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Main Article:

Introduction of Social Sciences in Australian Natural Resource Management Agencies

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Abstract

This paper examines the integration, from 1978 to 2002, of six social scientists in five Australian natural resource management agencies: CSIRO Australia, the Great Barrier Reef Marine Park Authority, the Murray Darling Basin Commission, the Western Australian Social Impact Unit, and the Queensland Social Impact Assessment Unit. All but one of the social scientists in the study occupied the first formal social science position in the respective agency. The organisational arrangements for integration, the roles of the social scientists and achievements of social science programs in those agencies illustrate a number of integration approaches and insights for effectively integrating social and natural science. Insights emanating from this research will be useful to inform future natural resource management that avoids integration failures. This paper illustrates both significant impediments to integration in practice and positive examples of integrated multidisciplinary approaches in natural resource management.

Keywords: natural resource management; integration; social science; Australia

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1. Introduction

Understanding the human dimension of natural resource management is a pressing research and management priority of almost every natural resource management policy and research and development agency. This imperative is frequently expressed in terms of enhancing public participation, improving adoption of research innovation by stakeholders, and furthering the ability of biophysical and social scientists to talk meaningfully to each other about natural resource management problems.

Social scientists working in natural resource management and development planning agencies explicitly recognised, in the mid 1970s, that people were the central drivers of environmental degradation and sustainable resource management. Natural resource management issues have long been viewed as predominantly biophysical in nature. The introduction of social scientists, particularly behavioural scientists working from a constructivist perspective and sometimes using a qualitative methodology, has not always been easy. This paper focuses on the integration of six social scientists into five Australian government and statutory agencies that deal with issues of natural resource management.

This paper is based on a research project that involved in-depth interviews with five natural resource management agencies, six social scientists--five of whom occupied the agency's first social science position--and their managers. The project included a literature review on integration across disciplines and an analysis of the annual reports of the five agencies from 1977 to 2001.

This paper focuses on the conditions that facilitated interdisciplinary integration in the five agencies and the impediments to effective integration. It briefly considers the argument for integrating the social sciences into natural resource management and then reviews the findings from the research project about this integration in practice.

2. Why Integrate Social Science into Natural Resource Management?

> Social sciences frame the context in which other knowledge can be applied; questioning the fit between that knowledge and its context and evaluating its purpose; and providing a critique of science and technology which is valuable as an input to technological decision-making from the beginning. (Australian Science and Technology Council, 1993, p. 13)

Natural resource management problems are rarely the domain of a single conventional discipline due to their scope and diversity. Efforts to integrate knowledge and skills across disciplines can enhance our ability to establish competencies to address these multi-dimensional issues. Social science is pivotal as it brings to natural resource management expertise in interpreting human activity. Human activity is a central consideration for natural resource management. The prerogative of the social sciences is to frame the context for natural resource management through development of theory based on the many different assumptions about resources, environment and quality of human life. The context is one into which other knowledge, including that derived from the biophysical sciences, can be applied.

2.1. The Imperative for Integration

Much uncertainty surrounds integration due to lack of a unified body of discourse but the dispersion of discourse is most important. Confusion is frequently apparent between the terms *integration* and *interdisciplinary*. Integration incorporates the idea of people from different disciplines bringing their knowledge and methods to bear on a particular problem in a particular place at a particular time with a common purpose. It encompasses an assumption that there is a willingness to share and exchange knowledge. The aim of synthesising knowledge from different disciplines is to arrive at a conclusion or solution which brings together insights from the contributing disciplines (Gibbons, Limgoes, Nowotny, Schwartzman, Scott, & Trow, 1994; Klein, 1990; Rossini & Porter, 1984; Roughley, 1998).

Natural resource management engages a multitude of disciplines within the biophysical and the social sciences. This involves consideration of the different epistemological and methodological paradigms with competing views on why a problem exists in the first place, how it has manifested, and what are the best ways to arrest or address it? Take for example salinity, a major and so far intractable environmental management problem. The geomorphologist, social psychologist, environmental planner, geographer, agricultural extension officer, botanist, economist, senior policy officer, government minister, farmer, and the local conservation group would have quite different answers to the above questions.

Literature dedicated to understanding multidisciplinary integration suggests that integration in natural resource management is best conceived as an amalgamation of the bodies of knowledge identified as essential to solving a specific problem. It is a means of solving

problems and answering questions that cannot be satisfactorily addressed using single methods or approaches. This scenario typically applies across natural resource management.

The positive experiences of integrated multidisciplinary approaches in natural resource management reveal that integration of knowledge occurs most effectively in small, non-hierarchical structures where team members have equal status and the leader is generalist in orientation (Booth, Frost, Rodgers, & Bukerup, 2001; Klein, 1990; Rossini & Porter, 1984). Integration across disciplines occurs when problems are formulated in terms that genuinely enable the different disciplines to work in close collaboration, without competition. Integration is also facilitated where the method of data acquisition is helpful to all the relevant disciplines, not biased in a particular direction. The test of effective *integration research* is when its results make a difference to the policy decisions eventually taken (Klein, 1990).

Environmental impact assessment emerged through legislation in the United States in 1969 (National Environment Policy Act of 1969) and in Australia in 1974 (Environmental Protection [Impact of Proposals] Act of 1974 [Commonwealth]). In the conduct of Australian environmental impact assessments, the anticipated effects of development on people, communities, and lifestyles are typically segregated. Environmental impact assessment reports have predominantly focused on biophysical impacts although integration of social assessment is a condition required under the legislation (Cox, Dale, & Morrison, 2001; Roughley & Scherl, 1992).

A common assumption is that integration can assist in finding an ecologically sustainable balance among these competing imperatives. The challenge that remains is to avoid a mere accumulation of knowledge supplied from more than one discipline (Rossini & Porter, 1984). Integration methodology is rather nascent. There remains a tension in the integration discourse between those who view integration as a philosophically conceived synopsis and those who view it as a practical toolkit (Klein, 1990).

3. The Context and the Actors

Natural resource management operates at a number of levels. The agencies discussed in this paper (i.e., CSIRO Australia, the Great Barrier Reef Marine Park Authority, the Murray-Darling Basin Commission, and the two state-based social impact units), represent the management level sandwiched between policy and on-ground implementation, with a

responsibility to service both. These agencies generate information about the nature and extent of resource management problems and methods for addressing those problems. Transmission of innovations for on-ground management is essential but complex, given the separation of the agencies from the end-users of their products.

The period of this study (1978-2002) was one when significant contradictions confronted natural resource management agencies rendering the "business" of running a natural resource management organisation an unenviable task. Introduction of neo-liberal economic policy coincided with a realisation that natural resource management turns on changing social and cultural practices that operate against sustainable resource management. Amidst these conflicting imperatives, CSIRO Australia, the Great Barrier Reef Marine Park Authority, the Murray-Darling Basin Commission, and the two social impact units created positions for social scientists.

3.1. CSIRO Australia

CSIRO Australia (more often referred to simply as CSIRO) began as the Institute of Science and Industry in 1921. CSIRO's two primary functions in 2001 were to:

- carry out strategic scientific research to assist Australian industry, and further the interests of the Australian community; and to contribute to national and international objectives and responsibilities of the Australian Government; and

- encourage and facilitate the application and use of the results of its own or any other scientific research. Secondary functions include international scientific liaison, training of research workers, publication of research results, and dissemination of information about science and technology (CSIRO, 2001).

CSIRO innovations covered diverse areas, from methods to eliminate diseases affecting crops and animals, to enhanced food and fabric production techniques and information technology (CSIRO, 2001, Autumn). At the time of appointing its first social scientist, Geoff Syme, in 1978, CSIRO was beginning to engage in environmental and natural resource management-oriented research, particularly in relation to water supply and quality

Syme, a social psychologist, joined CSIRO in Western Australia in 1978. His position was one of three in a new multidisciplinary program that was introduced to bring about a return of some applied research that would "have a broader public influence."

The year after Syme's position was established the CSIRO annual report claimed that the focus of CSIRO was strictly biophysical scientific research and development and that it did not have a direct role in undertaking social science research, suggesting that other agencies should carry that responsibility (CSIRO, 1979). By the 1980s the research focus had broadened:

> CSIRO needs a broadly based research capability and expertise in a range of disciplines... It must have ways of determining which areas the community considers to be most important and to require an input, and it needs to take account of information and advice from the community on factors that may be important in formulating research policy, priorities and resource allocation. (CSIRO, 1981, p. 17)

A new strategy, i.e., multidisciplinary research teams, was heralded by CSIRO in 1985 in pursuit of more holistic solutions to salinity, soil, and water quality problems (CSIRO, 1992).

Syme is now the Director of the Australian Research Centre for Water in Society at CSIRO. He has continued his work at CSIRO because, in his words:

> We really believe that better social ideas, even if we are not the ones to present them, or even if we come up with some dud [failed] ones, at least create a choice amongst social ideas, which is a really good thing for us to have in this country at the moment. (G. Syme, personal communication, September 20, 2001)

3.2. Great Barrier Reef Marine Park Authority

The Great Barrier Reef Marine Park Authority is a statutory body vested with responsibility for management of the Great Barrier Reef Marine Park. The Park includes the largest system of corals and associated life forms anywhere in the world, covering almost 300,000 square kilometres. The area includes over 2,900 individual reefs, 1,500 species of fish, 400 species of coral, 300 reef islands or cays, and 600 continental (or high) islands (Muldoon & Kenchington, 1998, April).

The Authority was established in 1977. In 1981 the Great Barrier Reef was inscribed on the World Heritage List based on its outstanding natural features and its integrity as a self-perpetuating ecological system. The Great Barrier Reef Marine Park Authority is the principal adviser to the Australian Government on the care and development of the Great Barrier Reef Marine Park. State agencies in Queensland carry out the day-to-day

management of the Marine Park subject to the Authority's mandate. The Authority undertakes a variety of activities including:

- developing and implementing zoning and management plans;
- environmental impact assessment and permitting of use;
- research, monitoring and interpreting data; and
- providing information, educational services and marine environmental management advice.

Unlike CSIRO, with a mandate to conduct research, the Great Barrier Reef Marine Park Authority plans the research framework, funds, commissions, and manages research projects but rarely undertakes research activity directly. With progressive deterioration of the reef and the park's ecological systems, the role of the Great Barrier Reef Marine Park Authority became increasingly focused on environmental protection and regulation in the late 1970s and 1980s. The Authority's research priorities in that period were:

1. marine research;
2. impact of human uses of the Marine Park; and
3. demographic, social, and economic studies to anticipate changing patterns (Great Barrier Reef Marine Park Authority, 1978).

The stated aims of the Authority were revised between 1985 and 1987 along with subtle changes in the terminology of the aims. Meaningful involvement of the community exchanged its place on the list with the broader environmental protection aim and moved down a notch. These changes, occurring within just a couple of years, were quite possibly in response to the fact that the reef users were not modifying their behaviour. The reef environment was deteriorating.

The Authority's activities now operate through four critical issues groups (based on the major threats to the reef):

- Fisheries;
- Tourism and Recreation;
- Water Quality and Coastal Development; and
- Conservation, Biodiversity, and World Heritage.

Lea Scherl, psychologist, started work at the Great Barrier Reef Marine Park Authority as a Project Officer for Social, Cultural, and Economic Research in the Research and Monitoring Program in 1990, in Townsville, Queensland, on the north-eastern seaboard of Australia. The five other research areas in the program were all biophysical:

- water quality;
- crown-of-thorns starfish;
- fishing;
- reef monitoring; and
- oceanography.

Each research area had an executive level coordinator. Scherl occupied a lower level position and reported directly to the overall Program Manager. Dominique Benzaken, with qualifications in pharmacy, zoology, and environmental psychology, took up the position at the Great Barrier Reef Marine Park Authority when Scherl left.

3.3. Murray-Darling Basin Commission

The Murray-Darling Basin Commission is responsible for advising the government on matters related to the environmental resources of the Murray-Darling Basin. Australia's Murray-Darling Basin extends across one-seventh of the continent and generates about 40% of the national income derived from agriculture and grazing. It supports a quarter of the nation's cattle herd, half of the sheep flock, half of the cropland and almost three-quarters of its irrigated land. The Basin contains more than 20 major rivers as well as important groundwater systems. It is also an important source of fresh water for domestic consumption, agricultural production and industry (Murray-Darling Basin Commission, 2002). The Basin's natural resources are of high environmental value. Its wetlands are extensive and support and maintain the productivity and health of the river systems. They are recognised under the Convention on Wetlands of International Importance (Ramsar Convention). Changing patterns of land use have groundwater impacts which are felt hundreds and even thousands of kilometres downstream (Murray-Darling Basin Commission, 2002).

The Murray-Darling Basin has an essentially rural population that accounts for an estimated 10% of the total Australian population (Australian Bureau of Statistics, 1994). Many people live on farms, dispersed geographically over long distances. The remoteness has a range of economic and social consequences including very limited access to services and facilities.

The increasing problems of rising water salinity and irrigation-induced land salinity are critical issues that cross state boundaries. The national government and all five Australian state governments signed the Murray-Darling Basin Agreement in 1987. The purpose of the Agreement is "to promote and coordinate effective planning and management for the equitable, efficient and sustainable use of the water, land and other environmental resources

of the Murray-Darling Basin" (Murray-Darling Basin Commission, 1999, p. 38). A Community Advisory Committee to the Commission provides the Ministerial Council, which is constituted of ministerial representatives from the national and each partner state government, with a two-way communication channel between the Council and the community. The Murray-Darling Basin Commission was officially established on 1 January 1988, with 19 staff. Approximately half were engineers or natural scientists and the other half administrative staff. In 1994, the major strategy of the Commission was to conduct research at local and regional scales and to increase public involvement in planning and management as well as in identification of research priorities. The Commission embraced the concept of integrated catchment management.

The Commission allocated AUD 340,000 of its Investigation and Education Program budget of AUD 867,645 to socio-economic research in 1994 and also established a Community Participation Coordinator position--a dedicated social science position. The objectives of the position were to:

- coordinate and facilitate effective community participation in significant Basin-wide issues; and
- provide expert advice on community participation to the Commission and the contracting governments (Murray-Darling Basin Commission, 1995).

Esta Knudsen, with qualifications in social science and humanities, and experience in community development, was appointed to the position.

3.4. Social Impact Unit, Western Australia, 1989-1992

In the early 1980s, a new Western Australian labour government election platform was to create a new and better environmental protection law. The new Environmental Protection Act of 1986 (Western Australia) was administered by the Chairman of the Environmental Protection Authority. By 1999 it had become apparent that implementation of the Act was impeded by public controversy over proposed development in Western Australia, particularly large-scale mining developments.

Towards the late 1980s, there was a plethora of proposals for large-scale development projects in Western Australia. Some had been stalled due to a confrontation between developers and community opponents; yet about 85% of the gross domestic product in Western Australia came from resource development--not just mining but gas, timber, and down-stream processing. As a result of growing political frustration with delays in the

development projects and the associated controversy, a Social Impact Unit was established in 1989, within the Department of Resources Development with Anne Verschuer as the founding Director. She had a direct line of reporting to the Deputy Premier.

The Unit drew its power from and worked under the Environmental Protection Act of 1986 (Western Australia). Through the Act, the Social Impact Unit was empowered to require development proponents to undertake a social assessment of their proposed development.

The mission statement of the Social Impact Unit was to ensure that development projects were good for the people as well as good for the developers. The Unit's objectives read:

Those who have an interest are able to make informed, fair judgements on social issues. Government agencies, communities and developers involve the public in decision-making. Developers address the social impact of their proposals in the best interests of the community.
Communities can readily access opportunities created by development projects. Social issues relating to developments are managed in a consistent and planned manner. Systems of social impact assessment and management are efficient and effective. (Social Impact Unit Western Australia, 1990, p. 1)

Lisa Pollard, anthropologist with experience in working with Australia's indigenous people, was appointed as Project Officer in the Unit.

In 1991, the Unit consisted of six staff, the manager, an environmental psychologist, planners and an anthropologist. The unit facilitated public participation in development planning to educate proponents, agencies and communities to work in cooperation. A substantial function of the Unit was to assess social impact assessment reports to ensure that potential social impacts of a proposed development were identified, negotiated, and mitigated to the optimum level. The goal was to support approval for developments that were socially acceptable. Development proponents were required through the Environmental Protection Authority to come up with solutions that were acceptable to the community. In effect, the unit had two clear roles: The first was to facilitate public participation or public problem solving, and the other was formal assessment.

Once the Social Impact Unit was operational, the Environmental Protection Authority required development proposals in very early draft stage. They set guidelines for environmental assessments that would be required and formally referred the proposal to the

Social Impact Unit for recommendations for the necessary social assessment processes. The Social Impact Unit then wrote the social considerations for incorporation in the Environmental Protection Authority guidelines. The Unit closed following a change of government in Western Australia in 1992.

3.5. Social Impact Assessment Unit, Queensland, 1993-2000

Established in 1993, Queensland's Social Impact Assessment Unit was located within the then Department of Family Services and Aboriginal and Islander Affairs, Queensland's social welfare agency that delivers a range of programs to socially disadvantaged sectors of the community. Allan Dale, with undergraduate qualifications in agricultural science and a doctorate in social and cultural impacts of development on indigenous communities was appointed to the position of manager of the new Social Impact Assessment Unit.

At the time the social impact assessment unit model was adopted, the broad goal of the Department was to improve and coordinate efforts between the different spheres of government, industry and the non-government sector to provide effective responses to community need (Dale & Crisp, 2001). The Unit was the first lead agency in social impact assessment in Queensland. Prior to the Unit's establishment, social issues were rarely considered in the concept phase of development planning. Community controversy over proposed development was prominent (Dale & Lane, 1995).

Prior to 1993, there was no formal system in place in Queensland for cooperative development of environmental and social guidelines for new proposals, in spite of existing legislation that incorporated social, economic, aesthetic, and cultural conditions in its definition of "environment" (Local Government [Planning and Environment] Act of 1990 [Queensland]). It was solely the responsibility of the Department of Environment and Heritage, for example, to ensure that biophysical and cultural heritage issues were adequately addressed in impact assessments. Impact assessments were commonly undertaken by engineering/environmental science consultants with an absence of relevant social theory and poorly structured public involvement (Dale & Crisp, 2001).

The Unit's objectives were to:

- promote the integration of social planning and assessment with land use planning;
- provide resources and training to achieve a consistently high quality of social planning and assessment;

- develop sound policy frameworks and standards for the integration of social planning and assessment with land use planning;
- facilitate social planning and assessment research and improve government, industry and community access to relevant social data; and
- establish social assessment as an integral part of the policy and decision-making processes of government.

Following its formation, the Social Impact Assessment Unit appointed qualified social planners at the regional level to carry out the Department's lead agency function within the "whole of government" approach to land use planning and impact assessment. One generalist social planner was appointed in each of the five regions of the Department. Five specialist social planners were also appointed throughout the State of Queensland to deal with cultural heritage issues concerning the Aboriginal and Torres Strait Islander peoples, such as sacred sites that could be threatened by a development project (Dale & Crisp, 2001).

In 2000, the Social Impact Assessment Unit ceased to formally exist. Unlike the three natural resource management agencies discussed here, the two social impact units had a brief and finite lifespan.

Similarly, in the mid 1980s there was public criticism that the Great Barrier Reef Marine Park Authority had not conducted a comprehensive social survey in their management planning of a particular sensitive area of the reef. The Social Impact Units in Western Australia and Queensland were born largely out of heightened concern over the social consequences of land use and development. While each state government was required to account for the human dimension of any development, their environmental protection laws and authorities lacked the capacity to appropriately deal with social impacts.

3.6. Discussion

A key motivation for initiating social science positions in CSIRO, the Murray-Darling Basin Commission and the Great Barrier Reef Marine Park Authority and for establishing social impact units was growing public concern over environmental degradation and the manner in which resources were being managed. For example, according to Esta Knudsen, the catalyst for the Murray-Darling Basin Commission employing a social scientist was vocal public protests along the Murray-Darling in response to varied results from projects the Commission had carried out. There was public pressure on the Commission for genuine public participation in the management of the river.

4. Integrating Social Science in Practice

Dedicated social science positions began appearing within natural resource management agencies in Australia in the mid to late 1970s. Over more than two decades the six social scientists who participated in the research were single individuals in generic management or research positions.

4.1. Expectations of the Social Scientists

Each of the six social scientists interviewed entered a position that was largely unformed and each experienced their position as a challenge on both personal and professional levels. CSIRO, the Great Barrier Reef Marine Park Authority and the Murray-Darling Basin Commission, with long histories and strong cultures as essentially biophysical science agencies created social science positions with limited arrangements for their inclusion in the agencies' activities. Syme, Scherl, Benzaken, and Knudsen had broad job descriptions. Five of the six recalled that when they were interviewed for the positions the interviewers demonstrated only a vague understanding of social science and therefore of the position.

At the time when the social scientists commenced in their positions, their managers' expectations ranged from "getting results quickly" in the arena of changing community attitudes, to developing "a system" for engaging the community in natural resource management. These things, of course, do not happen quickly. While all social scientists said their employers were initially quite vague about what they could contribute, there was a general expectation they would:

- engage, educate and at times, placate the community;
- directly undertake, design and/or manage research; and
- play a key if not lead role in establishing multidisciplinary integration across the agency.

4.2. Social Science Research and Practice

The social scientists performed multiple roles in these positions and the activities they undertook illustrate that "social science" incorporates many disciplines and that individual practices and practice strategies vary greatly.

Predominantly, all six social scientists worked from a community development model that involved:

- bringing people together and encouraging the recognition and ownership of needs and functions;
- translating needs into strategies for action;
- forming coalitions with others who have interests in common; and
- challenging power relationships and structures to redress inequalities (Lynn, 1994).

In spite of expectations that they would appease public disquiet and change behaviour and attitudes of resource managers and users, all were informed by an ethical code. For example, Syme said the ethical basis of his practice was to work with people to assist them in finding useful solutions but never to treat them as subjects of change: "Research should assist in addressing the community's problems not just supply information about the community for the purposes of the research of biophysical scientists. It should be partnership not paternalism" (G. Syme, personal communication, September 20, 2001).

The social scientists introduced qualitative and participatory approaches to organisations with a natural science understanding. These research and management models were often viewed in the agencies as not scientific, being less rigorous than positivist science. In the Murray-Darling Basin Commission, CSIRO and the Great Barrier Reef Marine Park Authority, as well as in the external groups that the social impact units worked with, the qualitative, participatory approaches were considered to be a matter not of science at all, but of common sense. The prevailing attitude towards social scientists was less than sympathetic, summed up well by the expression: "When it comes to the social, everyone's an expert." Three managers identified this as one of the most challenging barriers to effectively integrating social science in natural resource management.

The expertise of the social scientists ranged from undertaking research and conducting social impact assessments to managing impact assessment teams, establishing research programs and managing relationships between the agencies and their stakeholder groups. They applied social science to a wide realm of natural resource management contexts, from water quality, to fisheries, agriculture, mining, and sustainable catchment management. Specific projects the social scientists initiated and/or conducted included designing a new geographical information systems approach to monitor tourism activity on the Great Barrier Reef, development of decision-making frameworks, catchment management plans, dam safety guidelines, environmental valuation methods, infrastructure plans for new developments, and demand management plans for water, to name only a few of their activities.

All six social scientists, with grand expectations placed upon them, embraced a professional social science research approach based on theoretical foundations and their respective values. Between them, they carried out a range of projects through various approaches from engaging industry to educating extension officers to ensuring socially acceptable development and establishing the social sciences as the key to understanding the human dimension of natural resource management.

In striving to integrate social science, there has been a great deal of frustration as well as a sense of achievement. The social scientists no longer working in the featured agencies (all but Syme) considered that they had gone at least some way in paving a path for social science in natural resource management.

A commonly experienced barrier to integration of social science was that the associated disciplinary knowledge and skills were not recognised. Rather, others in the organisations viewed social science as marginal to the natural sciences. This resulted in one of the social scientists offering social science as a “service” to natural resource management.

A further emergent theme was that the social scientists were solo workers without status. In each case, the social scientist began as one person working across an organisation where all the other single-focus, biophysical programs were represented at a high decision-making level in the agency by coordinators or directors.

A common assumption over the last 20 years has been that the social scientist in natural resource management will not only coordinate the social science function but also coordinate integration. The onus for integrating social science has fallen to the social scientist to a greater degree than it has been the responsibility of the agency management or of other disciplines.

In the area of public participation, the social scientists found that managers and colleagues had little understanding or appreciation of the complexities of public participation and its political nature. Some of the managers expected social scientists to change the attitudes and behaviour of people. While community consultation seemed acceptable, giving them some real power over decisions for future resource management through participatory research methods was not.

5. Impediments to Integration

The social scientists and their managers identified a set of common impediments to integration, and most of those have persisted over the 25 years. Those impediments will be discussed below, under the following headings:

- organisational culture;
- non-acceptance of social science methodology in the natural resource management agencies; and
- dual roles of social scientist/science--manager and integrator.

5.1. Organisational Culture

Neither the agencies' mandates nor their organisational forms incorporated social science; it remained largely undefined but was said to be integral to all of their biophysical silos. In the Great Barrier Reef Marine Park Authority, social science was outside of the policy area where it could have contributed significantly. Syme, Scherl, Benzaken, and Knudsen all built relationships between their work, the biophysical program areas, the broader stakeholder communities and the policy and planning areas--a huge terrain to cover. Establishing structures and processes for communication between program areas remains a complex challenge for these three agencies. Likewise, institutionalising social impact assessment was challenging. Even though the Social Impact Units had legitimacy, one being established by the environment minister, the other being within a government department, they did not survive.

Competition between program areas for resources was also a factor that kept social science on the margins. There is a strong culture of disciplinary excellence in the physical sciences. This perpetuates competition for academic achievement and recognition which has historically been a criterion for attracting research funds. It may therefore act as a disincentive for career-minded scientists to undertake interdisciplinary projects or multidisciplinary integration. Further, not only did integration have few incentives for the traditional physical scientist but it threatened the autonomy and authority they enjoyed as researchers.

The lack of status of the social scientists in the agencies studied illustrates a lack of serious commitment to integration, and acted as a constraint to effective integration of social science knowledge. For instance, Dale was the unit manager but often found it difficult to negotiate high level referral deals with managers of other state government agencies because his

position did not have equal status. Syme reached a point at regular divisional meetings where he did not say anything at all for a whole day because he became so tired of having to ask that the social element not be overlooked.

The social science programs in the Great Barrier Reef Marine Park Authority and the Murray-Darling Basin Commission were combined into the communications programs. Even though Knudsen was a manager and the human dimension had gained program status, she was junior to the Education Manager in the Communication and Evaluation Directorate. Benzaken, Scherl, and Syme also assumed the same roles as biophysical program coordinators in their agencies but did not have recognised coordinator status. It was difficult to build a profile without a budget. Scherl articulated the situation in these words:

> Managers argued that the social science area did not have a big enough budget to warrant a coordinator. That is a catch 22 situation--they could not justify having the budget because the position was not senior and they could not justify upgrading the position because the budget was not big enough. (L. Scherl, personal communication, October 16, 2001)

5.2. Non-acceptance of Social Science Methodology in the Natural Resource Management Agencies

In the Murray-Darling Basin Commission, the Great Barrier Reef Marine Park Authority and CSIRO, understanding of social science theory and methods was limited. The six social scientists and their managers identified the lack of understanding and respect for social science as critical to their struggle for integration of social science in addressing natural resource management problems.

Of the six social scientists, only Dale took up a position in the natural resource management field in an organisation with a human welfare focus. Impact assessment was a new methodology for the department and was embraced enthusiastically. Dale experienced excellent support from management and colleagues in the department. However, gaining an appreciation of social impact assessment methods among the planning and environment departments, where the physical sciences dominated, required much effort.

There are sound arguments for impact assessment to combine technical and participatory methods (e.g., Dale, Taylor, & Lane, 2001; Taylor, Bryan, & Goodrich, 1990). Experience has shown, however, that technical and participatory approaches are informed by a number of opposing assumptions (Craig, 1990). Technical approaches are considered more scientific

and politically saleable. Biophysical environmental impact assessment managers outside the social impact units often discarded the participatory and qualitative impact assessment components. The methodological cleavage was exacerbated because the social scientists were often not involved in projects until a late stage.

Most of the social scientists said they experienced a profound sense of isolation. Not only were the social scientists isolated within the agencies but they were also isolated professionally. Formal networks for social scientists working in natural resource management in Australia have been slow to emerge.

5.3. The Dual Roles of Social Scientist/Science--Manager and Integrator

As new social scientists in the Murray-Darling Basin Commission, CSIRO, and the Great Barrier Reef Marine Park Authority, Knudsen, Syme, and Scherl were expected to integrate not only social science knowledge with the biophysical programs but also to link the biophysical programs with each other. All managers and social scientists interviewed touched on this issue and considered the "integrator" role to be an overzealous expectation of social scientists. Integral to the role of integrator are questions of cultural change.

Integration of social science is difficult in a bureaucracy because the multidisciplinary framework is usually a network model, which in theoretical and operational terms is the opposite of a hierarchy (Klein, 1990). Hierarchies are appropriate for operating a number of single-focus programs, but do not offer models for multidisciplinary integration, yet this has remained the dominant organisational form in natural resource management agencies. Network models remain substantially untested within government natural resource management agencies and will be more resource-intensive because communication will be multi-directional and connectors within the networks will need to be defined and established to replace existing organisational charts.

In the agencies reviewed, the role of integrator was unofficially bestowed to all six social scientists and on reflection, Ms Benzaken realised that a big part of the role they had played was that of change agent. The change in culture had to occur before integration of the different disciplinary perspectives was possible. In the cultures of these agencies, the attempts made by the social scientists to introduce integration were often resisted because they were viewed as something of a takeover. In addition, the social scientists did not have the professional recognition necessary to influence significant organisational or cultural change.

The research project also illustrated a number of strategies that assist in the successful integration of social science in natural resource management agencies and these are discussed briefly in the following section.

6. Strategies to Assist Integration

6.1. Building Relationships

Building relationships was a key strategy that the social scientists employed to assist integration. They identified the different types of relationship they found beneficial. Relationships survive over repeated interactions, involving both give and take. Mutually beneficial relationships generally develop through the establishment of trust. Building trust occurs gradually, over time.

Creating a social science presence was the initial task of the social scientists because their positions were not meaningfully structured into the organisations. All six social scientists made some observations about where social science could make the most important contribution and where the decision-making power was vested. By joining committees they introduced themselves and began to raise awareness about the potential contributions of social science.

When Syme started work at CSIRO, he found the environment to be averse to the ideas of social science. His credibility evolved through relationships he built with industry groups outside CSIRO. Both the water industry and the Environmental Protection Agency were impressed with Syme's work and staff of those agencies returned to him for advice. Over time, this contributed to the increase in his credibility within CSIRO. He worked with people from the water industry in ways that allowed for knowledge exchange across disciplines in the context of specific problems. He started to think of problems in different ways and to understand the problems from, for example, the perspective of the engineers. Syme was then able to assist with ideas for communicating these problems and possible solutions, in simple terms, to the general public and industry groups. As the amount of external funding for social science research increased, CSIRO began to realise that there was a demand for social science and that its products were assisting industry.

> Scherl highlighted her work in training scientists and planners in survey design and implementation as an important relationship and trust building exercise: "It lifted people out of the structure, out of their disciplinary boxes" (L. Scherl, personal communication, October 16, 2001).

Pollard pointed to her work with the Environmental Protection Authority officers on the social perspective as another example of a positive experience of integration. As a facilitator of integration, through her experience as manager of a large multi-cultural impact assessment project, Knudsen also heralded the multidisciplinary team approach.

6.2. Sharing Knowledge

Through establishing mutually beneficial relationships, the social scientists found that it was possible to begin sharing knowledge across disciplines. Dale and Syme suggested that integration is assisted by social scientists contributing a balance of technical and political competence, rigorous data collection and analysis, and the right institutional arrangements to make it work.

Integration through sharing knowledge was also served by having support from those at the top and through credibility. Ms Knudsen led a large impact assessment project with a multidisciplinary team. As team leader she had authority to establish stakeholder engagement strategies. Similarly, the Social Impact Assessment Unit in Western Australia had authority to give formal advice to the Environmental Protection Agency on environmental impact assessment guidelines and on consultation methods. Therefore, it was necessary for the Environmental Protection Agency assessment officers to learn about social assessment. Pollard found that good knowledge exchange relied on using accessible and understandable language.

6.3. The Stamina to Survive

Above and beyond working to integrate social science into natural resource management agencies, the social scientists had to find ways to survive, both personally and professionally. Having a work environment with sympathetic colleagues made this easier for Drs Dale and Pollard.

At CSIRO Syme gradually built a home for social science. The Australian Research Centre for Water in Society provided a definite and dedicated profile for social science research. This organisational model has contributed to an increased profile for and long-term survival of social science research in CSIRO. In Syme's words:

> The Centre is a very team-orientated place and can be rather mysterious to the rest of CSIRO because it operates horizontally. Staff share the up-front roles like presenting research findings. They also share in collegial support,

> camaraderie, when things are not going so well. (G. Syme, personal communication, September 20, 2001)

In the very process of pollinating integration across disciplines, social scientists can easily be lost between their own social science disciplines and the ones more traditionally associated with natural resource management.

Dale was emphatic that social scientists in the natural resource management field need a professional network not only to help them survive on a personal level but to further instil them as a compelling profession within natural resource management.

7. Conclusion: A Future for Social Science in Natural Resource Management

There is no doubt that, even with the struggles these pioneers have experienced, social science is making a significant mark in the arena of natural resource management.

Syme, for example, established a body of social science theory and method directly relevant to natural resource management. His approach produced a demand for social science research and slowly its profile grew and attracted external support. His Centre is recognised for excellence throughout Australia and internationally

Within the current climate that stresses the importance of understanding human behaviour and the human capacity to change, social science is at the very core of resource management. Social scientists deserve to have a professional home which would house particular areas of expertise. Solo social scientists in natural resource management agencies have had limited opportunities for professional development. The early social scientists in this field have struggled to find the time to build networks for professional support and development. Absence of a suitable professional support group had a significant impact on all the six social scientists.

To institute a strong social science program, agencies must be clear on the types of roles they want social scientists to undertake and for what particular outcomes. It is important that natural resource management agencies acquaint themselves with social science theory and methods if they are to be effective in serving their multiple and diverse stakeholders.

The broad catch-all role of social science must be replaced with some clear definitions based on awareness of what social scientists can do and the myriad social science approaches

available. Where an agency requires someone to undertake the role of integrator specifically, the task must be clear. The role of integrator may, but will not necessarily, be filled by a social scientist. In any case it will need to be a strong advocate for inclusion of social science.

Agencies themselves are responsible for providing the infrastructure to enable integration. If social science is to reside beside biophysical programs, it will require equal status, adequate resourcing and several social scientists. Structured opportunities for knowledge exchange among different disciplines will assist integration. Ongoing involvement of social scientists in planning research in all program areas would provide a channel for transmission of the expertise that social science brings into natural resource management and would offer settings for relationship building.

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