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## Natural Resource Management and Indigenous Well-being<sup>1</sup>

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### Introduction

Natural resource management (NRM) has become a policy instrument and “slogan” for solutions in Australia in response to increasing evidence of environmental problems. Specific examples include water pollution from diffuse sources, soil salinization, and biodiversity decline. Debates about how resources are managed are supported by a growing body of biophysical research about how conditions are changing, and economic research into efficient policy approaches. Comparatively little attention is being paid to the question of whether people are better off under different management options, or who potential winners and losers might be. Equity issues such as these extend beyond individual impacts to stakeholders groups, and have inter-generational implications. One group that is afforded increasing significance—at least in principle—is the group of First Nations (FN), Traditional Owners (TO), or more generally, Indigenous peoples. While in many cases they may not have property rights over natural resources and/or have little market presence, they do derive benefits and/or bear costs from land-use changes and NRM responses.

In this paper, we acknowledge that NRM issues as they relate to Indigenous peoples, are of international significance. We review six research case studies in Australia, New Zealand, and Canada, which seek to quantify the benefits that Indigenous people derive from natural resources and/or NRM. While each project involves collaborative work among researchers, and Indigenous people and groups, they have taken different routes to providing evidence of the benefits that are generated by natural resources. The six approaches include the following: a well-being index approach used recently with the Australian Nywaigi people; a replacement value approach to valuing wild-resource harvests for the Wallis Lake area of northeastern New South Wales; a bio-economic approach to Indigenous/non-Indigenous fisheries management of the Great Lakes in Ontario; a stated preference approach used in New Zealand; a choice experiment in northern Saskatchewan and Alberta; and a goal programming/multi-criteria analysis with the Wik People from the York Peninsula in northeastern Australia.

This paper focuses on a review and critique of the methodological and analytical approaches used in the six studies surveyed. The objective is to demonstrate that a diversity of valuation methods exist that can support research, and that can,

in turn, support evidence-based policy development. Our motive for taking this journey through the methodologies and how they have been applied is to develop better ways to describe the outcomes of NRM in support of society's goals, particularly for Indigenous people. Our hope is that by sharing this work with others, their own collaborations may be made easier. We are unable in this paper to explore broader economic and legal issues with resource use and property rights.

## **Background**

### ***Water Benefits, the Murray River Basin, and Indigenous People***

Research into measuring the range of benefits that flow from different water uses and management practices was initiated by Australia's Commonwealth Scientific & Research Organization (CSIRO) under their "Water for a Healthy Country" research flagship for urban, coastal, and other areas, with the goal of supporting management changes for resources in general. Work is underway to study a range of options to measure, and understand how multiple forms of benefits could be increased for regional sectors, groups, and the environment. One group of interest is Indigenous peoples.

The project we are concerned with is based in the Murray River Basin of south-eastern Australia. The Murray River is part of the Murray-Darling Basin, which is one of Australia's largest river systems extending across one seventh of the continent from Roma in Queensland to Goolwa in South Australia. The basin has a population of nearly two million people with another one million outside the region heavily dependent on its resources. The basin includes the three largest rivers in Australia—the Darling River (2,740 km), the Murray (2,530 km), and the Murrumbidgee (1,690 km). The basin has been highly developed over the past 200 years, and now generates about 40% of the national income derived from agriculture and grazing. It supports one quarter of the nation's cattle herd, half of the sheep flock, half of the cropland, and almost three quarters of the irrigated land. Water has been extracted from the Murray-Darling system for irrigation and other uses for over a century, but the volume extracted has risen dramatically since the mid-1950s. While this has brought many economic and social benefits, the health of the rivers and wetlands has suffered.<sup>4</sup>

Currently, wetlands are degrading, and the mouth of the system at the Coorong estuary in South Australia has been closed for most of the past two years. The Coorong is part of the lands traditionally owned by the Ngarrindjeri people, the group that is collaborating with CSIRO for this project. For the Coorong, the Murray mouth, and for the Murray River as a whole, there is widespread concern that the "cap," or official limit, on water diversions from the rivers has been exceeded, and that water is unavailable in the system to support a healthy river and floodplain environment throughout the system. Quiggin (2001) discussed these problems, noting that, given water scarcity relative to demand, the common

pool characteristics of the basin water, and the institutions governing how water is taken from the rivers, there are inefficiencies that will not be resolved easily. The consequence is that the degradation has continued.

The Murray-Darling Basin Commission (MDBC) is responsible under a joint agreement between the states and the Commonwealth for managing the Murray River Basin water allocations in a sustainable way. Its actions have evolved over time, with more and more attention directed at the allocation of water to highest value uses and to the environment. This is because the cap is exceeded and the flow of the Murray River is over-allocated to urban and irrigation uses with detrimental impacts on environmental condition of floodplains, water levels, and water quality through increased salinity.

State and Commonwealth governments have been facing political pressure over the condition of the Murray-Darling Basin. The main policy now determining investments in renewal and management in general has been in place since November 2003 when the Murray-Darling Basin Ministerial Council (MDBMC) announced the Living Murray (TLM) “first step decision” towards its vision of a healthy Murray River system sustaining communities and preserving unique values (MDBMC 2004). The “first step decision” was made in support of the more general TLM initiative, which was announced earlier in 2002 by the MDBMC with the goal of taking collective action to return the Murray River to the status of a “healthy working river,” thus addressing the degradation that has been evident in the decline in native fish populations, wetlands, and water quality (MDBMC 2002).

One of the key objectives of the intergovernmental agreement supporting TLM First Step includes a commitment to invest \$500 million over five years in cost effective, permanent recovery of water to achieve environmental outcomes. In terms of volumes of water, up to an estimated average of 500 gallons per year of “new” water over a five year period is committed to what have become known as “environmental flows,” with this water coming from “a matrix of options” including infrastructure improvements and rationalization, on-farm initiatives, efficiency gains, market based approaches, and purchase of water from willing sellers (MDBMC 2004). The focus of the environmental flows is on specific iconic sites along the Murray where there are significant ecological assets (SEAs), including sites of significance to bird breeding and feeding, and native vegetation. The Murray River channel is one of the six designated SEAs.

The Murray-Darling Basin Ministerial Council has also supported the development of the Murray-Darling Basin Indigenous Action Plan, which recognizes Indigenous interests. Determination of these interests, their measurement, evaluation, and prioritization in overall planning for the basin are as yet not well defined. However, there has been a commitment to appoint Indigenous officers to monitor and advise on the placement and construction of new engineering works in a sensitive manner so as to not disturb significant cultural heritage sites.

For the basin as a whole, the share of the population that is Indigenous is growing, and it is growing in the young age groups as well as through returns to country of older Indigenous people later in life. In 2001, the total estimated resident population of the basin<sup>5</sup> was just over 2 million and 3.4% were Indigenous people (approximately 70,000) with a share of 4.2% in non-urban centres. This compares with a share for all of Australia of 2.4%. What is significant is that the share has grown in the basin by 13% since 1996, with the share of population of non-Indigenous people falling. Indigenous population of the basin grew at five times the rate of non-Indigenous population. A major contributor to this shift is occurring with an out-migration of young non-Indigenous people that outweighs the losses of Indigenous young people. The Indigenous share of the population of the basin is predicted to continue to increase. Taylor and Biddle (2004) estimate that the Indigenous share of the population will grow by 44% from 2001 to 2016. This growth in the share of the population is an indicator of the need to better understand the needs and priorities of this group in resource management.

In terms of economic interest and control, the extent of the asset base of Indigenous people in the basin is not known clearly; however, the income figures do not indicate that there could be a very great saving and investment effort from the relatively low income levels. The income figures reported by Taylor and Biddle (2004) indicate that of the total \$35 billion in gross personal income accruing to adult residents of the basin in 2001, only 1.6% went to Indigenous people despite the fact that they represented 2.9% of the adult population up to the age of 65, and only 1.2% of the total regional employment income went to the same group. This is because approximately 38% of total Indigenous income is attributable to “welfare” sources, such as the community development employment projects (CDEP), compared to only 19% for non-Indigenous income.

### ***Benefits from Water for Murray Basin Indigenous People***

The goal of the CSIRO collaboration between researchers and Indigenous people in the Murray Basin is to delineate benefits that derive from water for Indigenous people, in support of more informed water-resource management. Initially, this collaboration is being undertaken as a case study with the Ngarrindjeri people of the Coorong and Murray mouth. Benefits are assumed here to include the sum of values attached to resources and the outcomes deriving from them. Values are both for use and non-use. Values also derive from market and non-market returns from the resource. Hence, water is used directly in a market sense for drinking where the alternative is bottled water, and water supports fish, a further consumable with a market value. Water also supports non-monetary, non-use values attached to a sense of place, importance of living on “country” as ancestors had done, and a sense of well-being from being attached and responsible for country. Non-use values can incorporate non-monetary, bequeathed values to future generations as well. If the resource declines in value, through quality reductions or introduction of predator species or pollution, then the use and non-use values decline. To the

extent that these changes in value are measurable and subject to management discretion, the value (or cost) of management decisions can be estimated. The methods described below take a number of perspectives on benefits and the values that determine them.

## **Measuring the Value of Resources**

In this section a range of approaches for measuring the benefits that derive from resources are surveyed. Our main interest is in measuring benefits that flow from water resources, however, the review here draws upon research that covers a range of natural resources. Some take a comprehensive approach and measure changes in well-being while others measure values on a more restricted micro basis such as replacement value. The emphasis here is on examples of how the approaches have been used, and the advantages and disadvantages of the approaches. The final few examples provide alternatives to values measurement, taking the position that it is not possible to measure the benefits, and that the best management approach is one that takes into account that the benefits exist, although unquantified.

### ***Well-Being Approach to Measuring the Value of Resources—The Nywaigi Traditional Owners, Northeastern Australia***

The research by Greiner et al. (2005) seeks to identify the value of natural resources through use and non-use for one Traditional Owner group, the Nywaigi language group in northeastern Australia, through a well-being approach. “Well-being” is an inclusive concept, integrating aspects of human life such as economic opportunity (employment/income), health (mental/physical), country, and culture, among others. It offers an alternative perspective to the economic concepts of utility and welfare, which are typically applied in a narrow sense dealing with monetary measures and preferences.

This work was motivated by a perceived need on the part of natural resource managers in Queensland (Burdekin Dry Tropics NRM group), and the Nywaigi people that NRM policy development and implementation of measures would be improved by a better understanding of what mattered to people and how their well-being was affected by resource management. In particular, the approach taken pursues a number of purposes:

1. It is readily repeatable with other Traditional Owner groups, and can be employed to provide a comparative analysis of what things matter (most) to different groups. Similarities and differences can be established. Requirements for different Traditional Owner groups can be articulated and explained on the basis of systematic research and solutions developed for group-specific problems.
2. By providing understanding of issues, it delivers important clues for policy and service prioritization. The depth of information complements regional statistics, which typically include standard quantitative indicators of well-being, including age structures, employment, and house ownership.

**Table 13.1: Comparison of Domains Contained in Various Human–Ecosystem Well-being Models**

<b>Human ecological model</b>	<b>Person/ Environment relationship</b>	<b>Concept of “liveability”</b>	<b>Millennium Assessment Framework</b>	<b>Australian Bureau of Statistics concept</b>
(Shafer et al 2000)	(Mitchell 2000)	(van Kamp et al, 2003)	(MEA 2003)	(based on OECD, 1976)
<b>Social equity</b>	<b>Community</b>	<b>Community</b>	<b>Material minimum</b>	<b>Family and community</b>
<b>Conviviality</b>	<b>Health</b>	<b>Health</b>	<b>Health</b>	<b>Health</b>
<b>Opportunity</b>	<b>Personal development</b>	<b>Personal development</b>	<b>Good social relations</b>	<b>Education and training</b>
<b>Accessibility</b>	<b>Goods and services</b>	<b>Economy</b>	<b>Security</b>	<b>Work</b>
<b>Liveability</b>	<b>Physical environment</b>	<b>Natural resources</b>	<b>Freedom of choice</b>	<b>Economic resources</b>
<b>Sustainability</b>	<b>Security</b>	<b>Built environment</b>		<b>Housing</b>
		<b>Services accessibility</b>		<b>Crime and justice</b>
		<b>Lifestyle</b>		<b>Culture and leisure</b>
		<b>Safety</b>		
		<b>Culture</b>		

3. The quantitative aspect of the research, if repeated in intervals, can help measure changes in well-being over time, and assist with the evaluation of policies and programs.
4. By being part of the research, Traditional Owners and their representatives gain more understanding of themselves, have opportunity for self-reflection and articulation, and research collaborators gain methodological experience.

The conceptual approach is guided by a number of existing models that are useful for providing the principal connection between humans and the natural environment (**Table 13.1**). The person-environment model (Mitchell 2000) examines a combination of measurable spatial, physical, and social aspects of the environment, and a person’s perception of these. The perception is not only related to the objective characteristics of the environment but also integrates personal and contextual aspects. The model is a “thinking model” and presents layers of concepts that are related to each other.

The concept of “liveability” (Pacione 2003) refers to the conditions of the environment in which people live (for example, air and water quality, state of housing) and the attributes of people themselves (such as health or educational achievement). Examples of various definitions of “liveability” are given in van Kamp et

al. (2003). Veenhoven (1996, in van Kamp 2003) describes the concept of liveability as quality of life of a nation, and the degree to which its provisions and requirements fit with the needs and capacities of its citizens. Newman (1999, in van Kamp 2003) notes that liveability is about the human requirement for social amenity, health, and well-being and includes both individual and community well-being.

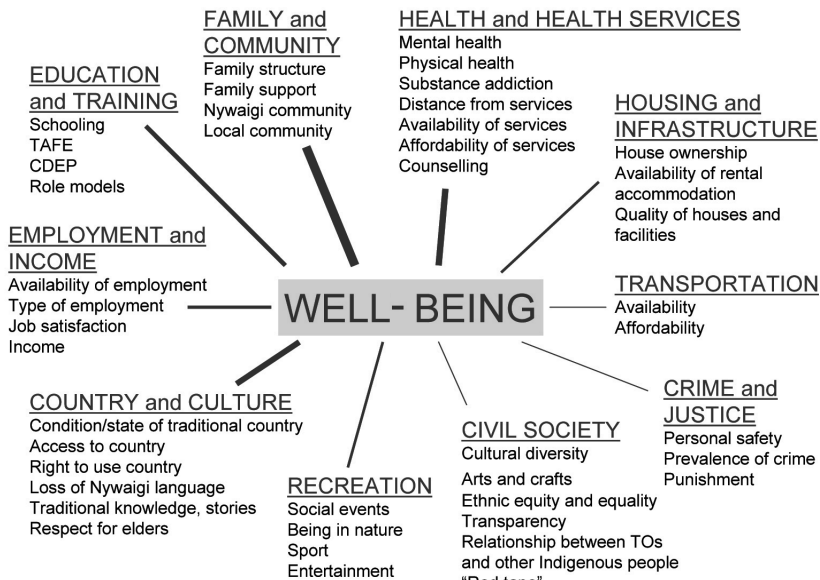
The main differences between the various models relate to object, perspective, and time-frame (van Kamp et al. 2003). Some concepts are primarily related to the environment, (physical, built, social, economic, and cultural), while others are primarily related to the person. Some are normative while others are person-based/experiential. The time frame of the concepts of well-being, liveability, and quality of life tend to focus on the 'here and now' and are less concerned about long-term considerations associated with the notion of sustainability.

The empirical aspects of the research adopt a subjective experience approach to the concept of well-being. It reflects on how well one's life is going on balance, and a sense of the extent to which one feels life is enriching or rewarding. A person's assessment of well-being is based on his/her personal characteristics and circumstances. Well-being is determined by a suite of factors, which vary in the literature, but broadly encompass material sufficiency, health, social relations, security, and freedom of choice. The state of the natural environment and its ability to provide ecosystem services greatly influences the state of many of these factors.

The research method negotiated with the Nywaigi Traditional Owners was focus group discussions. The various insights developed by each focus group into what contributes to and detracts from well-being are consolidated into a model of Nywaigi well-being (**Figure 13.1**, page 246).

"Family and community" is the single most important domain of well-being, based on the close ties that exist among members of (extended) families, which sometimes manifest as large families living together in households. Health is identified as a key contributor to well-being. Substance abuse and addiction, and the state of health services are key issues on the mind of Nywaigi people. "Country and culture" are identified as critical determinants of well-being that are seen as intrinsically linked to the identity of members of the Nywaigi community. There is a strong sense of loss and frustration at the extent to which traditional knowledge, stories, lore, and understanding of country have been lost. This is regarded as the root of many social problems that Nywaigi people are facing today.

Greiner et al. (2005) complement the qualitative approach given in **Figure 13.1** with a survey of workshop participants. The questionnaire is partially based on the Australian Unity Well-being Index (Cummins et al 2001; Cummins et al 2003; and Cummins et al 2004). The main reason for including a short questionnaire as a research tool at the end of the focus group discussions was to generate a quantitative data base that:

**Figure 13.1: Model of Nywaigi Well-being**

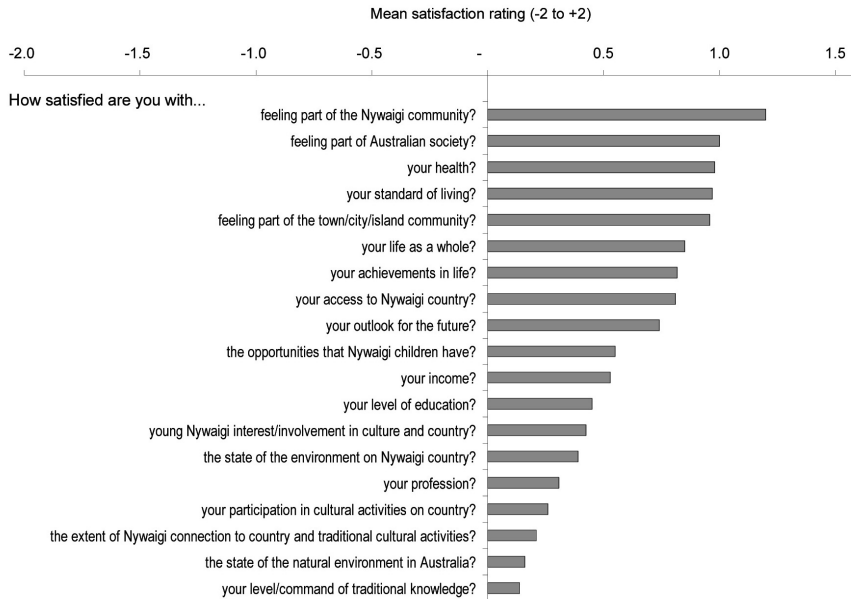
**Note:** The thickness of lines indicates the relative importance/contribution of the domain to well-being

1. Provides complementary quantitative information, which might enable triangulation of the qualitative information;
2. Assists the integration of data across all locations, and across all segments of the Nywaigi population; and
3. Makes it possible to compare aspects of Nywaigi life with other quality-of-life statistics compiled.

Respondents were asked to rate their satisfaction with a series of attributes relating to life in general, and to Nywaigi issues on a five-point scale from “not satisfied at all” to “highly satisfied.” For analytical reasons, the answers are coded as ranging from -2 (not satisfied at all) to +2 (highly satisfied). **Figure 13.2** provides an overview of the survey results. It shows the mean values of scores obtained for each attribute. Research participants expressed their highest satisfaction rating for “feeling part of the Nywaigi community.” They are also generally satisfied with life as a whole, their health (adult Nywaigi tend to be less satisfied), being part of Australian society, and being part of their town/city/island community. Respondents were least satisfied with their level of traditional knowledge (men are less satisfied than women), the extent of Nywaigi connection to country, and traditional cultural activities. Women tend to recognize the interest of young Nywaigi in culture and country.

The research outcomes have been readily accepted by the key stakeholders of the research who are: 1) the Burdekin Dry Tropics Board;<sup>6</sup> 2) official representa-



**Figure 13.2: Mean Satisfaction with Attributes; Sorted by Mean Value**

tives of the Nywaigi Traditional Owners, specifically Giringun Aboriginal Corporation and Nywaigi Land Corporation. Research questions and methodology were developed in collaboration with both stakeholders, and the research team liaised with both on an ongoing basis and provided regular updates. The research has also received much interest from Queensland State Government departments, specifically the Department of Communities, and the Department of Aboriginal and Torres Strait Islander Policy. Multiple briefings and presentations were provided to bureaucrats at the levels of regional manager and senior policy advisor. The research results were influential in the “Giringun Round Table” discussions, which sought to establish a Federal/State co-funding model for the Giringun Aboriginal Corporation as a key service provider to Traditional Owners in north-eastern Australia. However, these discussions have as yet, not been resolved, a major stumbling block being the issue of representation of traditional owners versus Indigenous people in general. A follow-up project has recently been established and has received funding; the project will provide an institutional analysis of Giringun Aboriginal Corporation, and seek to quantify the impact on Traditional Owner well-being generated by the services that Giringun provides.

This approach would be useful for the Murray River Basin because it is a comprehensive approach that could help identify values and priorities and provide a benchmark for future evaluation.<sup>7</sup> It would also provide a productive process for learning between researchers and Indigenous people in the basin. Running a

parallel non-Indigenous valuation would be a novel addition that could build cross-cultural awareness as well. The challenge would be in applying the approach across language groups, Traditional Owner groups, and other Indigenous residents since there is no homogeneity expected across groups. One way of dealing with this challenge would be to identify groups that could self-identify as group members with preferences that could be aggregated for the purposes of producing the index. However, assigning group weights would still be challenging.

### ***Replacement Cost Approach to Measuring the Value of Wild Resources—The Wallis Lake Catchment***

A replacement cost approach includes a much narrower definition of values than the well-being approach discussed above. The replacement cost approach deals with one activity—wild harvests—and their substitute value in the market. One example, the motivation for the work, the methodology, and its usefulness are discussed below.

Jon Altman, Matthew Gray, and Natane Halasz of the Australian National University Centre for Aboriginal Economic Policy Research (ANU CAEPR) group were contracted by the NSW Department of Environment and Conservation to develop a cost-effective methodology for estimation of the value of wild resources to Indigenous communities, with a small pilot study. The task was to provide a methodology for measuring values of resources to Indigenous people in a way that would be accepted by the people, and also repeatable over time and across different groups. The goal was to provide an assessment of whether the use of wild resources by the Indigenous population is significant, and to provide an order of magnitude for their value. It was anticipated that the information provided in their report would be of value to the NSW Government's ongoing Comprehensive Coastal Assessment (CCA) process by quantifying one category of the economic value of natural resources in the CCA study area. The CCA process is primarily about collecting information on the value of different uses of coastal areas of NSW and developing decision-making tools and methods (Altman et al. 2004, 2005).

The study was also motivated by the fact that there is no reliable national information on use of wild resources by Indigenous Australians. The 1994 *National Aboriginal & Torres Strait Islander Survey* (ABS and CAEPR 1996) is the only nationally representative survey with any information on use of wild resources, but the use of wild resources is asked only as part of a question on voluntary work with the estimate of 6.3% of the Indigenous population being engaged in hunting, fishing, and gathering bush foods seeming implausibly low. The 2002 *National Aboriginal & Torres Strait Islander Social Survey* asked about use of wild resources in the previous three months only in remote areas with findings indicating that 52% participated in very remote areas, and 16% in remote areas. The Wallis Lake study was intended to provide better micro data that could be more useful in regional planning than these disparate estimates.

The study area was the part of the Great Lakes region of the mid-north coast of NSW covering 1440 square kilometres in either coastal plain and estuary, or ridges and valleys. The land use is 39% cleared for agriculture, mining, and infrastructure; 5% developed for urban and rural residential uses; and 9% managed by the NSW National Parks and Wildlife Service.

For the Indigenous people of Wallis Lake, the harvesting of wild resources is not seen as a recreational activity. They say that harvesting is done because it is a customary activity and part of being Indigenous, as well as a means of obtaining food. As noted by Gray these reasons are very different from the reasons given for fishing as reported by the Australian population as a whole. The reasons given for fishing in the general population are to relax and unwind (37%), for sport (18%), to be with friends (15%), to be outdoors (13%), and for food (8%) (National Recreational and Indigenous Fishing Survey 2000–01).

The Altman et al. study considered only economic benefits accruing from the direct use of wild resources through consumption of wild resources harvested, use of wild resources as an input into something that is sold (for example, a work of art), or employment resulting from connection with wild resources. Economic benefits were calculated using market prices to estimate the market replacement value of the wild resources harvested.

Information was collected about average amounts of each species harvested, number of people harvesting each species, market price of each type of wild resource, and costs of harvesting the wild resources. The method of collecting information was a retrospective questionnaire in an interview situation with information collected from 10 interviewees about amounts of each species harvested over the previous 12 months for 27 members of the Indigenous community. Interviews were conducted over four days in July 2004.

A wide range of wild resources is non-commercially harvested; terrestrial plants and wildlife have uses that are primarily symbolic and cultural, while the vast majority of plants and animals harvested are aquatic. It was decided that due to the scoping nature of the study and its small scale, only aquatic-based resources would be used in the economic valuation. This covered 33 species. The total value of resources to the whole community was estimated from the sample as the midpoint from the high catch harvesters versus the low catch harvesters in proportion to the sample population. Using this method, the estimate Altman et al. found was that harvesting of wild resources represented about 5% of total income for the community.

This approach provides a good first step in understanding the harvesting activities and ways of the people as well as a way to learn about what matters to the people. A replacement-cost approach does not, however, provide estimates of total value. Nor does this approach provide indications of the way values would differ under different management strategies. The stated preference methods described below provide opportunities to go beyond replacement value of currently extracted resources, and explore the way values change when site conditions change.

***Optimal Resource Extraction in a Holistic Community Assessment—The Chippewas of Nawash First Nation, Great Lakes, Ontario, Canada***

The work described in Chami et al. (1997) seeks to contribute to an understanding of how well the Nawash community is managing its resources, how well regional NRM of a shared fishery is supporting the wellness of the Nawash community, and how management could be improved. The approach taken focuses on the Nawash whitefish commercial fishery with an economic analysis, and then provides the results within the context of the importance of the economics as a basis of cultural, social, and economic well-being for the First Nation. The approach taken is characterized by three steps: 1) a direct estimate of economic values using a bio-economic model of the fishery that focuses on optimal resource extraction; 2) evaluation of this estimate within the context of the community and its culture and social structure as well as its control over its environment; and 3) sharing of this information with the wider community including provincial natural resource managers.

The Nawash people sought an opportunity to work collaboratively with a group of economists and with a fish biologist from the University of Guelph in 1996 in order to explore the opportunities to improve the management of their fishery. Although the basic expertise of the outside team was either economic or biophysical, it was clear that it would only be possible to evaluate the management of the fishery within the more general context of the culture of the people. However, the contributions of economic analysis were sought by the Nawash as a tool with which to communicate with provincial managers and other groups. Hence, the approach taken was to evaluate the economic implications of different management approaches, quantify these in market terms, and then to put this information within the context of the cultural and social values of the Nawash people.<sup>8</sup>

The Chippewas of Nawash First Nation is located at Cape Croker, Ontario approximately 64 kilometres north of Owen Sound, and an approximately four-hour drive westnorthwest of Toronto. The First Nation lands comprised 15,500 acres with three sides surrounded by the waters of Lake Huron and Georgian Bay, both part of the Canadian Great Lakes in central Canada. The key concerns about the value of the resource and how it affects community well-being include the following: Could the fishery be managed better so as to improve the long term sustainability of the fishery resource? Is there a better way to optimize the catch? Is there a better mix of boat and other capital stock than is currently used? Is Georgian Bay generally being managed to support sustainability of the commercial Nawash fishery?

Key characteristics of the fishery and the community:

- Given the nature of the reserve and its region, fishing is, and has always been, the main source of on-reserve employment that is not within the public service.

- The Nawash fishery is unique in Canada in that it is managed by the owners of the resource. This right was recognized by the courts in 1994 when it was established that the Nawash had operated a commercial fishery before first European contact.
- Other commercial and recreational fisheries in the Great Lakes are managed by some level of government.
- The Nawash fishery is characterized by a relatively small number of fishers and close contact among fishers. This provides a set of circumstances which is conducive to encouraging good resource stewardship with optimal extraction based on a whole-of-fishery impact assessment. Internalizing the impact of catch has the potential to avoid the open access problems typical in common property resources without intervention.
- A major concern is that the whitefish stock—the stock of the commercial catch of the Nawash fishery—is being depleted by habitat competition and predation by salmon. Salmon are not native. They are stocked by the sports fishing community which lives outside the Nawash community and typically is not permanently local.
- Salmon may not be caught commercially, they are strictly for recreational use, and they do not reproduce naturally in the Great Lakes.

Information has been gathered through interviews and sharing of memories. Based on the information gathered, a bio-economic model of the fishery was constructed, which indicated that through its effect on stock size and optimal harvest of whitefish salmon predation has a significant negative impact on the present value of the Nawash fishery, and it is likely that the fishery is over-capitalized. These general results would hold under a range of circumstances; however, better biological information on all fisheries and the rate of stocking of exotic species is required to derive specific management changes for the fishery.

The economic evaluation was assessed within the context of community well-being and the realities of the control the Nawash have over the joint use of the Great Lakes to support a number of fisheries. The main conclusions of the research were: 1) a lack of opportunities for investment off-reserve is potentially encouraging over-investment in the fishery; 2) due to the importance of the fishery to the community, the decline of the fishery would cause non-trivial community-wide impacts on the Nawash; and 3) predation and habitat competition by stocked exotic fish are detrimental to the Nawash commercial fishery under any set of parameters; however, there is no mechanism by which the Nawash could control this effect, which was modeled as pollution.

The outcome of the collaborative work was far-reaching. The results were shared widely with resource managers, and management strategies were modified. The success of the process has no doubt been due to the fact that the information was: 1) collaboratively generated; 2) freely shared; 3) provided in a way

that managers could understand;<sup>9</sup> and 4) both quantitative and qualitative, which allowed a range of interested groups to understand and identify with the conclusions. This work has continued with improved biophysical information gathered, further analysis, and a more comprehensive and inclusive resource management approach being developed and adopted over the past decade (Chami et al 1997; Crawford 1996).<sup>10</sup>

### ***Stated Preference Techniques***

Stated preference techniques including contingent valuation and choice experiments provide the opportunity to ask respondents, through a survey or interview technique, how values change for them under altered conditions. They also allow for estimates of welfare change and investigation of preferences. Contingent valuation may have limited usefulness when it is applied to Indigenous communities. However, notwithstanding this limited utility, contingent valuation comes without a price tag for a number of reasons, including the smaller range of economic experiences and alternatives typical of this group, and a cultural approach that holds health of the country basic to all existence. Alternatively, as discussed below for one case study, the opportunities for choice experiments may be very promising.

### ***Contingent Valuation Method (CVM)***

Shaun Awatere (2005) used a CVM approach to estimate the values held for changes in the environment in New Zealand where the response was expected to be culturally influenced. He used cultural indicators to segment the respondents by their commitment and involvement in Maori cultural issues including language (Te Reo), Whakapapa (genealogy), Tikanga (Maori world view), and whanau (other Maori). The Maori worldview is holistic in nature because it embodies historical, environmental, and spiritual values as well as modern experiences.

The case study used was the “Improvements to the Road Surface and Roadside Survey,” which was mailed out and designed to have equal explanatory power for both Maori and non-Maori respondents. Two sets of willingness-to-pay options were offered. One offered improved road services and the other offered improved native plantings for roadsides, thus improving scenery, biodiversity, and erosion control. For the first, the value would be reduced costs in the form of noise, fuel usage, and increased braking capacity. For the second, the costs would be higher for indigenous plantings. Also included were cultural knowledge questions for the Maori respondents. The results indicate that the willingness to pay was not dependent on cultural knowledge with all Maori willing to pay more for improved plantings and for environmental improvements in general.

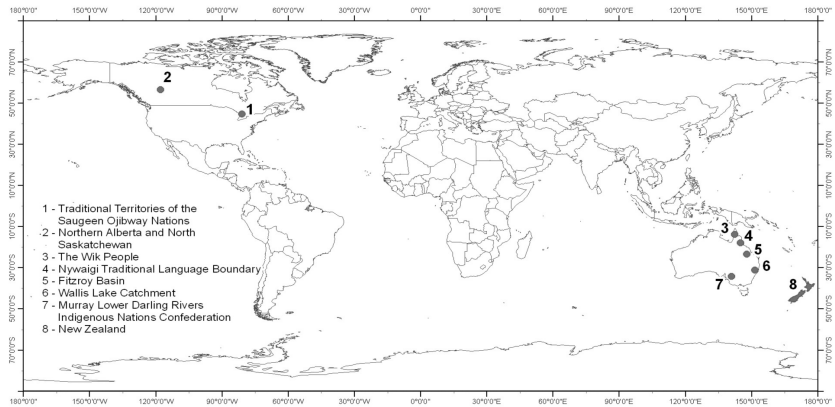
Awatere interprets the results as indicating that to all Maori, it is not appropriate to ask the monetary value of the life-giving force of mauri (life force). This is not only because the question may not make sense, but also because there may be

a perception that there is an intrinsic right to ownership that should not have to be paid for. This has been discussed widely elsewhere (Godden 1999; Adamowicz et al. 1998). In future studies, if CVM is pursued, Awatere recommends that alternative payment vehicles should be tested, including labour or knowledge contributions.

### ***Choice Experiments (Choice Modeling—CM)***

Two studies of the value of non-timber resources to Aboriginal people of the northern Saskatchewan and northern Alberta Boreal forest in Canada report on the usefulness of stated preference and revealed preference approaches (Haener et al. 2001; and Adamowicz et al. 2004). In the first study, a stated preference approach is used, and in the second, a combined stated and revealed preference approach is used with the stated preference information used to account for limitations of the revealed preference approach. The authors note that stated preference (or a choice experiment), is useful because the changes induced by management of forest resources, extraction, and development in general have changed the forest from any state familiar to current users and therefore revealed preference about response to these states in the past, is unavailable. Choice experiments allow the consideration of hypothetical cases that can allow respondents to imagine these altered states. The authors offer two further reasons for using a stated preference approach including: 1) the reality that traditional ways have dwindled with weakened connections to the land in consequence of migration, population pressures, and changing preferences thus revealed preference techniques may not give a good indication of future patterns of activity, and 2) stated preference technique can address choices without revealing private information. When sacred hunting or fishing sites are at issue, this is a valuable attribute of an approach. People can respond to the choices without revealing the secret information. This is in direct contrast to Altman et al. (2004), who also conducted interviews, but who asked for information that may have been considered to be private. In this situation, either the interviewer would need to be adept at extracting good information, or the information extracted may be incomplete. There are ethical considerations with the first and accuracy considerations with the second. Offering choices under the stated preference approach does not eliminate all problems since the choices must reflect real choices and these can only be determined with good, candid local input about the actual situations faced by those using wild resources.

Haener et al. (2001) discuss the importance of trust and reciprocity, or gift giving, during the interview process, as well as the importance placed on sharing results not only with the respondent group, but also with resource managers as users saw this as an important purpose for sharing with the researchers. Results indicated that the value estimated using replacement value of meat is similar to the value of the trip as a whole using choice experiments. However, the stated preference approach is preferred for the reasons discussed above and below.

**Figure 13.3: Value of Resources to Indigenous Peoples: Six Research Study Locations**

While the earlier study focuses on monetary welfare measures (Haener et al. 2001), the second (Adamowicz 2004) extends this by incorporating revealed preference data so as to develop spatially explicit models of resource use. Information was gathered on special sites, which is an important recognition of Indigenous ecological knowledge, and contributed to a supplementary “zonal” approach to resource management where special sites could be identified, mapped, and excluded from logging. The zonal approach is one way to incorporate Indigenous values directly into the management plan without having to estimate the dollar value of the sites. Revealed preference information about actual harvests was collected, as well as stated preference information for the identification of preference for attributes of wildlife harvesting sites where the preferences were influenced by values held for the total experience of hunting and gathering. Data were also gathered about forest characteristics from the forestry company.

The circumstances related to development and the emphasis on eliciting values so as to influence management in these Canadian studies are key similarities with the Murray River research being pursued by the CSIRO in collaboration with the Ngarrindjeri people. For the same reasons, it is likely that a stated preference approach may be a good process to use. As Haener et al. (2001) discuss, stated preference can address change in conditions as a “package” in a way that is more closely aligned with the Aboriginal approaches to holistic environmental well-being and their place in that environment. Replacement cost can only consider the value of a particular part of that environment—fish or moose harvest, which is limiting when a holistic approach makes more sense to the group being considered. However, there are challenges in estimating monetary values when it is difficult to estimate the opportunity cost of time for a group of people not fully active in the labour force. Resource compensation techniques may provide an alternative approach. Morrison and Hatton MacDonald (2006) suggest a budget reallocation approach for an alternative payment vehicle that could be pursued.



### ***Use Value and Non-use Value***

The approaches referred to above estimate use values. Rolfe and Windle (2003) address non-use values in a study that used a stated preference approach to estimate the value of cultural heritage in the Fitzroy Basin in Queensland, Australia. They found that the Indigenous group valued Indigenous cultural heritage more highly than the non-Indigenous groups when there were potential tradeoffs between protection of cultural heritage and development of water resources. The study raised issues about how valuations by different Indigenous groups, Traditional Owners, and other resident Indigenous people could be aggregated together, and aggregated with non-Indigenous groups to estimate total values. It was clear that preference sets are based on different foundations, and therefore, aggregation would be inappropriate. A further process for assigning relative weights for each group's values would be required for NRM decisions.

### ***Goal Programming—The Wik People of Cape York Peninsula, Queensland, Australia***

Venn and Quiggin (2005) suggest that price-based approaches to valuation, as discussed above, should be replaced or complemented by quantitative constraints that reflect the acknowledgment by planners that rights should not be violated. They suggest a multi-criteria analysis approach (MCA) in the form of goal programming, which is a continuous and quantity-based MCA technique. This approach was used with the Wik, Wik-Way, and Kugu people (Wik people) of Aurukun Shire on Cape York in Northern Queensland, northern Australia.<sup>11</sup> (Figure 13.3, Location 3) The goal with this research was finding a design for the commercial extraction of forestry resources that was compatible with the culture of the people. The Indigenous people were not involved in the model design, but they were involved in weighting a comprehensive set of feasible options. This was done in a culturally sensitive way during rest periods, and traditional and contemporary land management planning sessions (Venn 2004).

Venn interpreted the five goals for planning as: 1) maximize total employment generation; 2) maximize employment generation on country; 3) maximize income generation, measured in millions of dollars; 4) minimize forest area harvested south of the Archer River as protection for cultural heritage, environmental protection, and development of other economic ventures such as eco-tourism; and 5) minimize forest area harvested north of the Archer River and outside of mining leases.

Using this technique, shadow prices can be derived for the non-monetary goals. Although goal aspiration levels have not yet been identified, tradeoffs that implied weights could be identified in some cases. The Wik people have not yet come to a conclusion about a specific strategy, and are using the tool to continue to consider their options.

Given the wide variance of Indigenous People, including Traditional Owners, it is questionable if this approach would be appropriate on a basin-wide scale for the Murray; however, in a local region, as for the Ngarrindjeri case study, weighting of options could be incorporated into the overall evaluation of options and opportunities of value to the Ngarrindjeri. In addition, using stated and revealed preference as part of the information base of a goal programming/MCA could enrich the understanding of options, and perhaps encourage more clear choices and weighting for the Ngarrindjeri than was possible for the Wik people. This option could be explored collaboratively during the process of understanding what is important to the Ngarrindjeri people.

Venn and Quiggin (2005) caution against the use of stated preference approaches for a number of the same reasons discussed elsewhere in this paper. However, they emphasize that using a valuation approach may be an inappropriate strategy for policy analysis, in part because any values that are incomplete could compromise the Native land title claims made by traditional owner groups. This is an important point that needs to be heeded. However, it is not necessarily the case that partial information is bad information. If the information is gathered within a context that clearly defines it as partial, then there could be no claim that the partial value covers total value.

Venn and Quiggin recommend an iterative approach that does not involve economists “parachuting” into communities to elicit values using techniques that are incomprehensible to the people. We agree that this would be a costly option, both in monetary and non-monetary terms. It would not be useful. For this reason, we have worked over the past two years with the people in the Murray Basin to understand what can be done. This paper, and the work it summarizes for others, contributes to a sharing of information and inclusion of the people in a process of finding a workable solutions to understanding values, benefits, and acceptable management options.

Venn and Quiggin also recommend a quantity approach that is bounded by minimum acceptable protection levels for cultural heritage as constraints bounding the decision space. As an overall management planning tool this approach could circumvent the focus on values and benefits that derive from water in the same way that the MDBC used background information about biophysical and economic outcomes of various environmental flow options to decide to allocate 500 gallons under the Living Murray “first step decision” discussed above. However, for TLM, there was a great deal of valuation work done that underpinned this decision, and it is likely that any further decisions concerning cultural flows, for example, would need to be supported by a similar range of informative studies that address the values of the diversions, if not the exact total monetary value (For example: MDBC July 2004; Brennan 2004; Bennett 2002; CRCFE 2003).

## Conclusions

As this review has illustrated, there is no one way to evaluate benefits that derive from resources when there is no simple set of market prices for valuing the outcomes. The challenges are greater than for activities such as agriculture where much of the value would be expected to be for market values. This is the research challenge. However, this is not the only challenge. The ultimate challenge is to adapt the tools we have to a situation that reflects the social welfare concepts that are relevant for Indigenous communities and individuals. The emphasis is on developing an approach that draws on established approaches, and is firmly based on a collaborative process that seeks to find a common language and common understanding of what it means to estimate the value of resources to specific groups or communities of Indigenous people.

Equally challenging is the need to express the information about values in a way that will induce management change. If cultural flows are to be allocated in the Murray Basin, it is likely that there will need to be evidence that benefits will increase if flows are diverted from profitable agricultural and urban uses. This evidence will need to be understandable to the river managers. The precedent has already been set in the Murray Basin with environment flow allocations. Although the value of the environmental flow was not estimated beforehand, it was assumed that a chosen level of environmental flow would be sufficient to attain positive outcomes. These positive outcomes reflect a change in condition that could be measured *ex post* to any augmented flows. Key here is that although the total value was not known beforehand, it was assumed and accepted that the value would be positive. The assumption was based on a great deal of supportive biophysical information about the relationship between flow and environmental benefit, which was available before TLM “first step” was taken. Hence, it is likely that before any cultural flows could be expected to be allocated, it would be necessary to provide at least some supportive evidence that positive benefits would be generated. The collaborative research with Indigenous people to delineate the benefits that flow from water could provide the evidence required to support the allocation of flows for cultural purposes. This is especially true when Murray flows are over-allocated to agricultural and urban uses, as they have been recently, and any diversion for cultural purposes could potentially result in direct declines in agricultural and other industrial output and value.

In conclusion, the review provided here suggests the following recommendations:

1. The process for communication could benefit from an approach such as that used by Greiner et al. for the well-being approach. From the first meetings onwards, the workshop approach in focus groups and the collective mental modelling could provide a good foundation for sharing information in a

group setting with Ngarrindjeri people from a range of age and interest groups, and with researchers. Hence, mental modelling towards development of a well-being index may be one approach that could not only provide a useful set of indicators, but could provide a format for sharing information, and understanding which other valuation methodologies are most appropriate.

2. As this overview has indicated, replacement value could provide a first step in the analysis of how resources are valued, but this approach does not allow for estimates of changes in value if future conditions were to change. For this, bio-economic modelling as for the Nawash fishery can provide estimates of the impact of management change on the value of resources. Stated preference methods such as CVM can provide further information about values as a willingness-to-pay estimate. Where CVM falls short in being able to value changes in intangibles such as cultural identity, choice experiments could indirectly elicit information about the cultural values attributed to different potential outcomes. In the limit, where values are not estimable, a goal programming approach that acknowledges a necessary amount of cultural flow may be a beneficial approach if it focuses on cultural flows as described by Morgan et al. (2004) in a way similar to environmental flows allocated under the MDBC Living Murray initiative.

These recommendations were offered for discussion with the research partners for the case study underway in the Murray Basin. Hopefully, this process of discovery can inform others in their collaborative research. With each of these approaches in turn, there can be an iterative accounting that addresses the determinants of social welfare, and therefore approaches a fuller picture of the value of the benefits that derive from water resources for Indigenous people of the Murray Basin. The body of knowledge built in support of identifying values of resources could provide evidence for supporting better resource management and policy development.

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## Endnotes

- 1 Murray-Darling Basin Ministerial Council. (2003). *Communiqué on the First Step Decision of The Living Murray*, November, Canberra.
- 2 Economist and Policy Analyst, Social and Economic Integration—CSIRO Emerging Science & Policy and Economic Research Unit—CSIRO Land and Water.
- 3 Director & Ecological Economist, River Consulting.
- 4 Information is from the MDBC website: [www.mdbc.gov.au/river\\_murray/river\\_murray.htm](http://www.mdbc.gov.au/river_murray/river_murray.htm).
- 5 These shares refer to the whole of the Murray-Darling Basin of which the Murray Basin forms the southern portion. Figures for the Murray are not available independently at this time. All estimates are based on Taylor and Biddle (2004).
- 6 A regional natural resource management body in northeast Australia that provided financial sponsorship for the research. The Nywaigi people are one of 11 Traditional Owner groups in the region that the Board administers.
- 7 An extension could be the UN Human Development Index as used by Cooke et al. (2004) in Canada; however, the statistical base in Australia may be a limiting factor, and at its best this indicator is useful for whole-of-country comparisons rather than for evaluation of local conditions. Furthermore, the index uses three types of indicator: income, education and health whereas well-being goes beyond these three indicators as discussed in this section.
- 8 For the most part, this section draws directly from the report presented to the Nawash which is summarized in Chami et al. (1997).
- 9 This applies to the Nawash people, the state managers, the fish biologists, and the recreational fishers. Previously heated confrontations and intimidations reported in the press were defused by the objective analysis.
- 10 [www.uoguelph.ca/%7Eescrawfor/research/research\\_greatlakes/research\\_greatlakes\\_fisheries/research\\_greatlakes\\_fisheries\\_basins/research\\_greatlakes\\_fisheries\\_basins\\_huron\\_commercial.shtml](http://www.uoguelph.ca/%7Eescrawfor/research/research_greatlakes/research_greatlakes_fisheries/research_greatlakes_fisheries_basins/research_greatlakes_fisheries_basins_huron_commercial.shtml).
- 11 They discuss the drawbacks of cost-benefit analysis that would use a price-based approach to including values.

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