title of the book in which she warned about the impacts of pesticides, used indiscriminately to boost production, on the integrity of food chains. An important concept developed in this period was that of 'the tragedy of the commons' (Hardin 1968). This highlighted the problems of assuming that accelerating use of public goods, such as the atmosphere and the oceans, can be free and can proceed without due consideration of consequences.

It was through such works that the underlying assumptions of 'progress'—namely that technology assures an unproblematic future, that growth can be infinite and infinitely good, and that nature is a passive object designed for human domination—started to be questioned. Some elements of this alternative view are illustrated on the right-hand side of Figure 25.1. Hardin (1993) distinguished between a world pursuing illusions of limitlessness, and another that seeks to negotiate accommodation with the
realisation of limits. These limits are of resource availability as well as of environmental tolerances. They apply at a variety of spatial scales, from the global to the local, and can affect—differentially—the lifestyles of people in different places. For these reasons, 'sustainability' has become an increasingly political matter. Not only have politicians, such as former Prime Minister Geoffrey Palmer in New Zealand and former Vice-President Al Gore in the United States, written books on the subject, but it has affected political agendas and policy-making in recent times.

An example of the latter is New Zealand's Resource Management Act, which is discussed in a subsequent section of this chapter. Good illustrations of the former are the Brundtland Report (1987) and the Rio Earth Summit (1992). In these two cases the approach to sustainability adopted was a political one, namely that of sustainable development. A common definition of this, from Brundtland, is 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987, p. 43). This definition is clearly an attempt to combine elements of the competing discourses of developmentalism ('development which meets the needs of the present') and of sustainability ('without compromising the ability of future generations to meet their own needs').

To some, the concept of sustainable development is discredited, because of the way in which it is constructed. It has been said that '... if it is not to be devoid of analytical content, [it has to mean] more than seeking a compromise between the natural environment and the pursuit of economic growth' (Redclift 1987, p. 199). It has also been labelled 'the refuge of the environmentally perplexed' (O'Riordan 1989, p. 93). In view of such comments, the next section seeks to construct a clear model of environmental sustainability, with a view to minimising the potential for perplexity.

A model of environmental sustainability

There are many discussions in the periodical literature that explore aspects of sustainability. Often these confuse different categories of meaning—for example, by not distinguishing clearly between the means of achieving goals and the goals themselves. Therefore, in the interests of clarity, the model of sustainability presented here distinguishes between 'preconditions', 'principles', and 'goals'. 'Preconditions' are the understandings upon which viable applications of sustainability must build. The 'principles' describe the scientific rules to be specified and implemented in order to enhance the process of sustainability, whereas it is towards the 'goals' that the process is aimed. Intergenerational equity, for instance, is a goal, whereas the protection of natural capital is a principle, the pursuit of which is necessary to enable that goal to be met. It is best to read the discussion that follows with frequent reference to Table 25.1.

Preconditions

What then are the preconditions upon which a process of environmental sustainability must be based? The first is that it is not about growth in levels of human consumption, more material possessions, or higher incomes. Rather, it is concerned with
Table 25:1  A model of environmental sustainability

1 PRECONDITIONS
the understandings upon which viable applications of sustainability must build:
(a) environmental sustainability is not about growth in material consumption; it is concerned with sustaining global and local life-support systems indefinitely
(b) a new way of thinking that is critical of the U-shaped relation and of substitutability
(c) provision of adequate information
(d) how environmental systems function.

2 PRINCIPLES
the scientific rules to be specified and implemented to enhance the process of sustainability:
(a) input rules: management of resources should work towards greater reliance on those that are either plentiful or renewable; harvest rates for renewable resources should be within the regenerative capacities of the systems that produce them
(b) output rules: waste emissions should be kept below the assimilative capacities of receiving systems, without affecting their future absorptive capacities or other important service functions
(c) operational rules:
(i) development should increase efficiency rather than throughput
(ii) input/output assessments must be made using the precautionary principle
(iii) costs of environmental actions should be increasingly borne by users
(iv) biodiversity and ecosystem integrity must be maintained.

3 GOALS
towards which sustainability is aimed:
(a) intergenerational equity
(b) intragenerational equity
(c) containment of human demands, by distinguishing ‘needs’ from ‘wants’.

sustaining global and local life-support systems indefinitely (Goodland 1995). This is because all economic and social activity ultimately depends on the environmental base.

The second precondition follows from this, in that a way of thinking differently to that of the growth-oriented economist is required. This alternative way is grounded in a discourse of sustainability; it exposes the assumptions of the dominant discourse of developmentalism as untenable. For instance, it is sometimes argued that economic growth is good for the environment because of an inverted U-shaped relation between per capita income, on the one hand, and measures of environmental quality, on the other. As income rises, it is said that environmental degradation increases up to a point, beyond which environmental quality improves because, for example, wealthier populations are less tolerant of certain aspects of pollution, such as smog.

This alleged relation is used by the contributors to Simon (1995) to demonstrate that environmental conditions in countries like the USA are very much better than they were a century ago. But it has also been roundly criticised as applying only to a selected set of pollutants. It says nothing of those involving long-term and dispersed costs (such as growing concentrations of toxic residues in groundwater, for example), nor anything about resource depletions (Arrow et al. 1995). In other words, how we think determines the ways in which we frame questions (such as ‘what is to be sustained?’) and the sort of evidence we search for (e.g. that concerning environmental amenities such as cleaner city air or, alternatively, broader sets of environmental indicators).
Similarly the question of substitutability of resources, a favourite among economists, needs to be tackled. Often it is alleged that progress will see resources that are in short supply, or expensive, substituted by alternatives: copper wire yesterday, glass fibre today, electromagnetic waves tomorrow, for instance. But not all resources can be substituted: those such as water, air, soil, and living space can be used in different ways over time, but are unlikely to be replaced. The question of substitutability is intimately linked as well to whether resources are renewable, or non-renewable and in short supply: an issue that is pursued under 'input rules' below.

The third precondition concerns information. A major review of The State of New Zealand's Environment agreed with a team from the Organisation for Economic Co-operation and Development (OECD) that the country's 'lack of high quality environmental data is a significant barrier to effective environmental planning and management' (Taylor & Smith 1997). Such monitoring as there is, of both natural system behaviour and human impacts, is often not done on a consistent or standardised basis. Useful public information is minimal: the daily data reporting in local and national media focuses on indices of little concern to most people, like currency exchange rates and share prices, rather than on environmental measures, such as of air quality or water usage.

Information collected in the absence of any understanding of the workings of environmental systems is likely however to be of little value. A fourth precondition for sustainability is therefore the development of theoretical frameworks that enable identification of the significant variables to be measured. A basic requirement in this regard is an ability to think in systems terms, and a willingness to try to understand the complex ways in which the different elements of environmental systems and human impacts upon them interact in time and space and at various spatial scales. There may be feedback loops—for instance, those between extensive deforestation and impacts of the loss of carbon sinks—or network effects, such as the relationships between rural pollution inputs and downstream groundwater quality. The nature of systems thinking has been explored in greater depth in Chapters 1 and 2.

Environmental sustainability therefore presupposes that we are clear on what is to be sustained; that we recognise that how we think frames the questions we ask as well as the answers we look for; that environmental data is a basic requirement; and that better understanding of environmental systems, their relationships and behaviour, at different spatial scales, is required. The use of the term 'precondition', however, should not be taken to suppose that these matters must be fully in place before steps can be taken towards sustainability. They have been isolated for purposes of conceptual clarity; it is inevitable that progress towards fulfilment of them proceeds at the same time as clearer identification of the principles of the process.

**Principles**

Daily et al. (1996, p. 20) assert that 'a primary goal for . . . scientists is to elucidate nature's rules of game' (emphasis in original). Human impact on global life-support systems affects the source capacities of these systems (for resources such as food, water, air, and energy) as well as their sink capacities (to assimilate outputs or wastes). What
are 'nature's rules of game' with respect to the maintenance of source and sink capacities relevant to human populations? This question can be approached using Goodland's (1995) proposal for a robust set of principles based on input, output, and operational rules, although the specification of the rules here has been modified from his account.

Input rules vary according to whether resources are renewable or non-renewable. Non-renewable resources should be differentiated according to criteria such as availability, potential for recycling, and the extent to which they are needed in production processes. Those that are scarce according to such measures should not be depleted any faster than the rate at which renewable substitutes are developed; a portion of the proceeds from this depletion should be allocated to research into such substitutes. Management of resources should therefore work towards greater reliance on those that are either plentiful or renewable. Providing that harvest rates for renewable resources are held within the regenerative capacities of the systems that produce them, they will produce continuous 'income streams'.

Output rules focus on the management of waste emissions. Such emissions should be kept below the assimilative capacities of receiving systems in order that their future absorptive capacities or other important service functions are not adversely affected. An illustration of ignoring such rules, which has been controversial in the Northern Hemisphere, is the actual and potential consequences of reliance on nuclear power generation, given the inability of the environment to absorb nuclear waste safely. A current example of worldwide interest is that of the 'enhanced' greenhouse effect.

The operational rules are fourfold. First, development should aim towards being efficiency-increasing rather than throughput-increasing. The Brundtland Report made this distinction in a different way, urging 'quality' rather than 'quantity' of development (WCED 1987). Daily et al. (1996, p. 20) talked of 'maximizing the human benefit derived from each unit of environmental impact'.

Second, input/output assessments should be made using the precautionary principle that, broadly, recognises that where there is significant uncertainty, the environmental costs of acting in ignorance may be too great. Precise definitions vary, as might be expected given O'Riordan's (1995, p. 9) open statement that this principle 'introduces the duty of care on all actions'. Development has usually worked on the basis of risk-taking, with any compensation for damage being paid out of the proceeds of growth. In contrast, the precautionary principle shifts the onus of proof that it is safe to proceed from opponents to proponents of particular projects (Diesendorf 1997).

Third, the costs of environmental actions should be increasingly borne by users (Arrow et al. 1995). This presupposes effective systems of environmental accounting at various scales (Repetto 1992). For instance, resources without which people could not survive, such as clean water and fertile soil, currently have zero weighting in statistics of Gross National Product. However, the economic activity that results in the consumption of resources—for example, the removal of rainforest and the destruction of biodiversity that ensues from this—is counted as part of GNP (Chichilnisky 1996).

Fourth, both biodiversity and ecosystem integrity should be maintained. 'Biodiversity' describes the variety of life on earth. Although we may ascribe it intrinsic
value, it has incalculable instrumental value as well, both as a 'genetic storehouse' and for all the known and unknown ways in which different life forms sustain ecosystems. Ecosystem integrity refers to the ability of ecosystems to maintain the normal ecological functions that support life (such as absorption and storage of solar energy, and cycling of nutrients), as well as their tolerance, or resilience, in the face of disturbance (Diesendorf 1997). This does not mean 'no change', as sustainability may in fact be effected by constant change. An example is a beach foredune, which constantly accretes or erodes in response to the processes acting upon it. If, however, the foredune is removed by human action, the resilience of the beach system is lost.

**Goals**

As more is understood of the complex ways in which humanity places stresses on physical and ecosystems—which cannot be assumed to be either stable or infinitely resilient —then human environmental actions will become better costed, more precautionary, and increasingly efficient. The purpose of this better-informed behaviour is ultimately continued human existence, at living standards that are reasonable. This goal is often described by the term intergenerational equity, meaning that those that come after us do not have their survival or prosperity compromised by uses that present generations have made of the Earth. Intergenerational equity is essential to sustainability, by definition.

A further goal is that of intragenerational equity. This is based on the recognition that just as future generations should not be disadvantaged by the actions of those today, neither should members of present generations. Yet poorer peoples, whether in countries in the less developed world, or in parts of the developed world, often live in unhealthy environments and carry a disproportionate share of the costs of environmental pollution, such as contaminated water or industrial fumes. The alleviation of such inequities is the goal of the proponents of 'environmental justice'. French nuclear testing in the South Pacific has been interpreted as an environmental injustice (for countries in the region), as have the actions of multinational companies that shift their dirtier production activities to states with weak environmental regulations. An issue of even greater scope that can be posed in respect of intragenerational equity (and one that informed the Brundtland Report) is the extent to which the wealthier places and peoples of the world have the right to consume so much of its resources.

In this regard, the question of goals ultimately comes down to recognition of the ambiguity of the concept of 'needs', as also used—for example—in the Brundtland Report (WCED 1987, p. 42). The biophysical and emotional needs of people are not the same as their wants, which are openly 'created' by the structures and actors of capitalist modes of production and consumption. But while human happiness depends on our basic needs being met, it is not a function of the fulfilment of all our material wants. A reasonable, if hardly as yet realistic, goal for proponents of sustainability is the containment of human demands, or 'wants', as a means of constraining infinite expectations in a finite world. There is also the moral issue that without such constraints the claims of species other than humans for continued existence are undermined.
Management for sustainability

This section will pursue further the issue of 'needs' and 'wants', but before doing so will examine specifically New Zealand approaches towards management for sustainability. These are, first, those of Maori, and second, the system put in place through the Resource Management Act, 1991. Maori approaches are of interest specifically because they are indigenous to and characteristic of New Zealand. However, the discourse of developmentalism has been intimately implicated in the loss of Maori land (Figure 25.1) and, as is the case in other places colonised by Europeans, has discounted ways of knowing and acting practised by non-Europeans. Maori have thus often been romanticised as conservationists from another era or dismissed as lacking the capability to engage with the environment on progressive terms. In fact, their pre-European occupation of Aotearoa is an object lesson in coming to terms with the need for sustainability, albeit within technological limits considerably more restrained than those that subsequently applied.

Perhaps half of the forest area of New Zealand that has disappeared since human settlement was removed during pre-European times. Hence by the time Europeans arrived, 34 species and one subspecies of land birds were already extinct (Taylor & Smith 1997). As a result, Maori were faced with the loss of readily retrievable sources of nutrition. Combined with the diminution of accessible supplies of seafood, this led them to adopt, over time, more sustainable practices as well as widespread use of horticulture. Evolving discourses of sustainability took the form of narratives that explained rules designed to encourage harvesting regimes based on the need for resources to regenerate. It is a mistake, however, to assume that there are parallels between Western and Maori approaches to 'conservation': indeed this is a European concept that is grounded in a conceptual separation of people and nature. For Maori, there is no such separation, and human use of resources is only validated by the principle of reciprocity in which the kaitiaki (or guardians), of birds, trees, waters, etc., are respected (Roberts et al. 1995). In effect, close familiarity with local environmental systems generated culturally specific understandings about management of resources and wastes in the interests of survival.

The mauri (or life force) of water, for example, had to be kept healthy and strong: hence the need to prevent pollution of waters from which food was gathered. The work of the Waitangi Tribunal, in respect of alleged breaches of the Treaty of Waitangi, indicates how such understandings persist into the present (Pawson 1999). The Kaituna claim, upon which the tribunal reported in 1984, is a good illustration. This claim was prompted by a proposal to dispose of the treated but enriched effluent from Rotorua's sewage works—which was having a deleterious impact on the water quality of Lake Rotorua (and hence on the town's tourism prospects)—into the Kaituna River, the outlet of Lakes Rotorua and Rotoiti. In a comment sharply critical of the discourse of developmentalism, the tribunal characterised this idea as coming 'from the mind of an engineer', and by implication, a mind that did not understand the basics of ecosystem relations. This is but one instance of the manner in which Pakeha assumptions about nature as a stage for human action have been exposed as being in conflict...
with understandings developed by peoples who have had considerably longer to learn environmental input–output rules in Aotearoa.

Since 1991, however, New Zealand has had a Resource Management Act that is based on a concept of 'sustainable management'. The definition of this concept, in section 5 of the Act, is ambiguous, as it places the fulfilment of certain development objectives alongside a set of environmental ones, without a clear indication of which has precedence. The weighting to be accorded to each is a matter for case law as application of the Act proceeds. The environmental objectives cover the principles of containment of adverse effects and maintenance of ecosystem integrity, as well as the goal of intergenerational equity (Table 25.2). The Act also requires that certain 'matters of national importance', in section 6, shall be recognised and provided for in promoting sustainable management, including preservation of the 'natural character of the coastal environment' and 'the relationship of Maori and their culture and traditions with their ancestral lands' and valued places. These are added to in section 7, where a number of 'other matters' listed for 'particular regard' include kaitiakitanga (broadly, the act of guardianship).


5. Purpose

The purpose of this Act is to promote the sustainable management of natural and physical resources.

In this Act, 'sustainable management' means managing resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

The Act directs local authorities (regional, district, and city councils) to draw up plans for management of resources consistent with the definition in clause 5. It also requires developers to apply to councils for consents that will only be granted if they are deemed to be consistent with the principles of the Act and the requirements of these plans. The Act was described in the August 1997 issue of Business Development News, from the Ministry of Commerce, as 'usher[ing] in a new age. Its basic proposition is that an organisation can't pollute or adversely affect its environment without having to pay a price at some stage.' 'A price' need not be the full price, even if there were means in place to calculate that, but it is a start. This start is dependent on the generation of information (the responsibility for which lies with the applicant) through the resource consent process.

The consents process is frequently criticised for being time-consuming and costly, in the sense of being 'information hungry'. The Parliamentary Commissioner for the Environment, New Zealand's independent environmental watchdog, has responded to such charges by arguing that the level of environmental information upon which
commercial decisions were previously made would not have been tolerated in other areas of business decision-making (Smith 1997). Such an information requirement is a precondition for sustainability, as observed in the previous section. There are opportunities here for business to work ahead of the Act and to save resource inputs and the cost of waste outputs by adoption of environmental auditing measures. However, despite the New Zealand image of 'clean and green', commercial strategies have been slow to reflect such opportunities (Pawson 1996).

Most analysts nonetheless recognise the Resource Management Act as a genuine attempt to operationalise some of the principles and goals of environmental sustainability. It has been subject to negative comment because of the differences in environmental standards that prevail between the plans adopted in different places and for its focus on penalties rather than rewards for compliance. On the other hand, its local orientation is consistent with that recommended by Agenda 21, the global plan for carrying into action the Rio Declaration on Environment and Development, which was one of the outcomes of the Earth Summit of 1992. Underlying this perspective is the assumption that it is at the local scale that more sustainable outcomes can be most effectively negotiated. Nonetheless, the Act provides primarily for what O'Riordan (1989) would call a strategy of 'accommodation' inasmuch as it does not appear to require any fundamental re-orientation towards strongly sustainable environmental goals. In this regard, it is necessary to return to the distinction between 'needs' and 'wants'.

Economies and societies in today's capitalist systems are structured around the infinite expansion of consumer demands through the creation of 'wants' (including ever-lengthening life spans), rather than a goal of limiting human expectations by distinguishing those wants from 'needs'. The failure to make this distinction has led to the trap of consumption being used to meet non-material needs by material means. One commentator has condemned the use of concepts such as 'sustainable development' and 'sustainable management' because these assume a continuation of existing ways of living, in which 'Western aspirations are implicitly taken for granted, not only in the West but worldwide'. He calls this 'a fundamentally biased orientation: it calls for extended management, but disregards intelligent self-limitation' (Sachs 1991, p. 257).

This point can be illuminated by the distinction between 'weak' and 'strong' forms of sustainability (alternatively labelled 'soft' and 'hard'). Sometimes these are represented as part of a continuum, or 'ladder of sustainability'. Weak forms of sustainability encompass such matters as water metering, anti-smog policies, and extensions of national parks: they are really 'clip-ons' to existing policies and do not greatly disturb present ways of life. Stronger forms of sustainability involve a fuller commitment to the components of the model outlined earlier, or, in terms of the Resource Management Act, they would prioritise the environmental goals over those of development. Strong or hard sustainability upsets the political economy of the status quo in favour of Sach's more radical perspective. These distinctions can be illustrated further with a discussion of urban sustainability.
Urban sustainability

Cities are usually considered as social and economic systems, but from a sustainability perspective they are also, inseparably, environmental systems (e.g. see Detwyler & Marcus 1972; Douglas 1983). Cities depend on inputs of energy, land, and water, with outputs being solid, liquid, and gaseous wastes. Three-quarters of New Zealanders live in cities, although it has been said that they may be 'keen on protecting whales but they are not good at understanding the demands their day-to-day lives make on ecological systems' (Smith 1997, p. 58). Neither is the environmental operation of cities well understood scientifically: in New Zealand more is probably known about how pastures function. The massive official report The State of New Zealand's Environment 1997 (Taylor and Smith 1997)—unlike its Australian counterpart—has no chapter on human settlements and cities. Perhaps urban living encourages the illusion of a separation and freedom from natural constraints. Yet 'the integration of the urbanization question into the environmental-ecological question is a sine qua non for the twenty-first century' (Harvey 1996, p. 429).

One aspect of this integration that is receiving some attention internationally is autodependence, or the environmental demands that result from increasing levels of motor-vehicle use. Urban planning in New Zealand is not oriented to reduction of this dependence, in contrast to many cities in Europe. Indeed, there is a lack of New Zealand data to compare with those in the international studies of Newman and Kenworthy (1989, 1999), which assess autodependence for selected cities in North America, Australia, Europe, and Asia. Figure 25.2 shows the relationship for these cities between energy use per capita in private passenger travel and urban density. It also illustrates the considerable variations in per capita trips on public transport for cities in different parts of the world, including three in New Zealand, which are shown to rank poorly.

The 18th report of the British Royal Commission on Environmental Pollution, on transport and the environment, analysed the advantages to be gained from 'minimising the need for transport and increasing the proportions of trips made by environmentally less damaging modes' (in Banister 1994, p. 457). These included higher standards of air quality, lower emissions of carbon dioxide, reduced noise nuisance, and improved quality of life through less congestion and fewer accident-induced deaths. Policies of weak sustainability developed in respect of such goals typically use tactics like greater provision of buses, bus shelters, and bus lanes, with traffic-calming measures in residential streets. Strong forms of sustainability would need to include, first, agreed and specified targets to meet each goal, and second, measures directed towards cutting high levels of personal motorised mobility.

The Royal Commission proposed just such a set of targets (Banister 1994, p. 457), and Newman and Kenworthy have proposed 'reurbanisation', or 'urban consolidation', as a means of limiting mobility. This has been the subject of considerable debate in Australia (Mees 1997), where, as in New Zealand, patronage of public transport has fallen dramatically since its heyday in the 1950s. Reurbanisation would counter the dynamics of suburbanisation, which over the last 50 years has increasingly driven urban demands for land, extensive infrastructure, and access to personal motorised
transport. Rather than permitting further suburban expansion or city-edge growth, management would be directed towards reworking existing urban fabrics in order to develop a multi-nodal structure, focused on medium- to high-density 'urban villages' functioning as distinct subcentres within the city. Each village would contain its own mix of workplace and consumption facilities, within walking distance of residences, and would be connected by effective transit links to other villages. One place in New Zealand that is attempting something of this sort is Waitakere City, Auckland, the self-styled 'Eco-city'.

Such a policy orientation recognises what some geographers and architects have long believed—that lively cities rely on both creativity and conviviality. Many service sector jobs depend on face-to-face contact with other workers; contemporary patterns of consumption bring people together in groups and crowds. As a result, city centres that a decade ago were thought to be dying are experiencing revivals based on new jobs, landscapes of consumption, and residential development. The reurbanisation model can build upon these existing trends, so as to encourage the 'intelligent self-limitation' of which Sachs wrote. It could be further promoted by recognition of the
fact that the fastest-growing household type in today's cities is that with only one person, to which high-density living is well suited. The model cannot succeed, however, without realisation that it is current methods of zoning urban districts and designating buildings for single uses that fuel individual demands for transport. This is because they require people to move over considerable distances to fulfill their various daily tasks.

The application of a strong form of sustainability therefore needs a different way of thinking about how cities should function and be regulated. In the process, however, not only would urban environmental costs be lowered, but the attractiveness and liveability of the city would be improved. Hence it becomes more socially sustainable and, because investors are attracted by places that are not congested and polluted, also more economically sustainable. One noteworthy example that shows that strong urban sustainability can work is the city of Curitibo, in southern Brazil. Since the 1970s its development has been guided along axes of public transport (see Figure 25.2). It now has one of the lowest rates of ambient air pollution in the country, and possesses a network of walk and cycleways developed through riverside parks and around artificial lakes. These water bodies have been put in place to resolve what was previously a serious urban flood problem (Rabinovitch & Leitman 1996).

Conclusion

It has been suggested that the contemporary world has been sedated by 'the delusion of limitlessness' (Hardin 1993, p. 6). One definition of the term 'sustainability' is that of a continuous engagement with the lasting effects of this delusion, in order to seek futures that recognise the environmental constraints on, and limits to, human aspirations. The contemporary discourse of sustainability is not, however, always directly opposed to that of developmentalism, as the popularity of concepts such as 'sustainable development' and 'sustainable management' demonstrates. Nonetheless, the more clearly the preconditions, principles, and goals of environmental sustainability are specified, and thereby the more fully they are understood, the more apparent become the steps necessary to move from weaker to stronger forms of sustainability. Simultaneously, the previously taken-for-granted assumptions of the discourse of developmentalism are thrown into high relief.

Why, however, does sustainability matter now? It matters because of increasing levels of agreement among scientists that the impacts of human activity on the environment must be curbed, in view of the probability of adverse effects and the related possibility of sudden environmental shifts. It matters because of the realisation that, contrary to one of the most deeply rooted assumptions of Western cultures, the Earth is not designed for human benefit. Hence, in order for humans to be able to continue to benefit, a duty of care has to be exercised. It matters because there are already international agreements, incorporating the precautionary principle, such as the Montreal Protocol on Ozone-Depleting Substances, and the Framework Convention on Climate Change, by which signatory countries must abide.

The objective of the latter agreement (as specified in Article 2) is 'stabilisation of greenhouse gas emissions in the atmosphere at a level that would prevent dangerous
anthropogenic interference with the climatic system...’ It was opened for signature at the Rio Earth Summit, where New Zealand and a large number of other countries signed. The goal of the agreement was the reduction to 1990 levels of anthropogenic emissions of carbon dioxide and other greenhouse gases by the year 2000 (i.e. to turn around an increasing trend of emissions). This is a good example of a specified small step towards sustainability that would nonetheless have required substantially different ways of producing and consuming were it to have been achieved. In that form it was generally not achieved, because of national increases in emissions in the 1990s brought about by growth in production, in energy generation and in car usage. It remains to be seen whether the targets renegotiated at the Kyoto Conference in 1997 will be met. These vary, but for most developed countries a small percentage cut in 1990 emission levels by the ‘commitment period 2008 to 2012’ is required.

There is another, specifically New Zealand, reason why sustainability matters now. In recent years this country has invented for itself a brand image of ‘clean and green’ (Pawson 1997). This does not mean that it is clean and green: indeed the evidence of loss of biodiversity and autodependence, to use but two indicators, is that it is not. What matters, as with any brand, is that those who purchase the products associated with it believe what the brand stands for. In part this is the purpose of the Resource Management Act. If, however, New Zealand does not meet its international environmental obligations, and if its companies continue to lag behind those of its trading partners in adoption of environmental auditing procedures, then the trade advantages conferred by the national brand image will be undermined.

It matters, therefore, for purposes of economic sustainability that the process of environmental sustainability is effectively encouraged. The discussion of aspects of urban sustainability underlines this in another way, pointing to the interrelation of the environmental, social, and economic spheres in the realisation of sustainability. This growing field of scientific concern and research therefore presents golden opportunities for physical geographers to work with others who have complementary skills. Issues of environmental sustainability are manifest at global as well as local scales, and result from the interaction of human desires with physical processes. There could not be a more appropriate focus for physical geographers to work with human geographers on problems of immediate importance, to which both parties bring necessary but, in isolation, not sufficient skills. Better still that, as students, they be thoroughly trained in both.

Further reading


