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SUSTAINABLE DEVELOPMENT AND CONSERVATION OF BIOLOGICAL HERITAGE IN AUSTRALIA AND NEW ZEALAND[1]

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Introduction

The aim of this paper is to encourage greater attention by planners to conservation of native or indigenous biodiversity. It explains what is meant by indigenous, or native, biodiversity and why indigenous biodiversity conservation must become an on-going consideration for Australian and New Zealand planners in future. It outlines some recent national and international policy developments which provide the justification for planning involvement, and discusses some examples of biodiversity provisions in recent plans within New Zealand. It suggests some of the limitations of traditional planning approaches as they relate to biodiversity conservation and explains why planners have an important role to play, particularly in the context of local and regional government. Although the discussion rests heavily on recent experience of planning for biodiversity within New Zealand, the ecological trends within Australia, as well as policies at the federal government level suggest that conservation of biodiversity is as important for planners within Australia as those within New Zealand.

Most planners are trained in social science based programs that do not expose them to any extent to natural scientists whose knowledge is drawn upon for policy. Consequently, planning policies can be based on poor, popularist or dated knowledge. This paper argues that, in order to be most effective for biodivsersity conservation, planners need to develop methods and principles of planning and design that support the **long-term** survival of native species and ecosystems. To do so, they will need to work with ecologists, biologists, and land managers, or bring new areas of ecological understanding to their traditional skills related to land use planning and public policy formulation. In particular, conservation of biodiversity frequently requires the maintenance or restoration of ecological processes over time. It is usually not sufficient to make 'one-off' provisions by legislative fiat or the imposition of development conditions that can be forgotten about once the development is in place. In most circumstances, maintenance of biodiversity will require active ecological management on a permanent basis or over a period of years until ecological processes can be self-sustaining. Thus for planners, biodiversity conservation will often mean looking for resource management solutions that involve management of ecosystems and landscapes over time.

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Biodiversity and Sustainable Development

'Biodiversity' or 'biological diversity' is the variety of life in all its forms, levels and combinations, including ecosystem diversity, species diversity and genetic diversity (IUCN,UNEP,WWF, 1991:210). In the context of a particular country, such as New Zealand or Australia, it normally refers to native species and ecosystems that are purely or predominantly native in their composition. In the context of New Zealand and Australia, therefore, conservation of biological diversity means developing ways to help native plants and animals to survive in the landscape wherever they are (i.e. in developed and undeveloped landscapes), and finding ways to help native ecosystems or elements of ecosystems to retain their resilience in the face of environmental change.

Globally as well as regionally and locally, current rates of biological extinction are estimated to be several times higher than they have been in the last 65 million years (Wilson, 1992; Barbault and Sastrapradja, 1995:198; Jeffries, 1997:37, 113 - 148; Ministry for the Environment, 1997:9-6). This rate of extinction has led to concern about the long term environmental consequences of such loss. Although there has been much debate about the relationship between biological diversity and ecosystem resilience, diversity within and between species is widely thought to be important for general ecosystem resilience in the face of change, as well as a source of critical goods and services for the human community (IUCN,UNEP,WWF, 1991: 27-29; Mooney, Lubchenko, Dirzo and Sala, 1995;).

Services provided by natural ecosystems and the species within them include production of raw materials (food, fuel, building materials, fodder, genetic resources, medicines etc.), pollination, biological control of pests and diseases, water supply and regulation, waste recycling, pollution reduction, nutrient cycling, soil building and maintenance, climate and atmospheric regulation, and recreation (Abramovitz, 1997:96; Jeffries, 1997: 13 - 19).

Loss of biodiversity is a particular problem within both Australia and New Zealand because of the high rates of endemism characteristic of New Zealand and Australian species, and their vulnerability to habitat loss and the effects of introduced competitors. "Endemism" means species that are peculiar to an area and found nowhere else. Examples include the platypus and koala of Australia and the kiwi and tuatara of New Zealand. Some 76% of New Zealand's vascular plants are endemic and 100% of its amphibians and reptiles (Department of Conservation, 1994:11). 93% of Australian marsupials are endemic, and 88% of its rodents (SEAC, 1994:2-12). More than 500 species of eucalypt are uniquely Australian. (SEAC, 1994:2-13). The long isolation of New Zealand (at least 80 million years) and Australia/New Guinea (40 million years) from other land masses has meant that many of their plants and animals have evolved in the absence of competitors from other continents[2]. Although wonderfully adapted to the conditions of their evolution, they have proved

[2] Although a large component of the fauna a flora of Australia and New Zealand comprise species that were established before these land masses broke away from Gondwana, both continued to receive later prehuman immigrant speices, including rodents and bats, in the case of Australia.

fatally vulnerable to the disturbances and competition caused by human activities and introduced species.

Australia's State of the Environment 1996 report notes that, "loss of biological diversity is perhaps our most serious environmental problem. Whether we look at wetlands, or saltmarshes, mangroves or bushland, inland creeks or estuaries, the same story emerges. In many cases, the destruction of habitat, the major cause of biodiversity loss, is continuing at an alarming rate." (SEAC, 1996: ES-8). According to the report, all groups of higher plants and vertebrates in Australia have species that are highly threatened: "Some 5 per cent of higher plants, 23 per cent of mammals, 9 per cent of birds, 7 per cent of reptiles, 16 per cent of amphibians and 9 per cent of fresh-water fish are extinct, endangered or vulnerable. Australia has the world's worst record of mammal extinctions. In the past 200 years we have lost 10 of 144 species of marsupials and 8 of 53 species of native rodents" (SEAC, ES-14).

In a similar vein, New Zealand's 1997 State of the Environment report notes that, "Biodiversity decline is New Zealand's most pervasive environmental issue, with 85 percent of lowland forests and wetlands now gone, and at least 800 species and 200 subspecies of animals, fungi and plants considered threatened" (Taylor, et al., 1997: 10-6).

Conservation of native biodiversity of ecosystems and species is important for moral and aesthetic reasons, but also to keep open the options available to future generations. The plants, animals and ecosystems of both Australia and New Zealand have evolved gradually over a very long time period to suit conditions of soil, climate, hydrology, and other natural characteristics (e.g. solar radiation, light conditions) that are uniquely those of the two respective land masses. The New Zealand flora and fauna, for example, are survivors of a highly dynamic geological history, that has seen successive periods of mountain building and erosion, marine incursions, and dramatic variations in weather and climate (Fleming, 1979). In contrast to New Zealand, Australian flora and fauna have evolved on one of the most geologically stable land masses on the planet. This geological stability has contributed to a general infertility of Australian soils and limitations on the nutrients available to plants. In addition to its impoverished soils, Australia has experienced a long history of climatic cycles characterised by droughts and flood. As Flannery has argued, "Australia's infertile soils and the trials of ENSO (El Nino Southern Oscillations) have forced some unusual adaptations on its plants and animals. These adaptations …share… parsimony born of resource poverty, low rates of reproduction and strict obedience in following and exploiting brief windows of opportunity as they open erratically over the land." (1994:85).

We are currently living in a time of great biological change, such that it is impossible to predict what the world will be like 100 or 200 hundred years from now. But certain events and trends seem almost inevitable: a near doubling of the human population within the next 50 years (UN 1994), fossil fuel resources greatly reduced and more expensive, water shortages for agriculture as aquifers are depleted by overuse or water is diverted to other uses, continued widespread soil degradation of arable land and

rangelands[3], unpredictable climatic effects from global warming. Given the fact that Australian plants and animals have evolved for conditions of soil and water poverty and climatic uncertainty, they may become the great survivors of the next 2 centuries provided we can make sure that they survive the next two or three decades. In New Zealand, current agricultural practice is vitally dependent on the importation of fertiliser and the use of fossil fuels for machinery. If world trade patterns change significantly over the next century current New Zealand agriculture is likely to be unsustainable. These factors suggest that it is very wise for this generation to take a precautionary approach and conserve as much of our biological heritage as we can for the 22nd century.

The need for protection of biological diversity was articulated by the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Agenda 21, Chapter 15. Further political and diplomatic recognition of this concern resulted in the signing of the U N Convention on Biological Diversity by 157 countries in 1992.

As signatories of this convention, Australia and New Zealand have been obliged to prepare "national strategies, plans or programmes for the conservation and sustainable use of biological diversity" (Convention on Biodiversity, 1992, Article 6). New Zealand has incorporated this principle within the government's Environment 2010 Strategy. The Strategy includes as one of its aims,

> "To protect indigenous habitats and biological resources by:
> - maintaining and enhancing the net area of New Zealand's remaining indigenous forests and enhancing the ecological integrity of other remaining indigenous ecosystems;
> - promoting the conservation and sustainable management of biological diversity so that the quality of our indigenous and productive ecosystems is maintained or enhanced. (Ministry for the Environment, 1995:34)

New Zealand is also currently developing a national biodiversity strategy which was released for public consultation in early 1999.

Australia published its National Strategy for Ecologically Sustainable Development in 1992. This strategy has provided the basis and justification for a series of initiatives throughout Australia, including the preparation of a National Strategy for the Conservation of Australia's Biological Diversity, published in 1996.

Biodiversity Conservation and Habitat Protection

New Zealand's State of the Environment report summarises the causes of NZ biodiversity loss as: loss of lowland habitat (including lowland forest, wetlands and estuarine habitats), declining quality of remaining land and freshwater habitats,

[3] According to Australia's State of the Environment report, "most areas of cropland and improved pasture in Australia are affected by soil degradation (SOEA, ES-18;), 15% of rangelands currently need to be destocked in order to allow recovery (SOEA, ES-18; and in much of continent, reserves of water are being used faster than they are replenished (SOEA, ES-20)

impacts of pests and weeds, and, in the case of some marine species and ecosystems, human overexploitation (1997:10.6).

Australia's 1996 National State of the Nation report associates habitat loss as the single most significant cause of biodiversity loss in Australia (SEAC, 1996:4-7 - 4-16), followed by habitat degradation and the introduction of pests and weeds. As the Report notes, from 1788 to 1995:

- Seagrass beds in temperate areas have declined significantly;
- About 43% of forests have been cleared;
- More than 60% of coastal wetlands in southern and eastern Australia have been lost or degraded;
- Nearly 90% of temperate woodlands and mallee have been cleared;
- More than 99% of temperate lowland grasslands in south-eastern Australia have been lost;
- About 75% of rainforests have been cleared (SEAC, 1996: 4-26).

In the view of the National Biodiversity Council, this assessment of Australia's biodiversity is optimistic. According to Professor Harry Recher, Councillor of the National Biodiversity Council,

> " In my opinion…. the SOE report conceals the huge local and regional losses and declines in species which have occurred over the past two centuries. Over much of southern Australia, significant declines in the abundance and distribution of species affect more than half of all species, and in such important ecosystems as box-iron bark woodlands it could be said that the entire ecosystem along with all its populations of all its species is endangered - probably irreversibly so. By taking a narrow view of biodiversity (by and large equating it to species) and by using extinction as the most important (final) event instead of weighting status by the loss and decline of regional populations, the SOE report on biodiversity conceals the full extent of continental loss and environmental degradation from the Australian public. " (Glanznig, Andreas, 1996, http://www.peg.apc.org/~bdnet/Soe.htm).

With this comment, Recher is pointing out the essentially spatial nature of biodiversity loss. Biodiversity loss occurs because of on-the-ground losses repeated over and over again, but **not** inevitably and always so, from locality to locality, and region to region.

Habitat conservation must be seen against a broader backdrop of the spatial ecology of biodiversity. In New Zealand and Australia, agriculture, including pastoral agriculture, has been one of the greatest causes of land use change and habitat destruction. The areas in New Zealand of highest biodiversity before European contact were the flood plains and coastal lowlands of the North and South Islands. These have also been the areas of closest human settlement and greatest conversion to agriculture. Not only did these include the greatest diversity of ecosystems (coastal and low altitude forest of various structure and species composition, bog, swamp, flood plain, estuaries, dunelands, lakes, rivers, and streams), they were critical for the year-round ecology of many birds. Today, most of the land below 300m is privately owned and

supports little more than fragments of the original native vegetation. Such fragments suffer ecological disturbance and continued biodiversity loss. However, they remain as the seed banks of a depleted biological heritage and need urgent protection if there is to be any future possibility of developing hybrid landscapes in which exotic and native species co-exist.

The general tendency for areas of greatest production potential to also be areas of highest ecological potential means that the areas of greatest habitat value for conservation of native biodiversity also tend to be the areas of greatest human value for production for food or forestry.[4] Increasing pressures for production in future are likely to mean increasing potential for conflict of use.

Conservationists have increasingly recognised that future protection of biodiversity will have to occur within cultivated and pastoral landscapes rather than national parks or areas especially set aside for such purposes (Western, 1989:158-165; Western et al, 1989:304-324). McIntrye, Barrett and Ford (1996:156) comment that while reserves will continue to be important for the protection of biodiversity, the opportunities to extend or create new reserves are decreasing as pressures on land resources are increasing. Thus, "conservation in areas between reserves much be integrated with other land uses". In similar vein, Recher (1996:340) argues, that, "on the assumption that the commercial exploitation of Australia's forests will continue for the foreseeable future, the long-term survival of Australia's forest biota can only be assured by fully integrating the management and conservation of wildlife with logging and other forest management practices".

Examples of biodiversity conservation planning

Planning specifically for conservation of biodiversity is still a recent concern among planners, but there are Australian and New Zealand examples of plans and policies that have included biodiversity conservation, or some related objective, such as habitat, scenic or landscape protection.

In New Zealand, the Conservation Act 1987 (as amended by the Conservation Law Reform Act 1990) incorporated a requirement that within 5 years, all land administered by New Zealand's Department of Conservation be managed in accord with a Conservation Management Strategy.

The effect of this legislation is that all New Zealand's public conservation estate (more than 8 million hectares, or nearly 30% of the land area of the country) is administered in accord with a plan or management strategy (under the National Parks Act 1980, the Reserves Act 1977, the Conservation Act 1987, or similar protected areas legislation). A total of 17 conservation management strategies have been or are in the process of being developed (DoC, 1996a: Output Class 9). These outline the natural and historic resources of the areas administered by the Department, and the

[4] While this generalisation tends to be true for New Zealand, it is not always so, at least in relation to plants in Australia, where the most species rich sclerophyll communities are on the least fertile soils (hence, for example, current controversies on the Cumberland Planin),

priorities and measures by which the various conservancies intend to manage the resources under their responsibility[5]. Because of the timing of this amendment, when ecosystems and habitat types were increasingly valued in their own right, rather than as habitat areas for threatened species, most of the conservation management strategies have specifically included provisions for habitat protection, ecosystems protection or protection of threatened species.

The exercise of developing the plans meant that all relevant stakeholder groups (departmental staff, the general public, particular interest groups, and communities) and all administrative levels of the Department came to be co-ordinated in relation to specific natural resources (e.g. wetlands) and places (Waikato wetlands). Policies have been developed which allow for integrated management (e.g. in relation to pest control, restoration programmes, and recreational or other use by the public), and allocation of funds can be prioritised on an annual planning basis.

A major shortcoming of conservation management strategies is that they apply only to land administered by the Department of Conservation. This means that the funds allocated to protection are significantly (but not entirely limited) to those allocated by the Treasury, and they never seem to be sufficient to stop or reverse the impacts of introduced plants and animals [6] (DoC, 1998a:58). It also means that ecosystems, landforms, etc that are not well represented within the conservation estate (e.g. those associated with lowlands and coastal and marine areas) fall largely outside the Department's protective mandate. The effects of neighbouring private land use (e.g. drainage of neighbouring farmlands, escape of domestic stock) can impact adversely on conservation land, especially in the case of remnant areas of lowland or coastal forest, and in the case of wetlands that are subject to hydrological cycles that fall outside land administered by the Department. It also means that land administered by the Department may be perceived by local communities as the responsibility of the Department rather than an area deserving of local stewardship.

Another New Zealand example of plans that make provision for biodiversity conservation are a growing number of plans prepared under the Resource Management Act 1991 and its attendant New Zealand Coastal Policy Statement. These include an as yet small number of district plans (which apply to territorial authorities) and regional coastal plans (which apply to New Zealand's 17 regions).

[5] For example, the Waikato Conservation Management Strategy for Waikato conservancy, south of Auckland, identifies 11 "strategic management clusters", and indicates what management priorities will apply to these areas. A follow-up document, Conservation Progress in the Waikato, 1995-1997, (DoC, 1998b) provides a report and evaluation of progress in relation to the objectives outlined in the conservation management strategy.

[6] The Department's Strategic Business Plan of 1998-2002, for example, identifies 700,000ha of possum control and 700,000ha of goat control if there were more funding available

The Act states, as a matter of national importance, that, "persons exercising functions and powers under it…shall recognise and provide for…the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna." However, the Act provides no definitions or criteria for "significance", and the extent to which district councils have followed through on their responsibilities varies in accord with interpretations of what is deemed to be "significant" (Froude, 1997:17-18). Is an area of early successional regrowth "significant" ? How large or how unmodified must a wetland or patch of remnant lowland native forest be to deserve protection?

In some cases, protection of indigenous vegetation and habitat is hindered by lack of base-line information. Councils may be too poor, or politically unwilling to fund up-to-date surveys that identify and establish areas of significant indigenous vegetation or habitat, and even if the information is available, they may be unwilling to restrict the rights of private landowners to use their land as they see fit (Froude, 1997:17-20) Politically, the identification of sites of ecological significance may be fraught with difficulty and conflict (Froude, 1995: 20-23).

The introduction of the Resource Management Act 1991 has prompted a widespread consideration of techniques that can be used to encourage or ensure the protection of native vegetation, particularly at district and regional levels. Froude (1997: 18-19) has summarised some of the techniques used. At the district council level (applying largely to land use), they include the use of schedules of ecologically significant sites; restrictions on the clearing of native forest; provisions for encouraging the protection or restoration of riparian margins; the inclusion of criteria for identifying significant indigenous vegetation and significant habitat (considerable variation between councils); policies for rehabilitation; development requirements and development incentives (developers required to remove areas of indigenous vegetation from areas proposed for development, or developers receive a development entitlement in return for extending a legal protective covenant over areas of indigenous vegetation). Regional councils have included the identification of regionally significant sites for wildlife and botanical values within regional policy statements (Auckland region), active management of ecologically significant sites within a regional parks framework (Auckland and Wellington regions), and education programmes that are tied to the implementation of regional planning objectives (Waikato and Bay of Plenty regions).(Froude, 1997:19).

A major limitation of many planning provisions to date is that they do not generally ensure on-going ecosystem management of a kind that will enable the continuation of indigenous ecosystem processes. For example, in New Zealand, fencing requirements may be imposed on a development consent application, but unless these are enforced, there is no protection of native forest against the effects of domestic livestock or introduced wildlife and feral animals. Similarly, there are seldom, if ever, provisions made to manage invasive weeds, or sustain the nutrient and hydrological cycles that were typical of or necessary for native ecosystems and species to flourish. Within the former flood plain of the Waikato river (now mostly drained and developed for dairy production), a significant proportion of the wetland which remains is threatened by eutrophication from agricultural run-off from adjacent farms, or lowering of water tables as adjacent farmers try to reduce boggy, wet conditions on their land. Tension

exists between conservationists who want to maintain or return to hydrological cycles which involved annual flooding, and farmers who want to increase pasture production by lowering their water table. In this example, perhaps new ways of looking are required to find a solution: perhaps farmers could be paid an annual rental to keep parts of their land flooded for certain portions of the year, much as they might be paid a rental for grazing or a crop of hay.

The Resource Management Act includes a set of national policies in relation to coastal areas which apply to regional coastal plans. Policy 1.1.3 of the New Zealand Coastal Policy Statement states that it is a national priority to protect features which in themselves or in combination, are essential or important to the natural character of the coastal environment, including landscapes, seascapes and landforms, while Policy 1.1.4. states that it is a national priority to preserve the integrity, functioning, and resilience of the coastal environment in terms of the dynamic processes and features arising from the natural movement of sediments, water and air; natural movement of biota; natural substrate composition, natural water and air quality; natural biodiversity, productivity and biotic patterns, and intrinsic values of ecosystems (DoC, 1994a:5].

Regional coastal plans are able to specify Areas of Significant Conservation Value. Within these areas, development proposals must be consistent with the preservation of the values identified. (For example, see Waikato Regional Coastal Plan Appendix IV, (Environment Waikato, 1997).

A major limitation for biodiversity protection in the case of coastal areas, however, is that management is divided between different statutes and different administrative authorities. District councils are responsible for land use under the Resource Management Act; regional councils are responsible for marine and freshwater bodies under the Resource Management Act; and the Ministry of Fisheries is responsible for commercial fisheries under the Fisheries Act. Marine pollution is dealt with under the Resource Management Act and the Maritime Transport Act. Marine farming is controlled through regional councils (for the location of structures), the Ministry of Fisheries (under the Marine Farming Act 1971) for permits to collect spat and harvest shellfish) and the Marine Safety Authority (for navigation and safety). These administrative and legislative divisions make the chance of integrated ecosystem or multi-species management difficult, if not remote.

A recent Australian example of a plan which include provisions for the protection of biodiversity is the South East Queensland Regional Framework for Growth Management, published in May 1998. (South East Queensland Regional Co-ordination Committee, 1998). It is based on a comprehensive and co-operative assessment of the region's nature conservation areas, economic resources, environmental constraints, and infrastructural priorities. It recognises that the natural characteristics of the area are a key component of the region's attractiveness, and must be protected to retain existing 'quality of life' characteristics.

The objective "To conserve areas of regionally significant nature conservation value" is reinforced by a series of principles and "priority actions". Each of the priority actions has been identified against a "lead

agency" which is responsible for implementing the objective. Priority actions include the extension of "the area of national parks and Conservation Parks to include examples of all the region's landscape elements and vegetation communities which are poorly conserved" (Department of the Environment), and to prepare a Regional Conservation Strategy (Department of the Environment in co-operation with local government. Critical conservation areas are to be retained "together with the linkages connecting these". The document includes a map which highlights (the very considerable) areas of both economic resource and nature conservation value. By doing so, it shows up areas that are likely to experience conflict between development and nature protection, where issues and priorities between these will require particular consideration and care.

The effectiveness of the plan as a mechanism for biodiversity conservation will depend on the extent to which the various agencies (local authorities and state government departments) can be persuaded to follow the policies of the plan. However, by providing an integrated "whole picture" overview of the region, any departures from the plan are likely to require a more forcefully argued justification than where there is no such comprehensive overview.

In both Australia and New Zealand, local or regional government is becoming increasingly involved in forms of natural resource protection that go beyond plans and policies, to the support of implementation programs that get individual property owners or community groups actively involved in long term conservation management.

The growing number of landcare programmes in both Australia and New Zealand are examples of such local level action. Although few of them have biodiversity conservation as a particular objective, they sometimes have protection of indigenous vegetation as a consequence. For example, in New Zealand the Waikato regional council provides services and support to some 24 Care groups (including landcare, river care and beach care) (Environment Waikato, 1998:71). One of these groups has been concerned with the reduction of soil erosion within the Waitomo river catchment. Retirement of steep land from farm production within this catchment has resulted in a resurgence of indigenous forest over significant parts of the catchment (Personal observation).

The role of local government in biodiversity conservation

As the above examples suggest, local and regional government is important for biodiversity conservation in a number of ways: it has legislative power and responsibility for environmental issues at local and regional level; it is accountable to individuals and communities for environmental conditions within their local area, and can harness their energies and commitment for environmental action; and it is potentially the level of government that can provide the ongoing care that is necessary for long-term ecological protection and restoration.

An additional element of biodiversity that is often overlooked is genetic diversity. A major source of genetic diversity is due to variations of local environment, and to

spatial effects on population dynamics. Maintaining genetic diversity within species, therefore, often means maintaining sub-populations in different geographic areas. Local and regional levels of government potentially have most reason to maintain their own local species variants, and thereby the genetic variation within species nationally.

The role of planners in biodiversity conservation

Experience has shown that lack of community involvement in nature conservation can often result in neglect of areas of native vegetation, indifference, or active opposition to conservation (Froude, 1997). Where landowners and community groups have been consulted, on the other hand, acceptance of conservation measures is much more likely to be accepted. Planners can help make biodiversity conservation more effective by using their skills to enlist community support for conservation policies.

In terms of their ability to contribute to biodiversity conservation, planners have a combination of professional skills that make them particularly qualified to assist with the preparation and development of biodiversity plans and strategies. These include:

- analysis of spatial relations, including landscape phenomena;
- a holistic appreciation of context; planners tend to view places as parts within a larger whole, both spatially and in social, economic and environmental terms;
- integrative thinking; planners tend to be involved in bringing together information and objectives from different groups of people (engineers, ecologists, economists, experts, members of the public, special interest groups);
- awareness of political and cultural differences in the evaluation of environmental resources;
- commitment to democratic community processes in decision-making about the use of those resources;
- experience in public consultation and community involvement in decision making.

It is precisely the potential for environmental conflict between conservation and production which calls on and requires the skills of planners in the areas of process, community consultation, and integrative thinking.

Legislative Provisions and their Limitations

Although planners in New Zealand have by and large accepted the importance of biodiversity conservation, there has not yet developed an accepted body of knowledge about effective landscape planning techniques that will promote the on-going survival or restoration of native biodiversity. Planning policies so far remain very much within the ambit of the Resource Management Act as a statutory framework and depend largely on the imposition of planning controls when applications come in for development. In this respect they tend to be reactive, rather than proactive in their effect (they kick into action only after a new development has been proposed, not in response to existing development); to involve the application of 'once-off' solutions (e.g. the imposition of a conservation covenant at the time of subdivision), rather than on-going management (for example, measures for on-going weed and pest control); and to be incremental and ad hoc rather than systematic or related to ecosystem processes and conservation priorities.

There is a growing recognition among conservation ecologists and managers that legal protection of habitat areas is not enough. Long-term maintenance of native biodiversity depends on maintaining the natural and physical conditions that are crucial to the survival of native species and ecosystems. This depends on integrated ecosystem-based management within district or regional landscapes. Ecosystems, and the plants and animals they support, are not isolated or self-sufficient units; they are dynamic natural systems that change over time and involve relationships and interaction with other parts of the landscape. Ecosystem-based management involves an awareness of the relationships between elements of the landscape; and management of the processes that enable the plants, animals and natural conditions (e.g. temperature, humidity, hours of sunshine, periodicity of fire or flood) which characterise the ecosystem to continue without undue disruption.

The need for ecosystem-based management presents a crucial challenge to environmental and land-use planners because, (a) it introduces a new set of considerations in relation to landscape design (the interaction requirements and interdependencies of ecosystems and species on an on-going basis); and (b) it requires planners to think about and devise planning policies (and perhaps conditions of planning consent) which encourage appropriate long-term ecosystem management practices.

It follows from the preceding section that planners need all the traditional planning techniques (e.g. of resource identification and analysis, public consultation, and policy formulation) to assist with biodiversity conservation, plus an understanding of ecological and biological processes in the landscape.

Despite the strength of Australian research in relation to nature conservation, McIntyre, Barrett and Ford (1996:169), rightly point out that "Although the general ecological principles for maintaining biological diversity have been developed over the last 20 years, loss of species and communities continues unabated. It is now widely recognised that without community involvement and co-operation, conservation management plans will be ineffective."

It is in this respect that planners have most to contribute to the conservation enterprise. Planners are (or should be) aware of the political nature of land-use decisions and of the public participation and consultation processes that are essential for community acceptance of conservation objectives

Conclusion

In conclusion, there are pressing reasons for Australian and New Zealand planners to include protection of indigenous biodiversity as a key consideration in the development of plans, policies and implementation procedures.

These reasons are both practical, and legal. Internationally, biodiversity conservation has become widely accepted as an important component of environmentally sustainable development in the long term (IUCN, UNEP, WWF, 1991:27 - 29). The governments of Australia and New Zealand are both signatories to the UN Convention on Biological Diversity, and, as such, have pledged a commitment to promote

biodiversity conservation. Both governments have produced or are in the process of producing strategies for biodiversity conservation.

Plants, animals and ecosystems are subject to biological processes that require integrated management over time. In addition, in both Australia and New Zealand, the existing network of protected natural areas is deficient in terms of size, distribution and representativeness to assure the conservation of all endangered native species or even a representative collection of native species. Therefore, it is not sufficient to leave the conservation of native biodiversity to the existing network of parks and reserves. Conservation of biodiversity must move increasingly to include the private landscapes of farm and forestry. Private land managers must become aware of how their actions can impact on native ecosystems and species, and if possible, they must be motivated to assist with long-term measures for conservation management. Planners at local and regional government level are well placed to develop strategies and methods that will most effectively gain the support of local communities and landowners.

Local and regional government are particularly important for bringing about a halt to the loss of native biodiversity because they are the levels of government that most directly affect actions of private landowners and managers on the ground, and are most directly accountable to local communities.

To the extent that Planning, as a profession, takes up the concepts of sustainability and sustainable development as goals of professional practice, the issue of biodiversity conservation is a matter of relevance and importance for the profession. However, in, a world where environmental conflict and pressures for production increases are likely to grow, planning for biodiversity conservation requires new knowledge and skills in relation to ecosystem processes and species biology.

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