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Indigenous values and GIS: a method and a framework

In New Zealand, geographic information systems (GIS) are becoming increasingly important in all areas of resource management and environmental planning. There is growing interest among the Maori, the indigenous people of New Zealand, in the use of GIS to help them achieve some of their goals and aspirations. This article describes recent efforts to identify Maori values which are part of Maori traditional knowledge *(maatauranga Maaori)*. It then presents a method and framework for incorporating these values into GIS tools.

The Maori, the indigenous people of New Zealand, make up 14% of the country's total population of 3.7 million. Close to three-quarters of Maaoris (Hapi 1996) have a strong sense of belonging to regional or geographically concentrated "iwi" (tribes) and "hapuu" (sub-tribes). Land, water, and air are central to Maori life and values, and they regard themselves as the "kaitiaki", or guardians of all natural resources. The rights of the Maori people to their lands, estates, forests, fisheries and everything else they hold dear, including language and natural resources, are laid down in the Treaty of Waitangi (1840). According to present legal requirements, Maori values must be taken into account in land-use planning. However, the scarcity and sensitivity of the information on Maori values, as well as the issue of confidentiality, have made it difficult to meet these requirements.

This, in combination with the need to record vast amounts of spatial information related to historic land grievances, has led to a growing interest in the development of GIS tools geared specifically to the Maaori.

GIS and indigenous knowledge

The advantages of using geographic information systems (GIS) and knowledge-based systems (KBS) to document indigenous knowledge have been described by Tabor and Hutchinson (1994) and Gonzalez (1995). Applications at the local level have been documented by Lawas and Luning (1996), while Marozas (1991) has examined how GIS are being used in American Indian land and water rights litigation. Madsen (1994) has provided interesting examples of the potential power of GIS and remote sensing for the exploitation of indigenous peoples, particularly by non-indigenous groups. Examples from both New Zealand (Ihaka M, *pers. comm.*; Maori GIS Conference 1996; Harmsworth 1995, 1997a, b) and Canada (Anderson *et al.* 1993) demonstrate that where indigenous peoples develop and employ GIS tools, they are able to add their own cultural imprint to existing applications. Moreover, such tools complement the indigenous knowledge systems traditionally used to store and transfer knowledge and information, whereby an important role is reserved for the relationship with individuals, places, cultural activities, experience and the spoken word.

Maatauranga Maaori

In a traditional context, *maatauranga Maaori* (Buck 1949; Best 1924a, b) can be defined as 'the knowledge, comprehension or understanding of everything visible and invisible existing in the universe' (Williams 1997). *Maatauranga Maaori*, which involves observing, experiencing, studying, and understanding the world from an indigenous cultural perspective, is often equated with 'wisdom'.

The quality of the environment is central to Maori life and well-being. For hundreds of years the Maori have been intimately associated with their environment through ancestral links, and dependent on it for food, shelter, and medicine. Photo: Harley Betts

In Maori society, the transfer of knowledge has always involved expert individuals, "tohunga", and institutions *(waananga)*. The *tohunga* were trained to accurately recall elements of knowledge and to organize them systematically, for purposes of further dissemination (Williams 1997). Under the influence of the European colonists, this system gradually declined and the recording, collection and dissemination of *maatauranga Maaori* increasingly took other forms, such as written textual documents, archives, drawings, and paper maps. This process was promoted by the authorities, culminating in the Tohunga Suppression Act of 1907, which essentially prohibited *tohunga* from making use of their skills. Over the last 20 years, however, the Maori have begun to realize what a wealth of knowledge is in danger of disappearing forever on the death of Maori elders. These "kaumaatua" have reliable traditional knowledge related to cultural activities and experiences associated with specific local areas or sites. Thus there has been a resurgence of interest on the part of the Maori in recording traditional knowledge, particularly at the local or community level, and using new technologies to make aspects of traditional knowledge available to future generations is seen as an attractive option. In the last ten years, as access to computers has increased, they have taken an interest in developing computerized databases to store and organize information on Maori values and *maatauranga Maaori*.

Maori values

The expression 'Maori values', which is generally used interchangeably with the term *maatauranga Maaori*, is defined as 'instruments through which Maaori people experience and make sense of the world' (Marsden 1988). However, in the present

Type of information	Examples
Historic places, and tribal landmarks	Fortified villages, hills, rocks, rivers
Cultural and social sites	Sites such as "marae" which exist today
Ancestral sites	Traditional land tenure, historic tracks
Archaeological sites	Cooking sites, tools, weapons, artefacts
Sacred sites	Historic burial sites, sacred battle grounds
Indigenous place names	Correcting the spelling and adding placenames to maps, recording knowledge/ histories about indigenous placenames
Biophysical resources	Landforms, soils, flora and fauna, water quality, geothermal and coastal resources
Special plants, special types of trees	Plants used for weaving, wood for carving, traditional medicines

Table 1. Recorded information on Maori values

study we found it useful to use the term Maori values as a subset of *maatauranga Maaori*, in order to emphasize the special relationship which Maori communities have, or have had, with specific sites or areas and, where possible, to identify such sites and areas. Maori values are described here as historic, cultural, spiritual, and biophysical; often they are expressed in a spatial or geographic context.

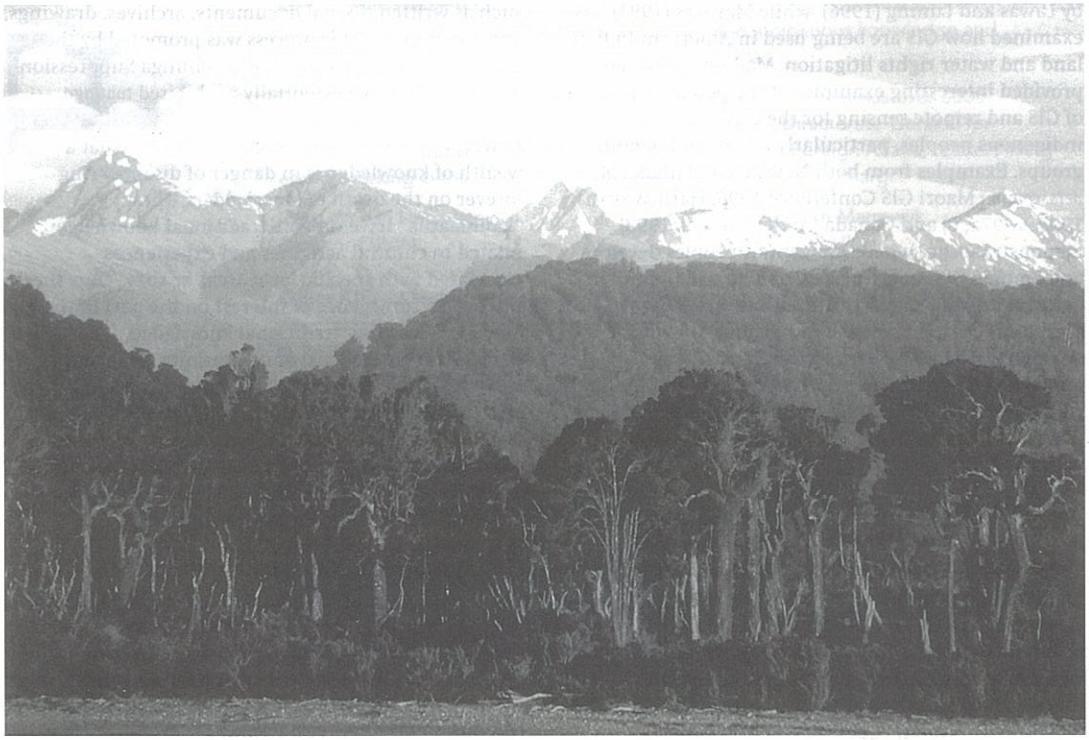
Method and framework

The present research, which made use of participatory methods involving a number of Maori organizations and individuals in New Zealand, established a number of culturally acceptable methods for recording, organizing and making available information on Maori values in a textual and computerized form (Harmsworth 1995, 1997b). All such information was classified according to specific geographic tribal areas (ranging in size from 500 km^2 to 5000 km^2). This produced models linking traditional knowledge—often in both oral and textual form—to GIS and multi-media systems. These models made it possible to store information on Maori values *(see table 1)* and biophysical information, for the benefit of environmental management planning, while protecting confidentiality and addressing intellectual property rights. Before making use of GIS technology, all information was recorded and organized within a framework *(see table 2)*.

A framework for enhancing the use of indigenous knowledge is discussed in Mathias (1995). In the present study, information pertaining to each geographic area was organized and arranged within the framework shown in table 2.

On the y-axis the information was classified according to eight main groups, although certain information may appear in more than one group. In general, the lower the number, the more sensitive the information (1-8). On the x-axis information is arranged according to its confidentiality and detail, and is designated as national, regional, local/ community, and individual levels. Along the x-axis, from left to right, the information becomes increasingly more detailed, confidential and personal; greater importance is placed on property rights; and access to information becomes restricted. The location within the framework indicates the type and special attributes of the knowledge, and determines whether the information may be transferred to more general levels for use by outside agencies.

Suitable GIS database structures have been designed to accomodate the setup described above . Once information is stored, links are provided between information at the national level and information accessible at the local or community level; the latter is likely to be detailed and confidential, requiring some form of restricted or protected access. Each piece of information recorded is referenced to an original source or sources, such as a person, book, archive or map, and all references are appropriately coded for database entry.



The Southern Alps, in the South Island of Aotearoa - New Zealand reach a height of 3764m. These mountains ("maunga") and the podocarp forest ("ngahere") in the foreground are of special significance to Maori both in terms of spirituality and resource use.
Photo: Harley Betts

Main groups used in Maori values classification	a. National level, central government (national databases, public domain access)	b. Regional and district databases, such as local government (conditions and criteria required for storing confidential information)	c. Maori databases such as at the *iwi* or *hapuu* tribal level (secured protection of information)	d. Individual or group information - extended family *(whaanau)* or individual (highly sensitive or personal infomation)
1. vegetation	1a. national or regional data on vegetation and land-use	1b. regional or district data on vegetation and land-use	1c. local information on vegetation types	1d. plant uses, plant varieties, medicinal plants, plants for weaving etc.
2. animals, birds, fish, insects	2a. national or regional data on animals, birds, etc.	2b. regional or district data on animals, birds, fish, insects	2c. local information on animals, birds, fish, insects	2d. special animals, birds, fish, insects, such as special foods, cultural harvest, fishing grounds etc.
3. land, soil	3a. national or regional data on landforms, soils, etc.	3b. regional or district data on landforms, soils etc.	3c. tribal information on land features, landforms, soils, etc.	3d. special landmarks, land features, traditional knowledge on soils and cultivation, muds/dyes for weaving etc.
4. water	4a. national or regional data on water	4b. regional or district data on water	4c. tribal information on water	4d. detailed or confidential information on water
5. air	5a. national or regional data on air	5b. regional or district data on air	5c. tribal information on air	5d. detailed or confidential information on air
6. special places	6a. limited information on special places, cultural sites	6b. regional and district information on special places, cultural and historic sites	6c. tribal information on special places, cultural and historic sites (such as archaeological sites)	6d. detailed or confidential information on special places, cultural and historic sites
7. sacred sites	7a. little or no information at the national or regional level	7b. regional and district information on some sacred sites (generalised information)	7c. tribal information on sacred sites (such as burial grounds)	7d. detailed or confidential information on sacred sites (such as burial grounds)
8. metaphysical	8a. little or no information at the national level	8b. no information at the regional or district level	8c. tribal information on metaphysical information (spiritual, cosmological)	8d. detailed or confidential metaphysical information (such as spiritual, cosmological)

Table 2: A matrix framework for recording information on Maori values

Important plants such as flax ("harakeke") are used for various purposes, including weaving.
Photo: Harley Betts

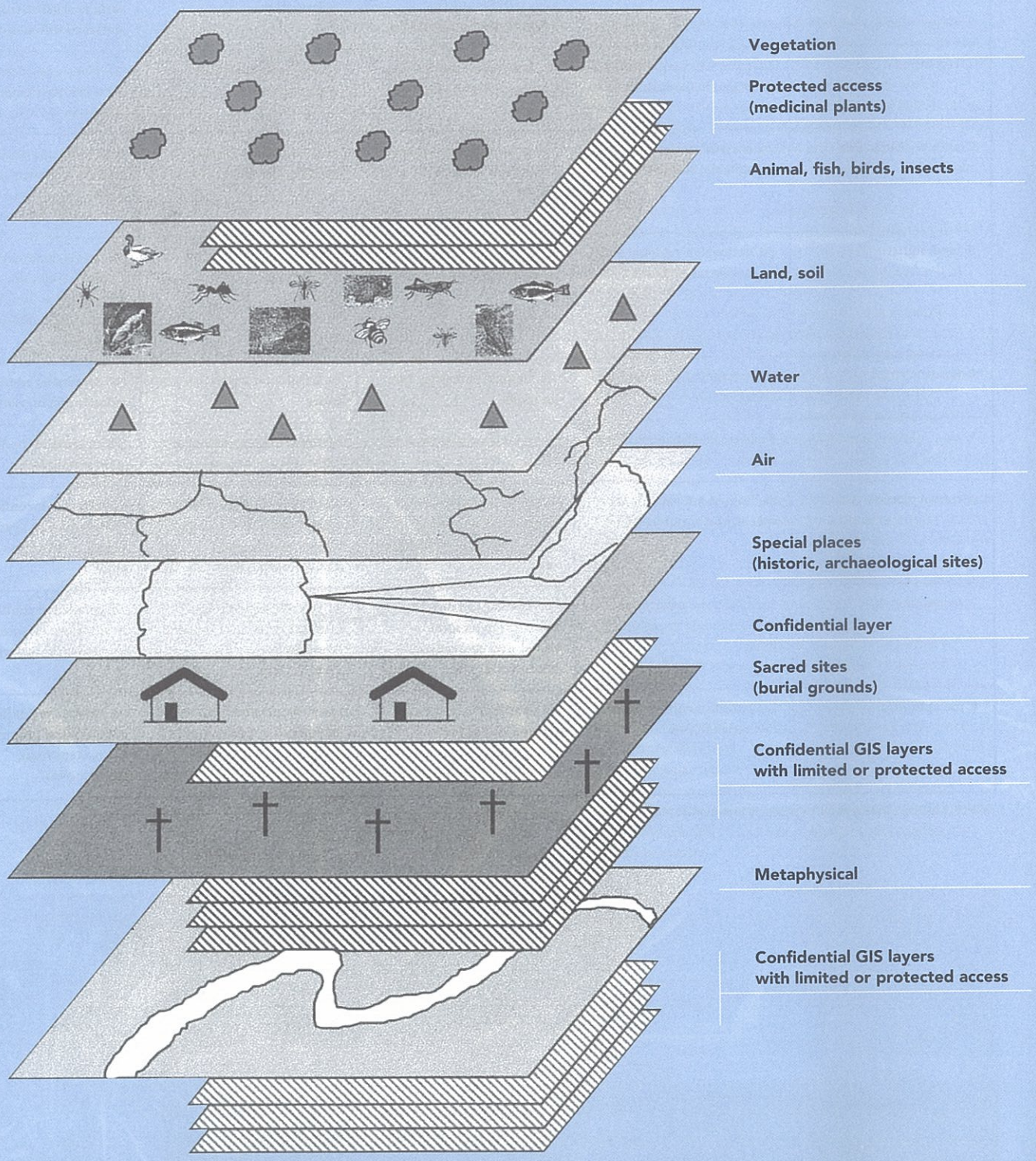


Figure 1: GIS layers and confidential sub-layers

Option	Example
(1) Silent or concealed files	Recording the information in an archive or filing system, linked to a GIS database or a map.
(2) Overlay or grid to flag sensitive areas	Recording the information for example as a grid network, which does not identify the actual position or location of confidential or sensitive information such as sacred sites.
(3) Link to books, maps, etc.	Setting up a directory to direct the enquirer to associated knowledge in books and maps.
(4) Link to people such as Maori elders	Setting up a directory to direct an enquirer, via a Maori organization or contact, to an individual for answers to particular questions and associated traditional knowledge.

Table 3: Example of options for a knowledge directory

Once information is classified and stored in the framework, it can be spatially represented in the form of layers *(see figure 1)*. Each layer is characterized by different levels of detail, sensitivity and confidentiality, which together determine the degree of access at each level.

Knowledge directories

Information too sensitive or confidential to store in a GIS is linked via a database directory to an individual person. This allows additional information to be obtained from an alternative knowledge source. Some of the available options are shown in table 3.

By following the options in table 3, highly sensitive or confidential information can be displayed in the form of a label on a map; alternatively, it can be simply flagged in the GIS as a sensitive or restricted area and the enquirer directed to another information source. This latter option relies on the availability of people with accurate traditional knowledge. Sadly, traditional indigenous knowledge is diminishing at an alarming rate as the population ages (Maundu 1995).

Discussion

Although the methods described above are still in the experimental stage, they provide insight into what is required in order to develop culturally appropriate GIS tools. In an increasingly knowledge-based and technologically advanced world, they underline the need to take into account intellectual property rights, sensitivity, confidentiality, and links to other, non-computerized knowledge-based systems. A great deal of traditional indigenous knowledge has already been irretrievably lost in New Zealand, and with the ageing of those in the indigenous population with strong links to the past, we are rapidly running out of time. Society must make clear what value it places on this information from a traditional or indigenous source.

There is enormous potential for the use of indigenous knowledge to enhance our understanding of the environment, underpin culturally appropriate development opportunities, and provide a more holistic and integrated perspective for planning and policy in the twenty-first century. I hope that GIS and the methods sketched here will be of some use in furthering those aims.

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