THE ENVIRONMENT-STRUCTURE RELATIONSHIP IN ORGANISATIONS MANAGING PROTECTED AREAS

by

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Signed: .....
Colin B. Winkler

Date: 13 March 2002

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ABSTRACT

The widespread and intense interest in the natural environment is not matched with the same concern for the functions and structures of the organisations which manage that environment, and redressing this imbalance is critical to underpinning the stewardship with which these organisations are charged. In seeking to remedy this disparity insofar as organisations managing protected areas are concerned, this Thesis explores the structural and contextual dimensions of the agencies responsible for six of these areas: the Great Barrier Reef Marine Park in Australia, the Ngorongoro Conservation Area in Tanzania, the Annapurna Conservation Area in Nepal, the Peak National Park in the United Kingdom, the New Jersey Pinelands in the USA, and the Central Plateau Conservation Area in Tasmania. The structural dimensions provide the "labels" describing the internal characteristics of each organisation, and create a basis on which to compare the six organisations. The set of core dimensions and allied structural factors used for each agency comprise their levels of delegation, sophistication of control and information systems, complexity, centralisation, formalisation, environmental agility, and infrastructure. The external environment of the organisations forms a contrasting contextual dimension of each organisation, with five variables being examined: heterogeneity, turbulence, hostility, technological complexity, and restrictiveness. Both the structural and contextual dimensions were necessary to evaluate and understand these disparate organisations.

The research proceeds through a review of theory and empirical research which provides tentative propositions on the environment-structure relationship. As the research strategy of choice, the case study adopts an amalgam of conventional comparative study and heuristic study of cases. The natural and socio-cultural environments of each area are explored, together with the way in which the present framework of management and organisation evolved. Information on environmental and organisational variables was obtained from respondents within each of the agencies and from outside observers, using a mix of interviews and structured questionnaires. A prototype profile of the relationship between environment and structure is developed spanning all six case studies utilising complementary qualitative and quantitative analyses to provide indicative information for use in conjunction with material gleaned from secondary sources and follow-up contacts with informants. The profile is embodied in a revised set of propositions offering insights into the way organisational environments influence agencies managing protected areas, and which suggests that an organisation's environment will determine the critical functions the organisation must carry out, which in turn will set the broad parameters of appropriate structures.

ACKNOWLEDGEMENTS

I have been most fortunate in having a unique blending of Supervisor, Colleagues, and Friends who have, in their respective ways, facilitated carrying out this project.

To say that I appreciate greatly the guidance Peter Hay has given me as my Supervisor, would be to understate the case considerably: I have always valued his help and constructive criticism, and his probing questions and observations have been somewhat reminiscent of the late Richard Jones who first helped me to come-to-grips with the complexities of managing protected areas, and with whom Bert Shepherd and I co-authored a paper on the Central Plateau of Tasmania in 1975 - the same year in which Richard became the Foundation Director of the Centre for Environmental Studies at this University.

The many respondents from within the organisations on which this research focuses, as well as those outside observers who freely gave their assistance, must necessarily remain anonymous in keeping with my assurance to each of them, however my gratitude to them is not diminished one *iota* by the fact that I cannot personally thank them here. I especially value the friendships which have grown out of some of these contacts in Nepal, in the United Kingdom, and in Queensland.

For Elizabeth's encouragement to undertake the work in the first place, and for her support over the past four years, I am most grateful.

I could have wished for no better than the new-found Colleagues and Friends who have made this a most stimulating and pleasurable time at the University.

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I am especially grateful for the support afforded by a Tasmania Research Scholarship and by the School of Geography and Environmental Studies which made it possible to pursue my work .

> We trained hard, but it seemed that every time we were beginning to form into teams we would be reorganised. I was to learn later in life that we tend to meet any new situation by reorganising, and what a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency, and demoralisation.

Petronii Arbitri *Satyricon,* 66 A.D.
(attributed to Gaius Petronius)

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GLOSSARY

ACA Annapurna Conservation Area, Nepal

Effectively a core Category II National Park and a large buffer area with considerable values in its own right qualifying as a Category VI area.

ACAP Annapurna Conservation Area Project

A Royal directive in 1985 required the KMTNC to investigate an appropriate protected status for the Annapurna region. The Project commenced in 1986 ahead of legislation adding conservation area status to the authorised types of protected areas.

AIMS Australian Institute of Marine Science

This Institute was established by the Commonwealth Government in 1972 as a Federally-funded and independent statutory authority to generate the knowledge needed for the sustainable use and protection of the marine environment through world-class scientific and technological research.

ANAO Australian National Audit Office

As the external auditor of the Commonwealth public sector, the ANAO carries out performance audits of agencies by evaluating the economy, efficiency, and effectiveness of the management through assessments of resource use, information systems, delivery of outputs and outcomes.

CPCA Central Plateau Conservation Area, Tasmania

As a Category IV Habitat/Species Management Area, this exists within the Tasmanian Wilderness World Heritage Area, and at the strategic level is subject to some Federal and State Government co-management. Day-to-day operations management is, however, exclusively in the hands of the Tasmanian Parks and Wildlife Service through its functional structure. Community involvement occurs through formalised consultative processes and various land user bodies.

DDM Day-to-Day Management

GBRMP Great Barrier Reef Marine Park, Australia

Established in 1975 through Commonwealth legislation, this Category VI Protected Seascape comprises the world's most extensive system of coral reefs.

GBRMPA Great Barrier Reef Marine Park Authority

A Federal Government body with Queensland Government and Aboriginal nominees. A Consultative Committee represents government, industry, and community bodies. A Ministerial Council coordinates the policies of the two Governments. The Queensland National Parks and Wildlife Service carries out day-to-day management for the Marine Park Authority.

CRC Reef Cooperative Research Centre for the Ecologically Sustainable Development of the Great Barrier Reef

The first CRC Reef was established in 1993 as part of the Commonwealth Government Cooperative Research Centre Program, the present CRC coming into existence in 1999 as an incorporated cooperative joint venture between the Association of Marine Park Tourism Operators, Australian Institute of Marine Science, Queensland Commercial Fishermen's Organisation, the State of Queensland through its Department of Primary Industries, the Great Barrier Reef Marine Park Authority, SUNFISH Queensland Inc., and James Cook University.

INGO International Non-Government Organisation

IUCN International Union for Conservation of Nature and Natural Resources (The World Conservation Union)

IUCN Protected Area Categories

Category:	Title:	Managed mainly for:
I	Strict Nature/ /Wilderness Area	science of wilderness protection
II	National Park	ecosystem protection and recreation
III	Natural Monument	conservation of specific natural features
IV	Habitat/Species Management Area	conservation through management intervention
V	Protected Landscape/Seascape	landscape/seascape protection and recreation
VI	Managed Resource Protected Area	the sustainable use of natural ecosystems

KMTNC King Mahendra Trust for Nature Conservation

Established and legally underpinned by the *King Mahendra Trust for Nature Conservation Act,* 1982 (*King Mahendra Trust for Nature Conservation Act* [2039 B.S.] Volume 32, No. 32 [Law #12]). Set up with a broad mandate on natural areas and wildlife linked with the quality of human life, the KMTNC became fully functional in 1984, governed by a Board of Trustees of eminent national and international figures. The Trust receives no Governmental funding, but relies entirely on charitable donations from Nepalese and foreign sources. The Trust appoints the Director of the ACAP.

MAB Man and the Biosphere

NCA Ngorongoro Conservation Area, Tanzania

Established in 1959 as a conservation area in its own right, since 1974 the Crater proper has effectively been treated as a core zone conforming to IUCN Category II, the remainder of the Category VI Conservation Area being managed as a buffer zone to the Crater and the Serengeti National Park, from which the NCA was hived-off.

NCAA Ngorongoro Conservation Area Authority

This is a government owned body incorporated under the Ministry of Tourism, Natural Resources and the Environment. Legally responsible for the management of the NCA, the Authority is managed by a Board of Directors in which the functions and powers of the NCAA are vested, and the Conservator and his staff who administer Board policy and decisions. In the spectrum of State enterprises which runs from direct governmental ownership to joint venture with private firms, the NCAA falls toward the direct ownership pole, and evinces the low level of local representation which characterises many of these "parastatals".

New Jersey Pinelands Established In 1978 by Act of the US Congress, the Pinelands National Reserve is an IUCN Category V Protected Landscape, and in 1983 was designated a Biosphere Reserve by the US Man and the Biosphere Program and UNESCO.

NGO Non-Government Organisation

Peak National Park Peak District National Park, England

The Peak District was designated as a National Park in 1951, the first in England and Wales. The Peak District National Park is currently classified as a Category V Protected Landscape.

Pinelands Commission After establishing the Reserve in 1979, the US Congress called on the State of New Jersey to create a agency to administer the Reserve. Created by gubernatorial Executive Order, the Commission consists of 15 members, variously appointed by the Governor, by each of the counties within the Pinelands, and by the US Secretary of the Interior.

PNPA Peak National Park Authority

The Peak District National Park Authority is both the National Park and Local Planning Authority for the area. The Authority comprises 20 members from the constituent local councils, together with 18 appointed by the Secretary of State either for their national or park-wide viewpoint. The PNPA is by far the largest of the English National Park Authorities.

UNESCO United Nations Educational, Scientific and Cultural Organisation

URT United Republic of Tanzania

WCMC World Conservation Monitoring Centre

Founded in 1988 jointly by the IUCN, World Wide Fund for Nature, and the United Nations Environment Programme as an independent, non-profit organisation. Its present role is essentially that of the world biodiversity information and assessment centre of the United Nations Environment Programme.

PART 1

THE NATURE OF THE RESEARCH

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

> Effective administration of environmental policies must be characterized by the following interrelated features that are necessary to coping successfully with environmental problems. Stating these characteristics as four general propositions, we may see that effective environmental management requires:
>
> (a) A coordinated multidisciplinary approach to environmental problems,
>
> (b) Integration of environmental programs with interrelating efforts in other fields (e.g. agriculture, health, transportation),
>
> (c) Organization matching the scope of tasks undertaken, and
>
> (d) Representation of environmental values at high levels.
>
> Caldwell (1972, 119)

Whilst much has been done in heeding Caldwell's *dictum,* his third proposition appears to have attracted least attention. In fact, since Caldwell's own work in that era together with the contemporaneous contributions of Henning (*e.g.,* 1968) and apart from later work on the processes of decision making and broader material on regime analysis, there is a paucity of recent literature dealing with the design of administrative structures for organisations concerned with the management of the environment.

There is something of a paradox here, for the widespread and intense interest in environmental science, environmental values, and environmental policy and planning does not appear to have been matched with anything approaching equivalent concern for the supporting organisational functions and structures. For example, the management plans for protected areas typically include comprehensive treatments of the legislative underpinning, relevant policy statements, objectives and desired outcomes, together with the relevant management strategies, all linked appropriately with scientific and cultural standpoints on the areas, usage infrastructure and the like. On

the other hand, "administrative matters" are added almost as an afterthought, without the careful consideration which is required if the plan is to stand any real chance of achieving its objectives. The design of an organisation needs to be at least compatible with what the plan is seeking to achieve, whilst the optimal design should go rather further than bare compatibility.

This Project sought to highlight the need for remedying this situation, and to contribute to our understanding of the complex issues involved in providing the necessary organisation infrastructure. It was on the third of Caldwell's characteristics that this Project concentrated, although it was inevitable that, in order to "complete the picture", it was necessary to consider the other three characteristics. In essence, this Project was concerned with exploring the two dimensions of organisations managing protected areas: structural and contextual. *Structural* dimensions provide "labels" which describe the internal characteristics of an organisation, and which create a basis for measuring and comparing organisations. *Contextual* dimensions, by contrast, are here considered as the external environment of an organisation within which the structural dimensions occur. Both structural and contextual dimensions are necessary to evaluate and understand the organisations, a view which is substantially that put forward by Hall (1991), Pugh (1973), and Pugh *et al.* (1968).

RESEARCH OBJECTIVES

OBJECTIVE 1

To enhance understanding of the structural and contextual dimensions of organisations managing protected areas, through identifying and evaluating the contingency variables in the environment which influence the design of these organisations.

OBJECTIVE 2

To contribute to the development of the theory underpinning the relationship between environment and organisation through identifying and analysing the theoretical and actual relationships between the environments and the structures of organisations managing protected areas.

WORKING AIMS

The Research Objectives translate into the following Working Aims:

1.2.1 To determine the external environmental profiles of individual organisations managing a diverse range of protected areas.

1.2.2 To identify the structural profiles of each organisation in terms of the core dimensions and allied factors of organisational structure.

1.2.3 To examine systematically these profiles for evidence of relationships between environmental and structural elements.

1.2.4 To analyse the nature and strength of any environment-structure relationships disclosed by the systematic examination.

1.2.5 To reconcile any anomalies which become apparent in either the relationships or in the profiles.

RESEARCH DESIGN

The research design was developed with the capacity to address and articulate the research objectives, with the review of theory and empirical research in Chapter 2 providing tentative formulations on the environment-structure relationship to guide the translation of the working aims into research questions and propositions. Chapter 3 highlights the factors indicating the case study as the research strategy of choice, adopting an amalgam of conventional comparative study and heuristic study of cases, using the cases as building blocks for theory development. Intimately linked with this is an account of the manner in which quality assurance in the research design was secured by a series of different tactics for attaining internal, external and construct validity together with reliability.

The chapter on research design also emphasises how, in order to examine the diverse structures that can occur and the conditions under which these patterns occur, a variety of cases was generated using a set of eight contingency factors derived from a review of the relevant

literature. The outcome was an array of six protected areas, *viz.,* the Annapurna Conservation Area in Nepal, the Great Barrier Reef Marine Park in Australia, the Peak District National Park in the United Kingdom, the Ngorongoro Conservation Area in Tanzania, the Pinelands National Reserve in New Jersey, United States of America, and the Central Plateau Conservation Area in Tasmania, Australia. These protected areas are identified in the satellite images comprising Figure 1.1. Methodological considerations also dealt with in Chapter 3 include the roles of the case study protocol and the pilot case study, and identification of the sources of, and relevant tactics for analysing evidence critical to addressing the propositions.

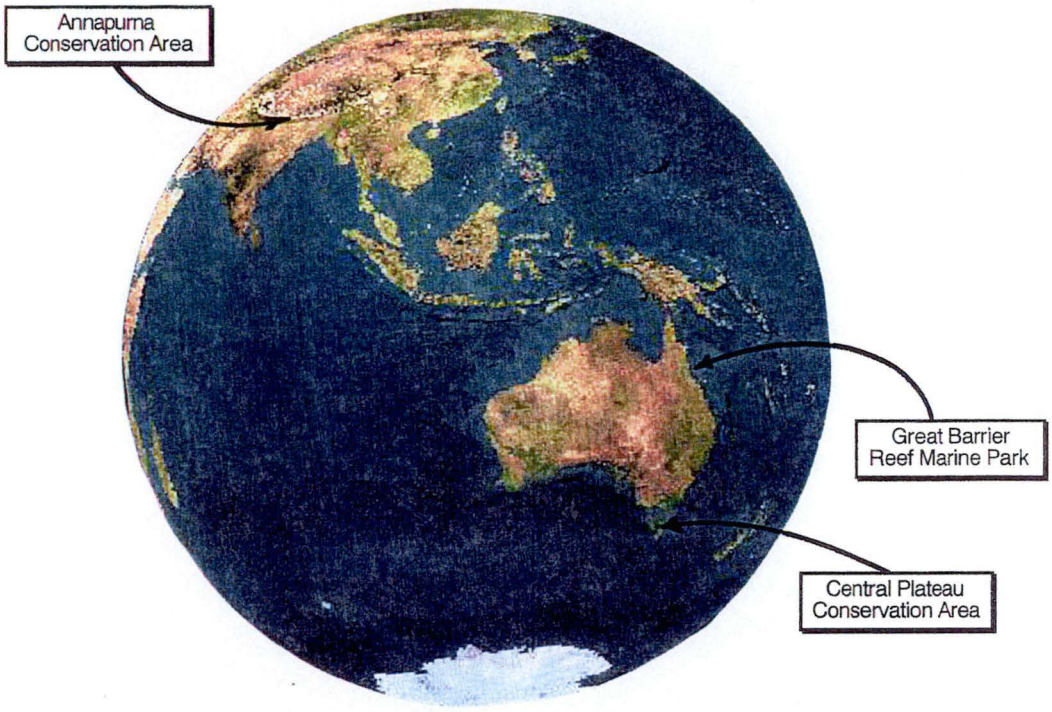
SIGNIFICANCE

In addition to the points raised in the preamble to this chapter, the significance of this Project lies in the way in which any comparative study of organisations has the potential to lead to a richer and more precise theory of organisation. Etzioni's comments on this retain much of their relevance even now; he observed:

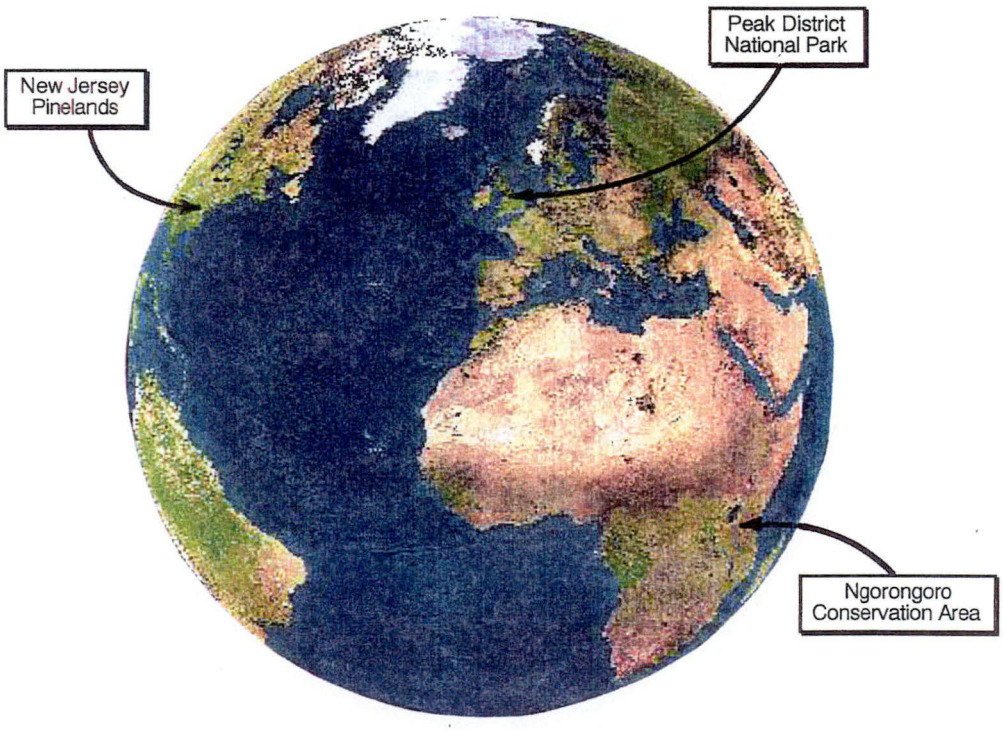
> It (organisation theory) will be richer because, to the statements on "universal" characteristics of organization, many new statements concerning "specifics" will be added. It will be more precise because many of the propositions which make up general organisational theory are not yet validated.
>
> Etzioni (1961)

The comparative study of organisations requires middle-range organisation theory, falling between high-level abstractions about the characteristics of organisations in general and the detailed study of individual cases - respectively the grand theory and abstracted empiricism described by Wright Mills (1959). Falling within this middle-range, the theory inherent in this Project also forms the foundation upon which to construct analytical models of the various types of organisation responsible for managing protected areas.

It is envisaged that this comparative study will contribute to the eventual establishment of universal propositions of organisation theory, to the reduction of overgeneralised propositions to middle-range statements by



Satellite View from ASIASAT 1 35789 km above 15°24'S 113°8'E



Satellite View from TDRS 4 35794 km above 34°18'N 9°30'W

FIGURE 1.1 THE PROTECTED AREAS SELECTED FOR RESEARCH INTO THE ORGANISATIONAL STRUCTURES OF THEIR MANAGING AGENCIES

(Source: Walker, 2000)

specifying the categories of organisations for which they hold, and to the development of new middle-range propositions so that knowledge of universals can be supplemented with statements about specific types of organisation. This sort of comparative study also has the capability of expanding the limits within which organisation theory conventionally functions, demonstrating the wide gamut of patterns which are possible in organisation structures.

LIMITATIONS

As indicated in the research design, there was a constant tension between the unique, contextually specific nature of individual organisations, and the need to make sense across the six sites. Case-comparison left some residual tension, and whilst this may have had no effect on accuracy, it may well have "thinned" the generalisations across cases.

Some improvement in the precision of the data might have been achieved had all responses been adjusted using weighted means to reflect the level of knowledge of an organisation perceived to be held by a respondent. For example, an outside observer who had been a senior member of an organisation's management might have been accorded a greater weight than an observer without the degree of intimacy which such a position would provide. A similar weighting might have been conferred upon responses from current chief executive officers of organisations, on the premise that they would have greater familiarity with the strategic level concerns of this project than organisation staff at the tactical and operational levels.

In order for some of the statistical tools to yield optimum results, it would have been desirable to have used a larger data set, as some instability in the output from, for example, the multiple regression, was inevitable. It was considered that this would nevertheless form a potentially valuable source of information when taken in conjunction with the other approaches.

AN OUTLINE OF THE THESIS

The Thesis consists of four parts dealing, respectively, with the nature of the research, the six case studies, the overall analysis, and the conclusions formed from the research. The nature of the research covered in Part 1 comprises, in addition to this introduction, a review of the relevant theory and empirical research together with a detailed description of the research design employed. Part 2 of the Thesis consists of a preface and six chapters, each chapter containing a case study of one of the six protected areas and its respective management organisation. Each of these chapters follows the same pattern, the initial description of the natural and socio-cultural environments of the area being followed by an account of the evolution of the present framework of management and organisation. In each case, analysis of the primary data then commences with validation of the source data and the provision of descriptive statistics for the environment and elements of the organisation structure, before concluding with an assessment of the environmental and organisational variables, and an overall summary.

Part 3 of the Thesis comprises a preface and a single chapter, the preface serving the essential purpose of providing much of the crucial backing for the material in the chapter, where the focus is on analyses spanning the six case studies of the protected areas, concentrating on the development of a prototype profile of the relationship between environment and structure. In working toward a synthesis, the chapter itself follows the research design and utilises the synergistic effect between conventional comparative study and the heuristic study of cases to weave a fabric of distinctions and relationships, to reveal patterns of similarities and differences amongst the contingency factors, and displaying the intricate causal textures of the environments surrounding the six cases. The four complementary perspectives which interact within the chapter comprise profile analyses of the environmental and structural variables; a preliminary correlation analysis across the six organisations of the relationships between the environmental and structural variables; a typological analysis of the environments of the six organisations; and multiple regression and correlation analysis of the relationships between the external environmental variables and the structural variables. The role of these four perspectives was indicative, none being taken as providing definitive information in isolation, but in conjunction with

information gleaned from secondary sources and follow-up contacts with agency respondents, outside observers, and other informants, synthesised toward explaining the relationship between environment and structure.

The conclusions in Part 4 of the Thesis address the Propositions which embody significant theoretically-based and empirically-researched themes critical to achieving the research objectives. A synopsis of the environmental variables highlights the patterns in environment-structure relations in the six organisations, and provides a medium through which to inspect the emerging themes which bring to light some further insights into the way organisational environments influence agencies managing protected areas. The implications of this study for organisational design are identified, and finally, the project is reconsidered in the light of the Research Objectives.

Many contemporary administrators would agree with the quote on page v attributed to Petronius. It seems that organisations are always either planning, starting, or completing a reorganisation, and everyone knows from the start that "this too shall pass". The traditional paradigms of organisational design simply do not address the need for organisations to concurrently conduct a multiplicity of diverse tasks and to survive and remain vital in a rapidly changing environment. This Thesis hopes to go some little way toward posing a remedy for this situation.

CHAPTER 2

REVIEW OF THEORY AND EMPIRICAL RESEARCH

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REVIEW OF THEORY AND EMPIRICAL RESEARCH

This review is in four sections dealing, respectively, with the mainstream literature on organisational environment and structure, alternative viewpoints on organisation-environment relations, the environment-structure relationship in protected area and cognate literatures, and tentative formulations on the environment-structure relationship. These latter formulations then form basic guides for the Research Questions, Propositions and, ultimately, the types of evidence required.

MAINSTREAM LITERATURE ON ENVIRONMENT AND STRUCTURE

It seems peculiarly apt that the literature on the relationship between environment and organisational structure is as beset with conceptual uncertainty as with the enigmatic character of uncertainty itself in this context (see *infra*). "Environment" is a splendidly elastic concept. This elasticity, coupled with imprecise specification of the environmental variables which have explanatory power for structural differences among organisations, and diverse measurement protocols, diminishes the level of comparability amongst studies considerably.

Although the relationship between the environment and the structure of organisations has long been recognised in the literature - noteworthy amongst early commentators being Barnard (1938), Parsons (1956), and Litchfield (1956) - the first reports on empirical studies of the relationship did not emerge until 1958. In Britain, Woodward (1958) reported on her research into the link between the structure of organisations and their technological environments, whilst across the Atlantic in the same year, Dill (1958) gave an account of his attempts to trace variations in organisational structure to environmental factors. Although their works will not be reviewed directly, the influence of both Woodward and Dill has been particularly pervasive, and can be seen in most of the studies reviewed here.

The wide panorama of studies which unfolded over the next few years was dominated by a few landmark works, including the pioneering contingency research on organic and mechanistic organisations by Burns and Stalker (1961), differentiation and integration (Lawrence and Lorsch, 1967), interdependence, coordination, and open systems (Thompson, 1967), and innovative work on environmental classification (Emery and Trist, 1965). These works were prominent amongst what Donaldson (1996) has termed the "fruit of a burst of research" conducted mainly in the 1960s, and which yielded a well-established research paradigm by 1970.

The inclusion of these works as the primary orientation for this review of the mainstream literature on organisation environment and structure can be justified on two grounds: *firstly,* they can be legitimately viewed as basic to contemporary understanding of the environment-structure relationship inasmuch as they are responsible for the genesis and patterns of a significant proportion of later research; *secondly,* these studies also largely comply with a number of objective criteria relevant to the present Project: most have an empirical base and are multivariate studies, they are contingent studies in the sense that they try to understand and explain the influence of different environmental conditions on organisation structure, and they exhibit considerable diversity in research methods *and* in their underlying conceptual frameworks.

Comments on more recent studies which have shed critical new light on aspects of these original works will be integrated into the main discussion; otherwise, representative later studies will be cited for each of the major works in order to establish continuity in the conceptual "gene pools". In relation to analysis, Scott (1987) points out that distinguishing among analytic levels is somewhat arbitrary and ambiguous. Consistent with this view, it was considered that analytical complexity in terms of different levels of analysis (*e.g.,* socio-psychological, structural, ecological) would not add significantly to the main approach taken here. It has accordingly not been pursued, even though some aspects of the material are capable of fitting within such an analytic framework (*e.g.,* the work of Emery and Trist (1965) on environmental classification falls clearly into the interorganisational field level of analysis).

ORGANIC AND MECHANISTIC ORGANISATIONS

Burns and Stalker (1961) propose that organisations can usefully be seen in two ideal-typical forms. The *mechanistic* organisation approaches Weber's bureaucratic type and is characterised by a clear hierarchy of offices involving strict specialisation, vertical communication, and the implicit assumption that top management will coordinate all specialisations toward achieving organisational objectives. The *organic* organisation, on the other hand, is conceived as having no clearly defined hierarchy and involves a continual re-definition of roles and hence a tendency to eschew fixed, formal job titles. Vertical command is replaced by lateral consultation, and frequent meetings between staff facilitate the coordination of functions, making it possible for individuals to perform their tasks in the light of their knowledge of the overall objectives of the organisation.

In their field studies, Burns and Stalker found that organisations which were coping with uncertain, changing environments had a low degree of formalised structure, that is, they were characteristically *organic,* instead of the *mechanistic* higher degree of structure associated with success in more certain environments. Burns and Stalker emphasise that *neither* of the two ideal-typical forms of organisation is necessarily efficient or inefficient, as this is dependent upon the nature of the organisation's environment. The mechanistic type is most appropriate for organisations operating under relatively stable environmental conditions. In such situations, the routinisation of behaviour which is generated is functional for performing the unchanging tasks faced by the organisation. An organic structure, conversely, mobilises expert knowledge informally, and by not freezing at a particular point in time the amount of authority linked with different tasks, is appropriate to an unstable situation in which the organisation continually experiences unpredictable problems.

In the context of the present Project, three aspects of the organic-mechanistic continuum are particularly significant:

- The area of commitment to the organisation - the extent to which the individual serves as a resource - is far more extensive in organic than in mechanistic organisations. The consequence of this is that it becomes far less feasible to distinguish "informal" from "formal" organisation.
- The two forms represent a polarity, not a dichotomy; there are intermediate stages and the relationship is elastic, so that an organisation oscillating between relative stability and relative change may also oscillate between the two forms. An organisation may operate with a structure which includes both types, consistent with the concept of subenvironments advanced by Lawrence and Lorsch (1967). The practical ramifications of such hybrid types have been the focus of later studies, *e.g.,* Wilkins (1987) and Mullins (1992).
- Whilst organic organisations are not hierarchic in the same sense as are mechanistic organisations, they remain stratified. Positions are differentiated according to acknowledged expertise, in line with the essential presumption that being *an* authority (in the sense of being most informed and capable) equates with being *in* authority.

More recent analyses have added to our understanding of this last characteristic. Ouchi (1981) defines it as a "Type Z" structure. Building on the distinctions proposed by Williamson (1981), Ouchi argues that hierarchies fail and are replaced by Type Z structures when interactions with the environment become moderately uncertain and complex. He goes on to suggest that monitoring complex exchanges by means of conventional authority will be cost prohibitive, and will increasingly produce organisational failures as well as promoting the search for alternative structures, one of which is the Type Z structure based on common internalised goals and strong solidarity. In Ouchi's conception, Type Z structures are distinguished from formalised bureaucracies by elements such as non-specialised roles, holistic rather than segmented concerns, implicit and internalised control mechanisms, and the long-term security which Type Z structures offer. The emphasis here on internalised controls and more diffuse, long-term affiliations has been supplemented by various later analyses emphasising the role of

organisational culture, particularly in offering a significant alternative to conventional structural forms (*e.g.,* Deal and Kennedy, 1982).

The work of Galbraith and Lawler (1993) on flexible organisations clearly identifies them as latterday adherents of Burns and Stalker. The flexibility which they advocate denotes an institutionalised ability to continually adapt, together with a mastery of the paradox of creating a stable environment for continual change. In the Galbraith and Lawler formulation, flexible organisations are composed of people who understand the need to shift the organisation design as circumstances shift - reconfiguring the structure to adapt to changes in the environment.

In similar vein, Van De Ven and Poole (1995) offer a perspective from which organisational change is viewed as a capability inherent in organisations, regardless of their configuration. Such flexibility in organisations allows them to be capable of self-correcting, adjusting their internal components to changes in the external environment. Where radical changes are made in organisational designs, this standpoint requires viewing the organisation holistically and developing a change strategy which rebalances the organisation around the new configuration, a view substantially in accord with that advanced by Morgan (1997)

DIFFERENTIATION AND INTEGRATION

On their own admission, Lawrence and Lorsch (1967), who gave contingency theory its name, were significantly influenced by Burns and Stalker (Lawrence, 1981). Lawrence and Lorsch however, focused specifically on the consequences of the environment for organisational structure. Their empirical study sought a conceptual framework which would heighten the probability of identifying key factors when analysing the structural design of organisations. Interest centred on the way in which the environment affects functional units in an organisation, the requirements for integration among the units, and the impact on effectiveness and efficiency. The conclusions they drew included the following:

- Among primary functional units, there was differentiation attributable to the particular environment of each, with differentiation viewed as variations in the way people are oriented toward goals, interpersonal relationships, and time, as well as in the formality of organisation structure. Since each unit is working in its own unique environment, it develops its own particular structural pattern determined by its tasks and its members' predispositions.
- The greater the differentiation the more is the need for integration, seen as the collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment. The most effective and efficient organisations are those that have achieved the highest degree of integration and are also the most highly differentiated.
- Differentiation and integration are basically antagonistic to each other: the more differentiated an organisation, the more difficult it is to achieve integration. Differentiated organisations will inevitably be conflict laden, placing a high priority on conflict resolution.
- In highly dynamic environments, the most effective and efficient organisations are highly differentiated and highly integrated. In more stable environments, there can be less differentiation, but there still has to be a high degree of integration.

The overall differentiation-integration approach is founded on the premise that there is no one best way to organise, but goes beyond this to show that a number of different types of organisations can exist within a single large organisation. An organisational unit subject to a relatively predictable subenvironment might reasonably be expected to tend toward a classical type of formal structure. Another unit, operating in a highly unpredictable subenvironment, in which all levels of management need considerable influence to deal with environmental uncertainty, may need a more participative structure along the lines suggested by Likert's System 4 (Likert, 1961, 1967). The variations are due to the differences in the subenvironments to which the two units need to adapt. The more

stable and certain the subenvironment, the more bureaucratic should be the organisation structure of a unit; the more dynamic and uncertain the subenvironment, the more System 4 should dictate the unit structure (Narayanan and Nath, 1993).

The process of aggregating specialised positions into organisational units is accompanied by the need to integrate the activities of the units. The integration of separate, yet interdependent, activities is a familiar problem in the structuring of organisations. The classical approach solved the problem through the creation of rules, procedures, plans, and a hierarchical chain of command which placed managers in the position of integrators or coordinators. The proponents of a more participative structure akin to Likert's System 4, on the other hand, advocate teams, integrators, and group-centred decision making. Lawrence and Lorsch observe that the appropriate approach will depend upon the situation. Classical integrative techniques are appropriate in these organisations which confront relatively homogeneous and certain environments. Organisations which confront relatively diverse and uncertain environments must rely upon System 4-type integrative techniques such as group-centred decision making, mutual adjustment through network communications, and integrative teams that are necessary to integrate highly differentiated units.

Of particular note with respect to the present study are the following points.

Following the Lawrence and Lorsch formulation, an organisational structure which will fit the environment *and* its members' needs may be generated by observing the following two rules:

- Group those units which have similar orientation and tasks - they will reinforce each other's need for differentiation.
- Group those units which require low differentiation and tight integration - in this way the coordinating task of the manager will be simplified.

Lawrence and Lorsch implicitly offer a corollary to these rules which should ensure the necessary integration of intergroup efforts:

- By the use of the basic integrative mechanism - management hierarchy - where low differentiation exists.
- By special integrative mechanisms - for example, cross-functional teams, integrative units - where more differentiation and tighter integration are required.

Revisitations to the work of Lawrence and Lorsch have included some early longitudinal studies (*e.g.,* Galbraith, 1973), work on multidivisional organisations and their environments (Lorsch and Allen, 1973), and different organisational sectors, such as large-scale research and development projects (Lane *et al.,* 1981). These apart, Lawrence and Lorsch share a focus with many later works in organisation theory - the prediction and assessment of the fit between organisational configurations and their context. In holding that high performance will be achieved by an environment-differentiation match accompanied by a differentiation-integration match, Lawrence and Lorsch effectively posited a continuum of potentially equifinal configurations. This concept of equifinality - the achievement of the final state of an organisation through multiple different organisational structures (even if the contingencies the organisation faces are the same) - is one which has been further refined by such writers as Pennings (1992), Galunic and Eisenhardt (1994), and Gresov and Drazin (1997).

In their empirical work, Jarley *et al.* drew on the work not only of Lawrence and Lorsch but also of Burns and Stalker. The common element here was *instability* - the degree of unexpected change that occurs in a task environment. Instability reduces standardisation and formalisation, but it may increase communication and coordination, as organisations replace mechanistic structures with more organic ones (Burns and Stalker, 1961). The impact of instability on structural differentiation is less clear, although there is widespread acceptance of the Lawrence and Lorsch view that organisations respond to instability by segmenting their environment into more homogenous elements (Jarley *et al.,* 1997).

INTERDEPENDENCE, COORDINATION, OPEN SYSTEMS AND ADAPTATION

Thompson (1967) was the first to articulate some crucial principles of organisation design, basing his principles (which paralleled the findings of Lawrence and Lorsch) on his scheme for classifying interdependence, on the ground that before organisational structure can be understood, the meaning of, and different types of interdependence and coordination must be considered. For Thompson, interdependence meant the degree to which units of an organisation had to depend on each other for resources and work flow. Low interdependence means that units can do their work independently of each other and have little need for interaction, consultation, or exchange of materials; high interdependence necessitates closer coordination.

Thompson identified three levels of interdependence, noting that as the interdependence increases, greater demands are made on managerial coordination, communication, coordination, and decision making across departments:

pooled interdependence

- in which units work independently of each other, and are connected only to the extent that they share financial resources;
- the low level of interunit coordination required is achievable *via* standardisation - using rules that channel actions uniformly.

sequential interdependence

- where outputs from one unit become the inputs to another;
- the median level of coordination required between linked units is achievable *via* planning - including scheduling.

reciprocal interdependence

- when the outputs of one unit form inputs to another and when the outputs of the second become inputs of the first;
- the high level of coordination required is achievable *via* mutual adjustment - transmitting information directly between people and mutually modifying their actions accordingly.

All organisations incorporate pooled interdependence; more complicated organisations have sequential as well as pooled; and the most complex have reciprocal, sequential, and pooled.

Building on these ideas, Thompson formulated his principles of organisation design. The optimal organisation, he argued, should minimise the costs of coordination *across* organisational units, through the processes of *localising* (grouping positions into local units) and *making positions semi-autonomous* (autonomous within the constraints established by plans and standardisation, for which Thompson's term was "conditionally autonomous"). In Thompson's conception, these processes must start with reciprocally interdependent positions, followed by sequentially interdependent positions, the final step being to group positions homogeneously to facilitate standardisation.

From this grounding in interdependence and coordination, Thompson builds his more generalised approach to structure. Basic to his approach is the concept of the *technical core* which represents the major activity or function of an organisation. For the technical core to operate with maximum effectiveness and efficiency, it must be free from the uncertainties and restrictions imposed by the environment. Accordingly, between the environment and the technical core, Thompson sees boundary-spanning units which, *inter alia,* serve to protect or buffer the technical core of an organisation from environmental influences. Thompson's position is close to that of Parsons (1960), who makes similar distinctions among functions within organisations, both writers holding that to the extent that an organisation succeeds in sealing off its technical core, units making up that core can be constructed around the nature of the technology rather than to meet externally imposed constraints.

The boundary-spanning units themselves are influenced by the homogeneity of the environment. In cases where the environment is *homogeneous*, there is a need for only a few functional boundary-spanning units, each concerned with its associated element in the task environment, and each only as elaborate as is justified by the number and intensity of environmental elements. On the other hand, an organisation facing a relatively *heterogeneous* task environment needs a

more complex boundary-spanning structure. The various functional units will need to be much more clearly differentiated and reflect the differences among the elements of the task environment to a much greater extent. Thompson recognises that there may well be higher order interdependencies (reciprocal and sequential) between boundary-spanning and core units which make it more appropriate to decentralise, placing them together in a semi-autonomous cluster. A stronger version of this position is taken by Lawrence and Lorsch (1967) who, building upon a framework originally developed by Brown (1960), propose that organisational subsystems will develop structures that reflect the demands placed upon them by their specific subenvironments.

Thompson (1967) argues that to a large extent the variation in organisational structure can be accounted for as attempts to solve the problems of concerted action under different conditions, especially conditions of technological and other environmental constraints and contingencies. In Thompson's *schema,* structure is thus viewed as a "joint result" of adaptations to the different elements of an organisation's environment. Like Thompson, Child (1972a) is critical of much of the research which endeavours to relate environment and structure on the grounds that it allows insufficiently for the exercise of choice on the part of those who design the organisation - or even for the possibility of such deliberate design. Child considers that many studies draw attention to possible constraints upon the choice of effective structures, but fail to consider the decision process itself in which economic and administrative exigencies are weighed by the decision-maker against the opportunities to operate a structure in line with a set of preferences derived from organisational values, personal beliefs, or other comparable source.

Latterday studies which extend Thompson's work include Spender and Kessler (1995) and Kamps and Polos (1999), both sets of authors acknowledging the influence of Thompson on generations of organisation theorists. Spender and Kessler expand Thompson's two domain model of how organisations deal with externally generated uncertainty. The original model proposes a relationship between an organisation's core activities and its rational efficiency-seeking activities, and between an organisation's boundary-spanning activities and its

natural system uncertainty-resolving activities. Although built on Thompson's model, Spender and Kessler's model differs in that it considers internally generated uncertainties, and they also create a more explicit link with Burns and Stalker's (1961) "equally influential distinction" between the mechanistic and organic modes of governance.

Kamps and Polos present a formal reconstruction of Thompson's propositions, an approach which identifies non-complex organisations as falling outside Thompson's framework and as forming an interesting special case because of their particular vulnerability to environmental influences. Unlike the complex organisations contemplated by Thompson, non-complex organisations are unable to seal off their core technologies from environmental influences. Kamps and Polos also establish that organisations can attempt to reduce environmental uncertainty by reducing constraints in the environment *via* negotiation - a concept not explicitly used by Thompson, but which completes the logical possibilities to reduce fluctuations and constraints within the organisation and in the environment. Empirical findings (*e.g.,* Edelman, 1992; Sutton *et al.,* 1994; Sutton and Dobbin, 1996) lend credibility to this notion of negotiation.

As a related issue, the formal reconstruction by Kamps and Polos reveals that Thompson's theory can be related to several alternative theories such as organisational ecology (see the next section) and the new institutionalism (also dealt with in the next section). Organisational ecologists do not necessarily reject Thompson's assumptions about individual organisations, but would argue that organisations are relatively inert and generally are unable to change their structures to better match their environments (Hannan and Freeman, 1984; Hannan, 1997). In essence, although organisational ecology and Thompson's adaptational approach are not in contradiction, there is a noticeable difference in the degree to which organisations are considered to be able to realise planned structural change. Similarly, even though many advocates of the new institutionalism are fairly radical in their rejection of Thompson's perspective (*e.g.,* DiMaggio and Powell, 1991a), the Kamps and Polos reconstruction suggests that adaptation theories and institutional theories are not mutually inconsistent, and that, moreover, Thompson's work can offer explanations for phenomena that are usually

conceived as requiring institutional argument - that is, beyond the domains with which they are traditionally associated.

Notwithstanding his many and varied insights, perhaps Thompson's most valuable contribution was the common ground which he shared with Lawrence and Lorsch and also Parsons - and for that matter with Woodward (1958), and Chandler (1962) - that is, the emergence of a new perspective in which organisations were viewed as open systems subject to environmental conditions, a perspective which departed from the traditional practice of endorsing or prescribing an ideal, universal type of organisation.

ENVIRONMENTAL CLASSIFICATION

Studies such as those by Burns and Stalker and Lawrence and Lorsch led to some interest in classifying environments by their properties.

Emery and Trist (1965) endeavoured to classify environments by the extent to which organisations sharing the same field have developed interlocking relations. They distinguished four types of fields of increasing complexity:

- *placid, randomised environments*

  in which resources required by organisations in the field are unchanging and randomly distributed over the area.

- *placid, clustered environments*

  in which resources are unchanging but clustered so that field location becomes an important factor in survival.

- *disturbed, reactive environments*

  in which the availability of resources is partially determined by the actions of the organisations themselves, so that a given organisation's survival is dependent on the use of strategies that take into account the behaviour of other organisations.

- *turbulent environments*

  in which all organisational actors are interconnected, so that the organisational field itself becomes a force that each organisation must attempt to take into account. Emery and Trist cite the example of an unsuccessful organisation that "failed entirely to appreciate that a number of outside events were becoming connected with each other in a way that was leading to irreversible general change".

The central message of the Emery and Trist typology is that organisational fields vary greatly in the extent and nature of the relational and normative structures that develop among organisations. These structures are important in their own right, and they will have strong effects on their constituent organisations, although Emery and Trist did not explicitly link their fields with any preferred structural arrangements within individual organisations. It is nevertheless possible to reconcile the Emery and Trist fields with the Burns and Stalker ideal-typical forms. Both *placid* environments would appear to correlate with mechanistic structures, whereas the dynamic environments - whether *disturbed, reactive* or *turbulent* - seem to be linked with the organic form.

As noted earlier, Emery and Trist did not explicitly link their classes with any specific structural arrangements, but they did offer some valuable guidance as part of their advocacy of the socio-technical systems approach which emanated from the Tavistock Institute following World War II. One of the guiding premises of this approach is that work involves a combination of social and technical requisites, and that the objective of organisational design is to "jointly optimise" both components - not sacrifice one for the other. One of their more significant points was that when the turbulence in the environment of an organisation increases, and work demands become more uncertain, a socio-technical design suggests that redundancy of function is superior to redundancy of parts (Emery and Trist, 1965). Redundancy of parts characterises the traditional bureaucracy: parts are broken down so that the ultimate elements are as simple as possible, an approach which brings with it a requirement for reliable control systems. In redundancy of functions, on the other hand, individuals and units have wide repertoires

of activities to cope with change, and enjoy self-regulation. For an individual, this creates roles rather than jobs, and for an organisation it brings into being a variety-increasing system rather than the traditional control by variety reduction (Pugh *et al.,* 1985). Semi-autonomous working groups (referred to earlier in discussing Thompson's principles of organisation design), collaboration rather than competition *between* organisations as well as within them, and reduction of hierarchical emphasis are generally considered under this approach to be the key requirements for operating effectively in turbulent conditions.

Irrespective of the terminology employed, the theme underlying the Emery and Trist model is also compatible with research findings on the technological aspect of the environment. The less routine the technology, the greater the uncertainty, the less effective the mechanistic qualities, and the more important it is to use flexible structural forms. Routine technology is associated with stability, and is handled best by structures that have well-coordinated and highly structured forms. Uncertainty means instability and the potential for major and rapid changes. Only a flexible structure can respond promptly to such changes.

The work of Emery and Trist - and for that matter, the interorganisational field concept as a whole - represents a significant shift in focus from that of the individual organisation. Organisations are treated as components of larger, overarching systems, the networks developing among organisations which share the same field representing, from an ecological perspective, adaptive mechanisms. As Astley and Van de Ven (1983) have highlighted, this approach emphasises a sort of collective survival, achieved via collaboration between organisations through the construction of a regulated and controlled social environment that mediates the effects of the remainder of the environment. This is, of course, in sharp contrast with the alternative view of organisations as engaged in a competitive struggle for survival through directly confronting the environment.

An issue which has particular relevance to this project is that conventionally, this approach has focused on the horizontal relationships amongst organisations, *i.e.,* on linkages among competing or

cooperating organisations which do not have authority *vis-à-vis* each other. This focus tended to ignore the vertical linkages between organisations in hierarchical systems, *e.g.,* the formal authority which exists between central and branch offices, or regulatory systems linking public and private organisations. The restriction implicit in this focus has only gradually diminished, as researchers began to include vertical as well as lateral relations, remote as well as proximate connections among organisations, and considered the patterning of the system of relations linking organisations as a significant attribute in itself. Prominent amongst those in the vanguard of this recovery were Knoke and Laumann, 1982. These vertical links form an integral part of the set of environmental forces with which any organisation has to contend, and as such, they carry potential implications for organisation structure, especially in terms of the prospective need for any dedicated boundary-spanning units.

It is also relevant to note that Emery and Trist, who essentially envisage the future environments of organisations as increasingly turbulent, argue that a possible solution for organisations in turbulent fields is represented by the emergence of values that have overriding significance for all members of the field. These commonly accepted values create a field which is no longer complex and turbulent, but instead simplified and relatively static. Effectively, this outlook includes some circumstances that result in more rather than less certainty for organisations.

Building on the work of Emery and Trist, Terreberry (1968) concluded that an increasing number of organisational systems find themselves in environments of the fourth type, describing the turbulent situation as one in which the accelerating rate and complexity of interactive effects exceeds the predictive capacity of the organisational systems which make up the environment and hence these systems tend to lose control of the compounding consequences of their actions. Terreberry's conception of the turbulent environment parallels the "dynamic-complex" environment of Duncan (1972), the "high-unstable change" of Jurkovich (1974), and the "unstable-heterogeneous" environment of Thompson (1967).

In the next decade, Emery and Trist (1973) confirmed their original conclusion that it was necessary to distinguish only four levels of environmental organisation, insisting that any attempt to conceptualise a higher order of environmental complexity would probably involve notions similar to vortical processes. They considered that adaptation would not occur in such fields, even though they admitted that survival tactics may well be evident. In the 1980s, however, in response to what were seen as accelerating change and increased interrelatedness, efforts emerged to extend the Emery and Trist model. McCann and Selsky (1984) for example, theorised a midrange condition between the turbulent field and the vortical environment to which they applied the term *hyperturbulence*. Babüroglu (1988) followed Emery and Trist's own speculation on a fifth environment with the characteristics of a vortex, arguing that organisational attempts to seal off and dampen turbulence actually create new instabilities, thus generating the vortical environment.

As it encapsulates the basic thrust of the main work in the area, it seems appropriate to end this outline of environmental classification with Terreberry's own conclusion: that the selective advantage of one intra- or inter-organisational configuration over another cannot be assessed apart from an understanding of the dynamics of the environment itself.

ALTERNATIVE VIEWPOINTS ON ORGANISATION-ENVIRONMENT RELATIONS

ORGANISATIONAL ECOLOGY

This essentially "natural selection model" explains the long-term survival or success of organisations as an ecological process. According to this model, variations in structure can occur among organisations by chance or choice. Some structural variants, according to this model, provide a better fit with environmental conditions than do others. The environment, then, rewards or "selects" organisations with the "best fit" characteristics: their odds of long-term survival are enhanced by better fit with environmental demands than the fit of organisations operating in the same environment (Hannan and Freeman, 1977). In this view of organisation-environment interaction, management plays primarily a *reactive* role, perceiving and responding to environmental conditions,

more often than not by emulating the structure and behaviour of more successful organisations (Aldrich and Pfeffer, 1981).

Consistent with the main thrust of organisational ecology, population-ecology theory as developed by Campbell (1969) and augmented by others such as McKelvey and Aldrich (1983) focuses primarily on the resources available to populations of organisations, the aggregate "birth" and "death" rates of these populations, and their spatial distribution. This view of organisations generally takes a relatively long-term perspective, within which organisational populations change in both number and characteristics as resources and other elements of their environment change.

The organisational ecology perspective relies on at least two distinct assumptions:

- That the environment is totally determining, survival being determined solely by how well the environment supports the organisation, and management's only role is to fine tune organisational fit.
- That the carrying capacity of the environment is finite.

Hannan and Freeman, 1989

The explanatory power of the organisational ecology model focuses on populations of organisations, rather than on individual organisations. Although this places some limitations on the utility of the model, it nevertheless has the advantage of providing an explanation for why organisations in common populations tend to have common structural characteristics, and why certain types of organisations survive while others die. It can also explain why small organisations so often fail, why the divisional structure became popular in the 1960s, and why organic structures flourished in the 1980s among highly technically oriented organisations (Ulrich, 1987). Perhaps most important of all, it can explain the rise and proliferation of the bureaucratic form and why many organisations today are primarily bureaucracies.

Organisational ecology also maintains that survival will be significantly influenced by the capacity and stability of the organisation's environment. Is the capacity of the environment rich or lean? The richer the

environment, the more organisations that will survive. Additionally, the more stable the environment, the harder it is for new organisations to enter and compete. Stable, certain environments tend to retain large organisations. This is somewhat paradoxical, for the organisational ecology model appears to have limited application to large organisations - possibly because such organisations can often insulate themselves against failure through *their* influence over the environment.

RESOURCE DEPENDENCE

In contrast to the natural selection model of organisation-environment interaction inherent in organisational ecology, Aldrich and Pfeffer (1981) describe a "resource dependence" model which emphasises *proactive* transactions between an organisation and its environment as the basic force shaping organisation structure and process. In this model, environmental contingencies constrain, but do not determine, organisational properties. Management may choose among a variety of structure-process approaches falling within a feasible set established by environmental characteristics. Aldrich and Pfeffer see management constantly attempting to influence or shape environmental conditions to produce a better fit with organisational needs and desires. Moreover, as environmental conditions change, some groups within an organisation become more important and others less so, the more powerful being those with access to or control of environmental information and resources. Power shifts within an organisation in turn help shape its structure and strategy for future environmental interaction.

Aldrich and Pfeffer's comparison of the two models suggests not only contrast but also convergence. Both views emphasise the importance of environmental conditions as shaping forces affecting internal organisational characteristics, and in fact the resource dependence model could be viewed as operating within a broader framework of long-term "selection". In the longest run, managerial choices, emphasised in the resource dependence model become, in the aggregate, a major condition in the environment of subsequent generations of organisations. In the longest run, managers shape their environments, although environments pose essential constraints, threats, and opportunities in the short run.

Compared with the organisational ecology standpoint, resource dependence theory tends to adopt a "finer grained" view of organisations by looking at their dependence on other organisations for resources. Pfeffer and Salancik (1978) take environmental dependence to be the relative importance of any resource to an organisation, the number of sources from which the resource is available, and the number, variety, and relative power of the organisations competing for the resource. There have been several works dealing with the various strategies and the concomitant structures which organisations use to reduce their dependence on external resources (*e.g.,* Pfeffer and Leblebici, 1973).

THE INSTITUTIONAL PERSPECTIVE

The 1980s witnessed the emergence of a new institutional perspective which traces its roots to the "old institutionalism" of Selznick (1949, 1957) and others, with which it shares a scepticism toward rational-actor models of organisation. In organisational analysis, the new institutionalism takes as a starting point the striking homogeneity of structural arrangements found in organisations, and indeed the core differences between the old and new institutionalisms are reflected in the treatment of organisational structure in the two traditions. The *old* institutionalism highlighted the "shadowland of informal interaction" (Selznick, 1949) - influencing patterns, coalitions, and cliques - *for example,* to illustrate how the informal structures deviated from, and constrained aspects of formal structure. The *new* institutionalism, by contrast, locates irrationality in the formal structure itself, attributing the diffusion of departments and operating procedures to, for example, interorganisational influences, rather than to the functions they are intended to perform. The two institutionalisms also differ in their conceptualisation of the environment. As contemplated by the new institutionalism, environments are relatively subtle in their influence, and rather than being coopted *by* organisations, *they* penetrate organisations - creating lenses through which actors view the world, including organisational structures (DiMaggio and Powell, 1991a), a view which is basic to the position taken by Nelson (1999) in relation to sustainable development. Nelson also sees environmental evaluation and assessment together with the regular acquisition of information on the environment as increasingly key concerns for organisations trying to deal with the challenges posed by protected area management.

From the standpoint of institutionalism, once a set of organisations emerges as a field, a paradox arises: rational actors make their organisations increasingly similar as they try to change them. In contrast to the view taken by Hannan and Freeman in organisational ecology, DiMaggio and Powell emphasise adaptation, but maintain that they are not suggesting that managers' actions are necessarily strategic in a long-range sense. In fact, two of the three forms of isomorphism noted below - mimetic and normative - involve managerial behaviours at the level of taken-for-granted assumptions rather than consciously strategic choices (DiMaggio and Powell, 1991b).

DiMaggio and Powell (1991b) identify three mechanisms through which institutional change occurs, but stress that these types are not always empirically distinct as the typology is analytic. *Coercive isomorphism* results from both formal and informal pressures exerted on organisations by other organisations upon which they are dependent and by cultural expectations in the society within which organisations function. *Mimetic processes* are initiated by uncertainty. When organisational technologies are poorly understood, when goals are ambiguous, or when the environment creates uncertainty, organisations may model themselves on other organisations. Much homogeneity in organisational structures stems from the fact that despite considerable search for diversity, there is relatively little variation from which to select. Large organisations choose from a relatively small set of major consulting firms which in turn spread a few organisational models - models possessing an inherent power because structural changes are observable. Organisations tend to model themselves after similar organisations in their field that they perceive to be more legitimate or successful. The ubiquity of certain kinds of structural arrangements can more likely be credited to the universality of mimetic processes than to any concrete evidence that the adopted models enhance efficiency. *Normative pressures* stem primarily from professionalisation, professions being subject to the same coercive and mimetic pressures as are organisations. Moreover, while various types of professionals within an organisation may differ from one another, they exhibit much similarity to their professional counterparts in other organisations, professional networks serving to cross organisational boundaries. This dimension of the institutional perspective directs attention to the importance of focusing on similarity as well as to variation among organisations and, in particular, to change in the degree of homogeneity or variation over time.

THE ENVIRONMENT-STRUCTURE RELATIONSHIP IN PROTECTED AREA AND COGNATE LITERATURES

The relationship between the environment of agencies managing protected areas and the structure of these organisations does not appear to have captured the imaginations or interest of writers from either the mainstream or any of the alternative perspectives on the environment-structure relationship. In the following digest, the meagre offerings from this source are integrated with extracts from the limited coverage in the literature on protected areas, and with some relevant material from the areas of general environmental administration and natural resources management.

Some limited coverage on the organisation of agencies managing protected areas has been included in various published "guidelines", although these typically have a practical focus, as with the work of Lucas (1992) and that of Harrison (1992), and it is not always clear on what principles the guidelines rely or whether they are grounded in theory. The recommendations made by Lucas, for example, do not go much beyond the fundamentals of organisation, and are confined to a basic pattern of administration for protected landscapes nationally, delineating the political, policy, and executive levels, together with counsel on such matters as maintaining a clear separation of, but close links between, the policy/advice/review role from the executive/implementation/operational role. Only in some of the examples provided by Lucas does anything resembling detail on structure emerge, and even then the associations with the relevant environments have to be conjectured, an approach which is mirrored in Bromley's (1997) work (see *infra*).

Another class of works offers more specialised guidance, as on the planning, research, and management aspects of protected areas (*e.g.,* Rodgers, 1991; Thorsell, 1984; Mossman, 1987). The latter two works are essentially training manuals - Thorsell focusing on the East African Region and Mossman on the management of protected areas in the South Pacific (based on Thorsell). Both include material on organisation structures as providing the functional frameworks for protected area agencies. Mossman's work, for example, is effectively the means to pursuing the ends set out in the *Action Strategy for Protected Areas in the*

South Pacific Region (South Pacific Commission, 1985). The *Action Strategy* points out that responsibility for protected area management in the South Pacific is often fragmented between a number of government departments or statutory authorities - a situation by no means peculiar to this region - and stresses that the development of an agency with specific responsibilities for protected area management is essential. The *Action Strategy* goes on to set out several *desiderata* at regional, national, and international levels, whilst Mossman converts these into a series of organisational principles.

There are also some overarching reviews (*e.g.,* Machlis and Ticknell, 1985; McNeely, 1993) and, at a more general level still, useful background is offered by such works as Young (1989) when covering the links between science and social institutions in the context of international resource regimes.

In relation to agency environments, Harmon (1994a) highlights the close contact that administrators necessarily have with the political power structure, and which accordingly enables them to function as a conduit between politicians and field activities in a protected area. This characteristic, which Harmon maintains is critical to the success of protected area conservation, is effectively an environment-structure linkage.

Relevant contributions are to be found in that part of the literature dealing with international institutions and protected areas, although even here their value is somewhat circumscribed, being limited to the international context and to specialised aspects such as participation, itself an important facet of protected area management. The significance which is attached to participation may be gauged from its increasing profile in international forums. The Third World Congress on National Parks and Protected Areas in 1982 acknowledged a shift from the approach that parks should be protected *from* people, to the approach that they should be protected *for* people (Harmon, 1994b). Ten years later, the Fourth World Congress focused on influencing management agencies, non-governmental conservation organisations, traditional peoples' groups, relevant industries, and resource managers. The entire theme - "Parks for Life" - focused on enhancing the role of protected areas in sustaining

society, which represented a remarkable shift away from the view that the *summum bonum* of protected area management is an exclusionary national park, and it poised the social sciences, cultural research, and protected area management for significant cooperation.

Even this shift in emphasis does not appear to have been accompanied by a corresponding change in the level of interest in whether the agencies responsible for managing protected areas are structured in a way which will facilitate the implementation of policy. From the standpoint of this Project, the value of the documentary sources on the Fourth Congress lies in the papers by Barborak (1995) which deals with institutional options for the management of protected areas, Norris and Camposbasso (1995) and Lees (1995) on relationships between the agencies responsible for protected areas and non-governmental organisations, Munro (1995) on the necessary expansion of public support for protected areas, and McNeely (1995) who, in introducing the collection of revised papers, presents a lucid exposition on the partnership concept. He enunciates the general problems from which protected areas suffer, most of which have their origin in the organisational environment - conflicts with local people, conflicts with other agencies of government, insecure and insufficient funding - and from this derives a set of principles for successful partnerships.

In terms of the present Study, four of these principles are of especial importance:

- site management should be planned individually, with linkages to the organisational system
  - given the diversity of protected areas in terms of species, habitats, human population, climate, and other factors, management needs to be site-specific;
- management should be adaptive
  - there needs to be the capacity to adapt to changing conditions in the natural environment, based on wide consultation (see Munro, 1995; Barborak, 1995; Machlis, 1995);

- networks of supporting institutions should be formed
  - a complex and diverse array of institutional arrangements is required to manage protected areas for meeting society's needs (Barborak, 1995);
- public support should be built
  - information and feedback are crucial: communication flows need to be reciprocal (see Munro, 1995).

Each of these four principles has a direct bearing on the environment-structure relationship.

Also stemming from the Fourth World Congress were works such as IUCN (1994a) which, in dealing with action for protected areas in Europe, may be seen as a response to the call of the Caracas Congress for regional plans to link global aims to national and local actions. Of its nature, this is largely a prescriptive work, however it provided some valuable ideas on adaptation and decentralisation of organisations. Forming an excellent sequel to the IUCN. work is Bromley (1997) which incorporates a coverage of the ways in which organisation for nature conservation is structured in each of the fifteen member states of the European Union, and his work affords some valuable information even though he does not focus on the level of the individual protected area, and draws no conclusions or generalisations concerning either the structures or their relationship to the environment.

Although Rosenbaum's (1995) concern is with broad environmental administration in the U.S.A. (focusing on the Environmental Protection Agency [E.P.A.]), there are, *mutatis mutandis*, some intriguing parallels with the administration of protected areas. For example, it is conceivable that in some settings "environmental partisans" may create barriers intended to frustrate "capture" of protected area programs by private interests. Rosenbaum cites the E.P.A.'s enabling legislation as deliberately intended to produce a structure which would institutionalise environmental values within the government to counterbalance other agencies partisan to business and other interests, a situation which might well have its counterparts in the case of protected areas.

Rosenbaum also notes difficulties in implementing major environmental programs, raising fundamental questions about the appropriateness of agency structures. He suggests that a major institutional restructuring of existing environmental agencies may be required in order to overcome some of the flaws in their current design *vis-à-vis* their operating circumstances (*i.e.,* task environment). One of the most commonly cited defects - the fragmentation of authority among too many separate and competitive bodies - could feasibly apply to the structuring of agencies managing protected areas.

In a similar vein, decisions about the need for structural reforms in the administration of protected areas would be facilitated by an understanding of the capacity of agencies to change and innovate in response to, or in anticipation of external forces - as exemplified in Schiff's (1966-1967) examination of the impact of a change orientation on administrative practices in agencies concerned with, *inter alia,* wildlife and parks management.

From the area of natural resources management, Brunson and Kennedy (1995) deal with the way in which agencies respond to changing social values. Prospectively, Brunson and Kennedy suggest that natural resource agencies will either have to change from within, or change will be imposed from without. They believe change is inevitable until agencies truly are able to "reflect the relationship that society now demands between itself and the natural environment". This conception of environment-structure relationship is reinforced by DeBonis (1995) and Kessler and Salwasser (1995), whose viewpoints on the role of organisational culture are nevertheless diametrically opposed, DeBonis taking the standpoint that structural change derives from outside forces, and Kessler and Salwasser the view that such change is most effective if emanating from within the organisation.

TENTATIVE FORMULATIONS ON THE ENVIRONMENT-STRUCTURE RELATIONSHIP

Given that the organisational environment is cast in the role of the independent variable in this Project, it was considered essential to do two things: *firstly,* to develop a working conception of its morphology to facilitate further exploration of its relationship with organisational structure, and *secondly* to establish the potential links between environment and the core structural dimensions of organisations. Both these pursuits draw upon ideas from the preceding sections which, linked with other material, form a framework to guide the research questions and propositions.

THE MORPHOLOGY OF ORGANISATIONAL ENVIRONMENTS

Determining the form and configuration of organisational environments from the studies reviewed here required a set of reference concepts - *de facto* coordinate axes. The seeds of these reference concepts were provided by the research of Dess and Beard (1984), who advocated a three-dimensional perspective on organisational environments: munificence, dynamism, and complexity, dimensions which are conceptually similar to those proposed by such writers as Pfeffer and Salancik (1978), and Mintzberg (1979), and which are almost identical to the environmental conditions identified by Child (1972a), *i.e.,* illiberality, variability, and complexity. Sharfman and Dean (1991) propose identical dimensions to Dess and Beard.

In distilling their three dimensions from the work of Aldrich (1979), Dess and Beard expressly grounded their ideas in two of the alternative viewpoints on environment-organisation relations - the population-ecology and resource dependence views. To bridge the gap between the effects of these alternative viewpoints and mainstream thinking, the individual environmental variables selected for application in the present project were drawn from the dimensions of *capacity, volatility,* and *complexity.* Although there is some conceptual similarity in the terminology applied to the dimensions of organisational environments, in order to maintain clarity, each of these parent dimensions is identified below, whilst the extracted variables are discussed in Chapter 3.

Environmental Capacity

Environmental capacity derives from the proposal of resource dependence theory that an organisation's need for external resources and information determines its degree of dependence on the environment, with *capacity* relating to the extent to which the pool of resources making up that environment is capable of supporting the organisation's growth and stability (Aldrich, 1979). Although it is a concept normally associated with various business contexts (*e.g.,* Yasai-Ardekani, 1989), it can equally well be applied to protected area management. As a dimension of the environment, *capacity* relies upon affluent and expanding environments generating excess resources, which can buffer the organisation in times of relative scarcity. Surplus capacity leaves scope for an organisation to make mistakes, whilst tightly circumscribed capacity does not, as in the case of insecure and insufficient funding - one of the general problems of protected areas described by McNeely (1995).

Of course, the availability of resources, whether financial or otherwise, does not necessarily mean that favourable outcomes will result. Especially when services are delivered through a network of organisations, other system-level factors, such as integration and stability, appear to be more important for ensuring effectiveness than the allocation of large amounts of resources to a system that is not organised effectively to take advantage of its favourable situation. This is not to say that the importance of financial resources should be discounted, but simply that network/system-level factors are critical whether overcoming problems of resource insufficiency or capitalising on resource abundance.

Aldrich's concept of environmental capacity picks up the essence of Starbuck's (1976) concept of environmental munificence. Both state that organisations seek out environments that permit organisational growth and stability, allowing an organisation not only to generate "slack" resources as buffering media, but also as a means of maintaining organisational coalitions, providing resources for organisational innovations, and serving as a means of conflict resolution.

As an integral component of this dimension, the constraints imposed by an environment - whether legal, political, economic, or socio-cultural - imbue the environment with some elements of complexity, on the grounds that decision making needs to take into account the many constraints that capacity imposes on an organisation. Consequentially, these sort of restrictions necessitate careful planning and controlling of operations, together with a research-based approach to decision making. This applies, *a fortiori,* when the restrictions are essentially legal and imposed on an organisation because of its monopolistic standing and/or because it serves vital public interests. One or other of these situations appear, *prima facie,* to fit the profile of the agencies managing protected areas as selected for this project.

In a not dissimilar vein, environmental capacity may well include some elements of hostility - risk, stress, domination - or the opposing, benign aspects of safety, richness in opportunities, and susceptibility to manipulation or control by the organisation. If an organisation experiences hostility on several key fronts, it will tend to regard the environment as quite hostile overall, whereas if the fronts on which it experiences hostility are not crucial, then it will tend to regard the environment overall as benign. Some earlier studies have suggested that the organisational response to a crisis arising from events in the environment leads to a centralisation of power (*e.g.,* Janowitz, 1959), whereas others (*e.g.,* Khandwalla, 1977) have suggested that as environmental hostility rises from low to moderate, there is:

- a sharp increase in authoritarianism and its structural correlates, which wane as the degree of hostility increases from moderate to high;
- a reduction in costly support activities (*e.g.,* long-range planning, research and development), which then increase in line with increases in the level of hostility.

Essentially, the initial management response may be to reduce what may be perceived as organisational slack, however if the environment continues to deteriorate once staff services are streamlined, the tendency will be to increase investment in what will then be perceived as units which assist in understanding environmental forces.

Environmental Volatility

Environmental volatility serves as an indicator of the degree of instability in an environment. The environment is considered to be volatile where there is a high degree of unpredictable change - as on some occasions in the management of protected areas when there is a high level of conflict with local people and/or other agencies of government. This makes it difficult for management to predict accurately the probabilities associated with various decision alternatives. At the other extreme, a stable environment facilitates this sort of prediction. In a stable environment, what little change occurs is highly predictable. The information about the environment is easy to get and generally fairly reliable, and the ability to take calculated risks in the face of uncertainty is seldom tested.

An environment in which there are large cyclical or other swings of activity is likely to be viewed as volatile or, in some terminologies, turbulent. Rapid sociocultural change, abrupt variation in the needs of an organisation's clientele, or unpredictable shifts in government policies can also lead decision makers to perceive the environment as volatile. The more of these components that coincide, the stronger will be the inference about the degree of volatility.

This dimension highlights the need to manage adaptively, one of the key principles of successful partnership as put forward by McNeely (1995). The Fourth World Congress on National Parks emphasised the need for adaptability in relation not only to change generally, but also to the *accelerating rate* of change. The argument ran that if protected areas are to succeed in making their contribution to sustainable development, then they must adapt to the increased pace of change manifest in trans-boundary pollution, demographic pressures, international aid, and tourism (IUCN, 1994a).

Volatility in one or other of its guises (*e.g.,* dynamism) makes frequent appearances in the literature of organisation theory, the pattern of use indicating *firstly* that turnover is amongst the best measures of environmental stability-instability, and *secondly* that volatility should be restricted to change that is difficult to predict and that heightens

uncertainty within an organisation. The literature suggests that tactics such as vertical integration will create more predictable environments. Uncertainty also has the potential to affect structure, because as task uncertainty increases, more decision information must be processed to maintain a particular level of performance (Galbraith, 1973).

Aldrich's (1979) idea of turbulence emphasised the degree of interconnection among environmental elements, and it is essentially consistent with Emery and Trist's (1965) definition. Terreberry (1968), building on Emery's and Trist's work, was among the first to stress the difficulties of planning for changes in an organisation's task environment when such changes originate in its residual environment. Mintzberg (1979) contended that the volatility and complexity dimensions have very different effects on organisation structure, and that there has been a tendency to mix the effects of these two dimensions. Specifically, Mintzberg hypothesised on the one hand that the more dynamic the environment, the more organic the structure, whilst on the other, the more complex the environment, the more decentralised the structure.

Theory indicates that an organisation will be shaped by environmental volatility, and suggests that an environment which is highly volatile or turbulent may well be endowed with opportunities for growth as well as beset with problems. This blend of uncertainty and opportunity frequently means that highly volatile environments present distinct challenges, and it may mean that management may try to insulate an organisation from external turbulence as far as possible through devices such as vertical integration. The greater the volatility, the more significance management needs to attach to seeking information about crucial prospective changes in the environment through forecasting. Considerable flexibility is needed to cope with high volatility; an organic style likely to eventuate, marked by open communication channels, informality, and a loose administrative structure. At the same time, continual readjustment of operating plans is likely to lead to friction between interdependent departments. At the other end of the spectrum, high stability will generally lead to contrasting outcomes.

Environmental Complexity

Environmental complexity refers to the degree of heterogeneity and concentration among environmental elements. Simple environments are homogeneous and concentrated, whereas environments characterised by heterogeneity and dispersion are considered to be complex. Child's (1972a) conceptualisation of environmental complexity as "the heterogeneity of and range of an organisation's activities" is typical of other theorists' views, including that of Thompson (1967), and the school of thought which contends that in organisations facing a more complex (*i.e.,* heterogeneous) environment, greater uncertainty will be perceived, and such organisations will have greater information-processing requirements than those faced with a simple environment.

The environments of diversified organisations tend to exhibit high levels of heterogeneity, and organisations operating in highly heterogeneous environments of necessity become differentiated, that is, they develop separate homogeneous structures to deal with each major, distinctive element of their environment. This internal differentiation typically creates problems of coordination, waste, and duplication, and to achieve operating efficiency, management is likely to:

- utilise a sophisticated control and information system to monitor the environment, operations, and performance of subunits;
- apply throughout the organisation those standard operating procedures that seem to work well in a variety of situations;
- institute a participative style of management in order to secure the cooperation of subunits.

There is another aspect to environmental complexity, originally raised by Lawrence and Lorsch: they argued that an organisation with a differentiated task environment is likely to be differentiated in terms of several attributes, including departmental goals, the structuring of activities, and the time span of feedback from the environment (Lawrence and Lorsch, 1967). Such an organisation needs, for effective functioning, to be integrated by complex means such as special liaison personnel who share the values of interfacing departments.

The question of perception arises once more in relation to organisations which view their environment as highly complex. Such organisations tend to have managements that are strongly oriented to long-term planning and to the optimal utilisation of resources through the use of management science techniques. These organisations typically have sophisticated management control and information systems, and their operations tend to be highly automated and computerised. By contrast, organisations which perceive their environment as relatively simple, tend to have almost intuitive approaches to management, much less sophisticated information and control systems, and significantly less automated and computerised operations technology.

These three source dimensions synthesise most of the key aspects of the studies reviewed earlier, but perhaps more importantly, this three-dimensional perspective affords clear evidence linking the degrees of *environmental uncertainty* to different structural arrangements. Specifically, the more scarce, volatile, and complex the environment, the more organic an organisation structure ought to be, as organisations in such settings face greater uncertainty brought about by their typical characteristics of restricted room for error, high unpredictability, and diverse sets of environmental elements which require constant monitoring. Conversely, the more abundant, stable, and simple the environment, the more a mechanistic structure will be appropriate.

As one of the indirect-action elements of the environment, technology forms an integral part of the concept of environmental uncertainty, and may affect an organisation's predictive capability, its ability to deal with excessive information, or its capacity to determine the results of an action - any or all of which may stem from technological deficiencies. This view is implicit in the comparative study undertaken by Koberg and Ungson (1987) on the effects of environmental uncertainty on organisational structure and performance.

Uncertainty occupies a key role in an alternative conception of the environment. This conception is exemplified by Dill (1958), Weick

(1969), and Duncan (1972), and treats an organisation's environment as the flow of information perceived by members at the organisation's boundaries (akin to Thompson's "boundary-spanning" concept). When the environment is considered as a source of information, theorists have generally assumed that complexity and instability of the environment generates uncertainty (Duncan, 1972), though it can be argued that uncertainty may be caused - at least in part - by the organisation's search and analysis methods. Uncertainty has been hypothesised to lead to less formalised and less centralised structures (Burns and Stalker, 1961), though it is conceivable that complex and contingent structures simply allow more of the uncertainty in the environment to be perceived. This is essentially the standpoint adopted by Milliken (1987).

Based on what has been discussed thus far, it is possible to make some tentative predictions concerning the environment-structure relationship. All organisations are dependent on their environments to some extent, however the degree of dependency will vary amongst organisations. The effect of the environment on any organisation will, accordingly, be a function of the organisation's vulnerability, which in turn is a function of dependence (Jacobs, 1974). The evidence supports the contention that a dynamic environment has more influence on structure than does a static environment (Mintzberg, 1979). A dynamic environment will move an organisation toward an organic form, even if its size or routine technology suggests a mechanistic structure. However, a static environment will not nullify the influence of size or technology.

CORE STRUCTURAL DIMENSIONS

To serve as the basis for the research questions and propositions, tentative formulations on the environment-structure relationship were developed focusing on the core structural dimensions of *complexity, formalisation,* and *centralisation* as advanced by Fredrickson (1986). This approach was adapted to the present work by extracting four allied factors which span all three structural dimensions in a manner analogous to span of control's encapsulation of the interrelationships between the three aspects of differentiation (see page 46). The allied factors which were adopted comprise *environmental agility, infrastructure, sophistication of control and information systems,* and *delegation.* Extracting these variables incidentally reconciled what was essentially

an Aston approach with some of the alternative approaches which have been proposed (*e.g.,* Blackburn and Cummings [1982], Hoggett [1996], and Miller and Gubin [2000]). The three core structural dimensions are described below, whilst the allied factors are outlined in the Research Questions in Section 2.5.

Environment and Organisational Complexity

For the purposes of this research, complexity is viewed as the degree of differentiation which exists within an organisation. This is seen as covering three distinct aspects: *horizontal differentiation* - the most visible evidence of which is usually the degree of specialisation and departmentation, *vertical differentiation* - the number of levels in an organisation's hierarchy, and *spatial differentiation* - the extent to which an organisation's units are dispersed geographically. An increase in any one of these factors will increase an organisation's complexity.

Horizontal differentiation has been taken to be the degree of differentiation between units, based on the orientation of members, the nature of the tasks they perform, and their education and training. The more extensive the range of occupations that require specialised knowledge and skills, the more complex will be the organisation, such diverse orientations rendering communication and coordination of activities more difficult. The creation of specialised groups or the expansion of departmental designations has the effect of differentiating groups from each other, making interactions between those groups more complex. Similar backgrounds, skills, and training will tend to invoke similar perceptions; conversely, diversity increases the probability of different goal emphases, time orientations, and jargons.

With the focus of *vertical differentiation* being on structural depth, concern here focussed on the way in which expansion in the number of hierarchical levels in an organisation increases complexity. Prime consideration was given to the relationship between increased depth and rises in the potential for communication distortion, and the concomitant inducing of difficulties in coordination and control. As a point-of-departure, vertical differentiation has been examined as a

response to increases in horizontal differentiation - with expansion in specialisation, it becomes increasingly necessary to coordinate tasks. The diversity in staff training and background which accompanies high horizontal differentiation is frequently linked with individual units experiencing difficulties in comprehending how their work integrates into that of the organisation as a whole. This predicates increased coordination, manifested in the development of vertical differentiation.

The final aspect of complexity to be considered in the present analysis is *spatial differentiation,* which from the standpoint of this work has been treated as the degree to which the people and units of an organisation are dispersed geographically. In a sense, spatial differentiation is an extension of horizontal and vertical differentiation, with both tasks and authority separated in space. Notwithstanding the significant role played by communications technology in reducing some spatially-induced complexity, the separation of functional tasks between multiple locations still has the effect of increasing complexity, as does the dispersal of levels of authority in terms of geographical distance. An additional factor which may affect the level of complexity is the proportion of an organisation's total staff which is located at spatially dispersed locations - the more staff working in relatively remote units, the greater the complexity.

The interrelationships between these three aspects of differentiation can be seen clearly in the concept of span of control which, as a measure of the number of subordinates which a manager can effectively control, has significant implications for horizontal, vertical, and spatial differentiation. The voluminous literature (amongst the most significant being Ouchi and Dowling [1974], Van Fleet and Bedeian, [1977], Van Fleet, [1991]) discloses a plethora of factors which may affect span of control, the most relevant to the present work being similarity of functions, geographic contiguity, and difficulty of functions, although others - such as the degree of planning and coordination required on the part of the manager, and the amount of organisational assistance received by the manager, touch on related concerns.

An additional nexus is worthy of exploration: environmental uncertainty and complexity are directly related; heightened environmental uncertainty tends to lead to increased complexity. Through

differentiation, organisations are able to improve their responses to dynamic and more complex environments. Faced with a volatile environment, an organisation will need to monitor that environment more closely than would be the case with one that is stable, a process which is facilitated typically by creating differentiated units. Similarly, a complex environment induces an organisation to buffer itself with an expansion in its number of operating units and staff specialists, thus absorbing environmental fluctuations. An extension of this is the tactic of forming networks of supporting institutions as suggested by Barborak (1995), reminiscent of the interorganisational organisation field noted earlier.

Environment and Organisational Formalisation

Formalisation is conceived here as the degree of job standardisation within an organisation, taking the Hage and Aiken (1967-1968) approach which argues that formalisation applies to both written and unwritten regulations, rather than the narrower Aston interpretation advanced by Pugh *et al.* (1967-1968) that formalisation refers only to procedures, rules, instructions, and communications which are reduced to writing. The Hage and Aiken stance has the advantage that it takes into account perceptions as well as reality, so that *attitudes* to the way procedures are specified and rules enforced are taken into account, in addition to documentary sources.

Taking an otherwise conventional view, *high formalisation* will be equated with situations in which the job incumbent has minimal discretion over what, when, and how tasks are to be performed, leading to consistency and uniformity of output. The means to formalisation include explicit job descriptions, together with clearly defined procedures and rules. *Low formalisation,* by contrast, involves considerable latitude and freedom to exercise discretion, relatively little programmed behaviour, and a minimum of standardised guidelines.

Indicators of formalisation along the entire spectrum from high to low are discernible in the protected area and cognate literatures, however high formalisation seems to be more typical, as exemplified in Mossman's (1987) advocacy of procedural mechanisms to permit smooth running of

an agency, together with manuals and directives to standardise procedures. Clear job descriptions and traditional organisation structures find their correlates in selection and training of employees which is geared to supporting formalisation.

In order to apply this dimension to the analysis of individual organisations, and subsequently to the comparison of organisations, it is necessary to identify how formalisation varies within organisations. Essentially, formalisation depends upon whether jobs are unskilled or professional, the narrower and less skilled jobs generally equating with high formalisation. Two additional relationships to be considered are that:

- formalisation tends to be inversely related to level in the organisational hierarchy:
  - the higher the level, the greater the involvement in activities that are less repetitive and require unique solutions, managerial discretion increasing accordingly;
- the type of function (*e.g.*, human resources, financial resources) also influences the degree of formalisation:
  - some functions tend to be concerned with stable and repetitive activities, and lend themselves to standardisation, whilst others need to retain flexibility to respond to changes in the environment or to be innovative.

It is reasonable to expect stable environments to lead to high formalisation, as stable environments create a minimal need for rapid responses, and organisations which standardise their activities are able to reap significant economies. It does not necessarily follow, however, that a dynamic environment will inevitably lead to low formalisation throughout an organisation. There will be a tendency to attempt to insulate key operating activities (Thompson's "technical core") from uncertainty, to enable the maintenance of relatively high formalisation in these key functions, even though low formalisation in boundary-spanning units is likely to be induced by the dynamic environment.

Environment and Organisational Centralisation

Despite many and varied definitions, for the present purposes, centralisation is considered to be the degree to which formal authority to make discretionary choices is concentrated in a single individual, unit or

level, thus permitting minimal input into decisions from beyond those boundaries. At the other extreme, decentralisation which, in the sense used here, equates with delegation, reduces the probability of information overload, facilitates rapid responses to new information, provides more detailed input into decisions, motivates and represents a potential vehicle for training management in developing sound judgment. The degree of control that an individual, unit, or level holds over the separate phases of the decision making process constitutes a useful means of locating a situation on the centralisation-decentralisation continuum.

According to Mintzberg (1979), the more complex the environment, the more decentralised the structure. Regardless of the stable-dynamic dimension, if a large number of dissimilar factors and components exist in the environment, an organisation can best meet the uncertainties that this causes through decentralisation. The diversity of factors tends to overload the information processing capabilities of management, with the consequence that the environment is dealt with as a series of subenvironments and responsibility for decisions within each are delegated.

Responses to environmental disparities are through decentralisation (Mintzberg, 1979; McDonough and Leifer, 1983), different responses to different subenvironments being achieved through creating decentralised subunits. Organisations tend to decentralise selectively, using this approach only as a reaction to differential elements in the environment. An organisation's overall environment may well be basically static, however one or more of its subenvironments may be dynamic.

Many of the key aspects of this dimension are touched on in the protected areas and cognate literatures, the regional plan for actions for protected areas in Europe (IUCN, 1994a) being typical in advocating the decentralisation of specific authority and responsibility for each protected area to local managerial level within the agency charged with its management. The European regional plan also deals with public participation, an issue not uniformly addressed in such plans. It supports the notion of giving local communities the right to be involved in the

management of all public protected areas, and goes beyond this to specify the rights of public or user involvement, including the rights of local authorities, local businesses, scientific institutions, and non-governmental organisations concerned with conservation.

Mintzberg (1979) examines hostility as a further aspect of this dimension, the evidence confirming that extreme hostility in the environment drives organisations to centralise their structures, even if this is only a temporary measure. The apparent contradiction with the earlier point that a dynamic environment is customarily met with decentralisation, can be explained by the need for innovation and responsiveness normally achieved through decentralisation being neutralised by the risk of an incorrect decision.

A number of researchers have found that decentralisation and the use of sophisticated control and information systems go hand in hand (*e.g.*, Child, 1972b), an impersonal system of control being substituted for personal supervision and control. As key elements of organisation structure, the primary function of control and information systems is to reduce internal and external uncertainty in decision making. The degree of sophistication in these systems derives from a complex of situational variables, such as organisation size and environmental diversity.

As a tool, decentralisation promotes synergy between an organisation's performance aspirations and the needs of its middle- and lower-level managers. It is also a tool that enhances the adaptive capacity of different parts of an organisation, however it exposes an organisation to the risk of a lack of coordination among management activities.

Essentially, there is a choice between centralisation and a simple structure on the one hand, and decentralisation and a complex structure on the other. Centralisation can make for quick, but not necessarily for the most rational and timely decisions, whereas decentralisation can facilitate decisions that *are* rational and timely, although it does not necessarily foster the speed of decision which can be essential from top management in a crisis. In addition, decentralisation requires a complex and costly infrastructure if it is to work effectively. Clearly, serious problems for an organisation can be avoided by paying attention to the

task environment and selecting the combination of centralisation and structural complexity that is most apt in that environment.

* * * *

Linking the review of the mainstream literature with alternative viewpoints on the environment-structure relationship *via* the dimensions of capacity, volatility, and complexity provided the seed for crystallising both the influence of environmental uncertainty on structural arrangements, and the way in which different structural dimensions articulate. *Firstly,* underlying this Review has been the contention that different organisations face different degrees of environmental uncertainty, and that structural design is a major tool which is available to eliminate or minimise the impact of environmental uncertainty. *Secondly,* in developing tentative formulations on the environment-structure relationship to serve as the foundation for the Research Questions and Propositions which follow, there was a focus on the core structural dimensions of complexity, formalisation, and centralisation, representing the factors which, in combination, generate different organisational designs.

RESEARCH QUESTIONS

The tentative formulations on the environment-structure relationship as derived from the preceding review of theory and empirical research were used as basic guides in translating the Working Aims set out in Chapter 1 into the following Research Questions:

1 How are the following contingency variables configured in each organisation's environmental profile?
   - Heterogeneity
   - Turbulence
   - Hostility
   - Technological Complexity
   - Restrictiveness

These contingency variables represented particular aspects of the three environmental dimensions identified under "Organisational Morphology": The two variables selected from the environmental capacity dimension were *hostility* and *restrictiveness.* As has been noted, *hostility* was characterised at one extreme by some combination of risk, stress, and domination, and at the opposing pole by safety, opportunity richness, and organisational controllability. The other variable, *restrictiveness,* was taken as meaning significant legal, political, and/or economic constraints on an organisation's operation and, at the other extreme, by little constraint from such sources. There is a patent link between environmental volatility and *turbulence* - understood as a state of unpredictability occasioned by events themselves or other phenomena or brought about by contradictory information about events. At the other end of the turbulence spectrum lies the relatively stable scenario of predictable events together with reliable and readily available information. *Turbulence* reflects the key aspects of volatility, and accordingly was taken as the variable for this dimension. Two variables were selected from the dimension of environmental complexity: *heterogeneity* and *technological complexity.* Typically, *heterogeneity* was seen here as connoting an environment which is diverse and differentiated, its polar extreme being marked by homogeneity. *Technological complexity* was taken as referring to environments in which the decision information required is technically sophisticated, as opposed to those which lack technological refinement from this standpoint.

2 How are the following core dimensions and allied factors of organisational structure configured in each organisation's structural profile?

- Complexity
- Centralisation
- Delegation
- Sophistication of Control and Information System
- Formalisation
- Environmental Agility
- Infrastructure

The three core structural dimensions were outlined earlier in this Chapter, whilst the four allied factors which span the core dimensions are described below.

Environmental agility relates to the extent to which an organisation maintains awareness of, and responds appropriately to, its environment. The focus of maintaining awareness is on environmental components: other organisations operating in the same task environment, together with technological, political, legal, and social factors. Proactivity or reactivity will depend upon the circumstances, and action may include structural flexibility, *i.e.,* the extent to which an organisation is able to adapt to externally induced change. This, in turn, will normally be a function of the degree of flexibility in the organisation's existing policies and structure.

Infrastructure as conceived here enables an organisation to engage in a number of very disparate activities *and* to keep them coordinated. The key elements of infrastructure include mechanisms to ensure that internal boundaries between organisational units do not interfere with achieving solutions to joint problems, together with division of work in terms of overall task responsibility and the integration of core and support work.

Given that the primary function of a *control and information system* is to reduce internal and external uncertainty for decision makers, it is critical that the level of *sophistication* be appropriate to the external and internal environments. This may range from a highly refined, comprehensive, and technologically advanced system which provides advanced forecasting, planning, and monitoring of internal and external activities, to the other extreme of a bare, simplistic approach which is essentially informal in nature. Systems in which the level of sophistication is high may well substitute for personal supervision, rules, and decision discretion, leading to structures which are lower in complexity, and in which there is less formalisation and centralisation.

Whilst *delegation* of authority forms the core element of centralisation, it also overlaps with both formalisation and complexity *via* various intervening variables such as the level of sophistication in the control and information system noted above. Not only was the *degree* of delegation considered to be material to the analysis, but also the *type* of decision which was delegated and the *actual* extent of delegation where this differed from the level of formal delegation.

3 How do the environmental profiles of organisations compare, and in particular, are there notable differences in the task environments of the principal structural elements of any of the organisations, or in the capacity, volatility, or complexity of the environments?

4 How do the structures of the organisations compare with respect to their superstructures and infrastructures?

5 What degree of variation is there in the influence exercised by the contingency variables over the core dimensions and allied factors of organisational structure?

6 What is the relative sensitivity of the principal structural elements to the influence of the contingency variables?

7 Are any significant anomalies apparent in either the profiles or in the relational patterns between environmental and structural elements, and under what conditions does each anomaly occur?

PROPOSITIONS

In the context of the Project, the following propositions were ultimately derived from the survey of the literature of organisation design and a selective review of the literature of organisation theory. These propositions provide reference points with which to orient much of the work in this Thesis, and will be central to constructing the conclusions to this research.

PROPOSITION 1

The greater the technological complexity and heterogeneity in the environment, the more comprehensive and sophisticated the control and information system, and accordingly:

1.1 the greater the level of delegation;

1.2 the greater the organisational agility.

PROPOSITION 2

The more heterogeneous the external environment facing an organisation, the greater the structural complexity of the organisation through horizontal, vertical, and spatial differentiation.

PROPOSITION 3

Increases in environmental heterogeneity and turbulence generate organisational uncertainty, resolution of which is achieved by increasing structural decentralisation.

PROPOSITION 4

As hostility in the environment increases:

4.1 centralisation increases;

4.2 formalisation increases in organisational operations.

PROPOSITION 5

The extent to which an organisation is able to provoke change or adapt to externally induced change will be determined by the degree of flexibility in the organisation's policies and structure, and by the levels of turbulence and restrictiveness in the environment.

PROPOSITION 6

The greater the heterogeneity, technological complexity, and restrictiveness in the task environments of the major subsystems of an organisation, the greater the proportion in those subsystems of professional personnel who adhere to the norms of their professions, and:

6.1 the greater the decentralisation;

6.2 the less the formalisation.

PROPOSITION 7

Turbulent environments are likely to induce:

7.1 the insulation of key operating activities from uncertainty to enable the maintenance of relatively high formalisation in these key functions;

7.2 low formalisation in boundary-spanning units.

PROPOSITION 8

Organisations in heterogeneous, turbulent, and hostile environments coordinate disparate activities through endeavouring to ensure that:

8.1 internal boundaries between organisational units do not interfere with solving joint problems;

8.2 division of work is accomplished in terms of:

8.2.1 overall task responsibility;

8.2.2 integration of core and support work.

CHAPTER 3

RESEARCH DESIGN

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RESEARCH DESIGN

The broad framework of the research design was effectively predicated by the nature of the Project as manifest in the Research Objectives. *Firstly,* some research designs were automatically excluded by the need for the structure of each organisation to be considered in conjunction with its context. Yin (1981) and Hartley (1995) have pointed out that in such situations where the context is deliberately an integral part of the study, the number of variables and the number of observations would be disproportionate, rendering conventional experimental and survey designs inappropriate. However organisational structure was of interest here *precisely because* of its relation to its environmental context.

Secondly, the broad concerns which make up the Research Objectives, coupled with their focus on contextual conditions in addition to the phenomena under study, and their implied reliance on multiple sources of evidence, all point to the case study as the research strategy of choice. This is supported by Yin (1993), and by the accent in this research on explanation and on tracing structural patterns over time, factors which point to the use of multiple case studies as the preferred research strategy. Additional backing is provided by Campbell, Daft, and Hulin (1982) and by Hartley (1995) in their contentions that the case study is preferred in examining contemporary phenomena which cannot be manipulated or controlled, and when the boundaries between the phenomena and their context are less than clearly evident - scenarios which parallel the main thrust of the present work.

Accordingly, the design of this research:

- articulates the research objectives, working aims, research questions, and propositions representing themes derived from theory and previous empirical research;
- links the research objectives and questions to theory, prior research, and the multiple cases under study;
- outlines the methods used to ensure the quality of the research;
- defines the bases on which cases were selected for study;
- sets out the roles of the case study protocol and the pilot case study;
- identifies the sources of evidence which are critical to examining the propositions and provides guidelines on using multiple sources;

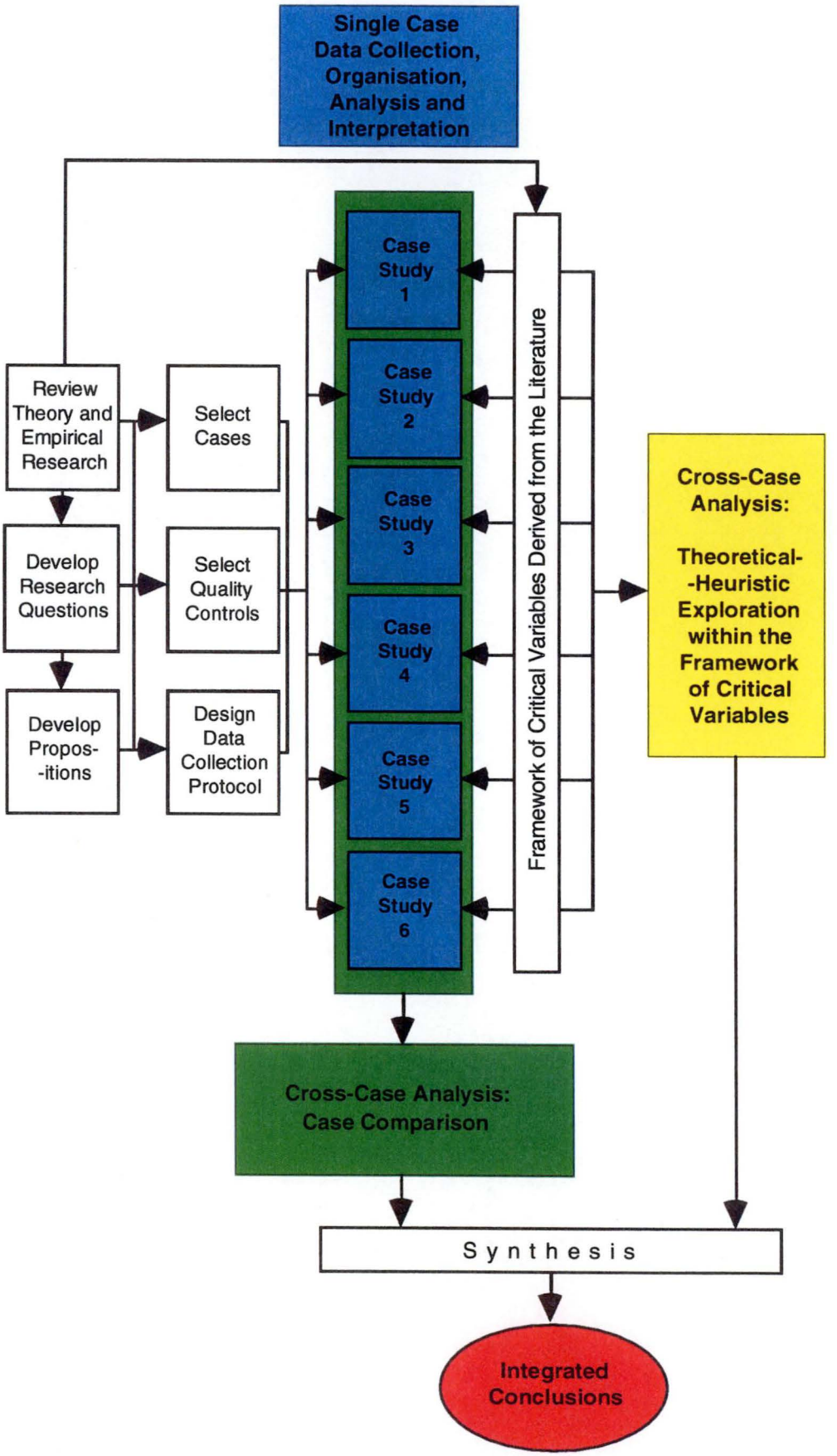
- stipulates the relevant tactics for analysing the evidence, so that questions of initial interest are addressed in a critical manner, both at the individual case level and cross-site.

The main components of the research design are set out schematically in Figure 3.1. These are progressively amplified in this Chapter.

Not only does the case study rely on multiple sources of evidence, but as a systematic research strategy, the case study's unique strength lies in its ability to deal with a full range of evidence including documents, interviews, and observations. The case study *neither* implies the use of a particular type of evidence, *nor* entails a particular data collection method. It accordingly afforded considerable latitude in the selection of each of these, governed only by the exigencies of the type of case study chosen, and in particular the idiosyncrasies of each organisation under review. This work adopted an amalgam of conventional comparative study - both qualitative and quantitative - and heuristic study of cases, using the cases as building blocks for theory development. In preserving key aspects of each of their identities, a synergistic effect was created between the two types of study, which facilitated the clarification of patterns of similarities and differences displayed by the contingency factors. This, in turn, helped in the identification and classification of both causal factors and interrelationships amongst the variables under study.

Underpinning the core theory of research design advanced in this chapter is a synthesis of the ideas advanced by Stake (1995), Eisenhardt (1989), and Yin (1994), the latter work being widely acknowledged as the standard text on case study research. Yin's concept of "explanation-building analysis" is comparable with George's (1979) proposal of "analytical inductive approach to theory development", and in collecting data on the same variables across cases, approaches George's "structured focused comparison" (King, Keohane, and Verba, 1994). The case study is essentially an heuristic device to stimulate the imagination to discern important *new* problems, identify possible theoretical solutions, and formulate potentially generalisable relations that were not previously apparent. At the tactical level, some of the approaches to collecting evidence derive from Khandwalla (1977), and a considerable intellectual debt to Miles and Huberman (1984, 1994) must be acknowledged.

FIGURE 3.1 RESEARCH DESIGN - MAIN COMPONENTS



THE QUALITY OF THE RESEARCH DESIGN

In developing the research design, four criteria were identified as indispensable to achieving a high quality research design - construct validity, internal validity, external validity, and reliability. A number of different tactics were adopted in an endeavour to ensure that all four quality criteria were met. These tactics are noted below:

Construct validity

In order to establish organisational assessments appropriate to the conceptual content of the research objectives, four tactics were employed:

- using multiple sources of evidence during data collection encouraged convergent lines of inquiry;
- establishing a chain of evidence, also relevant during data collection;
- utilising statistical correlations to confirm linkages;
- having the draft reports of each case study reviewed by key interviewees and other informants.

Internal validity

The main tactic for establishing whether causal relationships existed, whilst controlling extraneous variables, was the analytic technique of explanation-building, itself a special type of pattern-matching.

External validity

To establish the domain to which case study findings can be generalised beyond the immediate case study, replication logic was applied to the set of case studies, a feature dictated by the analytical generalisation upon which case studies rely.

Reliability

In demonstrating that the operations of any of the case studies - such as the data collection procedures - could be repeated, with the same results, adequate documentation was essential, and accordingly the tactics here included case study protocols and the development of case study databases.

SELECTION OF CASES FOR STUDY

The epistemological principles on which case-based research is founded are fundamentally different from those of research relying solely on quantitative multi-variate techniques (Edwards, 1998). The small sample in the sort of comparison used here need not be representative in the statistical sampling sense in order to contribute to theory development. The *desideratum* that guided selection of cases in this comparison is not primarily numbers but *variety*, that is, cases belonging to the same class that differ from each other. The intention here was to search for cases in which the outcome of the dependent variable differed, together with cases having the same outcome but a different explanation for it. For the present study, the requisite variety was generated *via* a diverse set of eight factors distilled from a review of the relevant literature, this set of factors reflecting a cross-section of the contingency variables which would be likely to influence the structures of organisations managing protected areas:

- number of levels of government involved
- mechanisms for coordinating governmental levels
- type of government involvement
- extent of public participation
- level of economic development of the country
- maturity of the management regime
- local management
- relevant IUCN classification. [1]

Cases were selected on the basis that they differed in at least one of this set of factors, resulting in the six cases shown in Table 3.1. This approach made it possible to examine the variety of causal patterns that can occur, and the conditions under which each type of pattern occurs.

1 Using the revised system of 1994 (IUCN, 1994b) the *range* of categories recognised by the IUCN reflects the thinking of its membership including governments and conservation groups as well as the expert network making up the World Commission on Protected Areas (previously the Commission on National Parks and Protected Areas). The range of categories also reflects the varied ways of maintaining the world's living resources for their intrinsic value, for their biological diversity, and as the basis for sustainable management to meet human needs. The *order* of categories reflects, in ascending order, the degree of human use acceptable in each case.

The IUCN management categories selected (II, IV, V, and VI) represent the mainstream, accounting for more than 90 per cent of the total areas covered by the Protected Area category. The research objectives were not compromised by the exclusion of Category I, 'Strict Nature Reserve/Wilderness Area', together with Category III, 'Natural Monument', as these did not appear likely to require any specialised organisational arrangements beyond those which might be expected in the mainstream categories.

As Table 3.1 indicates, the six areas chosen exhibit marked differences in their physical size and geographic location, quite apart from the degree of variation which they show on the factors listed.

TABLE 3.1 INVENTORY OF PROTECTED AREAS SELECTED FOR STUDY

PROTECTED AREA	KEY FACTORS
Annapurna Conservation Area, Nepal	Management of this Area is innovative, relying on public participation and education, and linking conservation with human development. Local management is in the hands of a director appointed by the King Mahendra Trust for Nature Conservation. This is a planned experiment with a management regime for an area which, in effect, consists of a core Category II National Park and a large buffer area with considerable values in its own right qualifying as a Category VI area. *Area*: 7,629 km^2.
Ngorongoro Conservation Area, Tanzania	Originally part of the Serengeti National Park, this was established as a separate conservation area with an evolving management regime. Some efforts have been made at closer integration between the Area Authority and local government. Since 1974, the Crater proper has effectively been managed as a core zone (conforming to IUCN Category II), the remainder of the Category VI Conservation Area being managed as a buffer zone to the Crater and the adjacent Serengeti National Park. *Area*: 8,288 km^2.
Central Plateau Conservation Area, Tasmania, Australia	As a Category IV Habitat/Species Management Area, this exists within the Tasmanian Wilderness World Heritage Area, and at the strategic level is subject to some Federal and State Government co-management. Day-to-day operations management is, however, exclusively in the hands of the Tasmanian Parks and Wildlife Service through its functional structure. Community involvement occurs through formalised consultative processes and various land user bodies. *Area*: 892 km^2.
Pinelands National Reserve, USA	This IUCN Category V Protected Landscape is administered by a three-level partnership involving Federal, State, and local governments coordinated by a fifteen member Pinelands Commission as an independent State agency. *Area*: 4,452 km^2.
Peak District National Park, United Kingdom	This is the classic Category V Protected Landscape in a developed country with sophisticated planning systems. The Peak District National Park Authority is both the National Park and Local Planning Authority for the area; 20 members from constituent local councils, 18 appointed by the central government. The local administrative structure is the most direct of the English and Welsh protected landscapes. *Area*: 1,438 km^2.
Great Barrier Reef Marine Park, Australia	Control of this Category VI Protected Seascape is through the Great Barrier Reef Marine Park Authority - a Federal Government body with Queensland Government and Aboriginal nominees. A Consultative Committee represents government, industry, and community bodies. A Ministerial Council coordinates the policies of the two Governments. The Queensland National Parks and Wildlife Service carries out day-to-day management for the Marine Park Authority. *Area*: 339,750 km^2.

Notwithstanding these considerations, this essentially qualitative approach is later complemented by selected quantitative techniques, and it was accordingly necessary to make some concessions to the requirements of both types of approach.

PLANNING DATA COLLECTION

CASE STUDY PROTOCOL

As the research strategy calls for a multiple-case design, it was necessary to develop a case study protocol containing the instruments and related procedures. The protocol is recognised as a major tactic in improving the reliability of case study research and provided guidance in carrying out the case studies, particularly in helping to integrate real-world events with the needs of the data collection plan.

Whilst the protocol was of particular relevance in the Australian case studies (the Great Barrier Reef Marine Park and the Central Plateau Conservation Area), it also proved its value as an adjunct to the more remote studies, especially given the sometimes lengthy delays in responses from informants.

Following some aspects of the model provided by the Case Study Protocol developed in a rather different context by the National Key Centre in Industrial Relations at Monash University, the protocol here comprised:

- Schematic outline of the case study project - which served to maintain focus on the research objectives, working aims, research questions, and propositions.
- Field procedures, emphasising the major tasks in collecting data, including:
  - gaining access to interviewees in key organisations in the two Australian cases, and to key informants in the remote cases;
  - accessing resources while in the field in the Australian cases;
  - procedures for handling accumulations of voluminous documents at the Australian field sites;
  - a schedule of the data collection activities that were expected to be completed within specified periods of time;
  - possible tactics for unanticipated events, including changes in the availability of interviewees; preparation of the protocol was valuable in that it forced the anticipation of several problems.
- Case study questions which reflected the full set of concerns from the initial design were embodied in interview *pro formas* and structured questionnaires as summarised in the next section "Collecting Evidence". The protocol also included the probable sources of evidence.

PILOT CASE STUDY

In order to guide the design of the detailed analytical study which forms the core of this Project, it had been intended to carry out a pilot study of the management of the Central Plateau Conservation Area (CPCA) of Tasmania by the State Parks and Wildlife Service. This pilot study was to have been carried out whilst awaiting responses to the preliminary contact letters to the other organisations. Forming part of the Tasmanian Wilderness World Heritage Area, the CPCA was chosen primarily because of its geographical convenience and the anticipated ease of obtaining information through both interview and documentation. Informants within the Parks and Wildlife Service ultimately proved to be supportive and accessible, and the Service served as a productive source of documentation and data, however a protracted delay in the initial agency response meant that work on the CPCA had to proceed in parallel with that on the other organisations, and it has been treated as a case study in its own right. Nevertheless, it was still possible to use the CPCA as something of a testing-ground through which to refine data collection plans with respect to both the content of the data and the procedures to be followed. In addition, the CPCA case assisted formatively in developing relevant lines of questions, as well as in providing some conceptual clarification.

COLLECTING EVIDENCE

SOURCES

Selecting from amongst the various sources of evidence which can serve as the focus of data collection for case studies was guided by the Propositions emanating from the review of theory and empirical research and which are set out at the end of Chapter 2. These Propositions reflect the Research Questions, and provided an intimation of the sort of evidence which would be required in order to facilitate later analysis. Consideration of these Propositions culminated in the choice of documentation, surveys using interviews and structured questionnaires, archival records (where available), and in the two Australian cases, direct observation. Efforts were made to maximise the benefits of these four

sources of evidence by following three fundamental guidelines which are generally acknowledged as being of considerable value in dealing with the problems of establishing the construct validity and reliability of a case study. *Firstly,* multiple sources of evidence were inherent in the wide variety of evidence which characterises the case study approach. Indeed, a major strength of data collection here is the opportunity to use many different sources, and far exceeds the potential of other research strategies in this respect (Yin, Bateman, and Moore, 1983). Whilst the use of multiple sources of evidence in these case studies was clearly advantageous in that it allowed the examination of a broad range of historical and contemporary matters, the most important value attaching to the use of multiple sources is that it enabled converging lines of inquiry to be developed - a process of triangulation as noted earlier under Interviews. It was in this manner that the potential problems of construct validity also were able to be addressed, because the compound sources of evidence essentially provided multiple perspectives on the same phenomena.

Secondly, maintaining a chain of evidence was mandatory so that subsequently it would be possible to trace the derivation of any evidence from the initial research questions through to the ultimate case study conclusions; this included ensuring that no original evidence was lost. This improved the reliability of the information in the case studies, and also addressed the methodological problem of determining construct validity, thereby increasing the overall quality of the case studies. *Thirdly,* a systematic method of organising and documenting was essential, given the voluminous data collected on each of the case studies. Quite apart from the extensive secondary documentation obtained on all the case studies, the two Australian cases generated substantial sets of field notes gleaned from interviews and observations, whilst the questionnaire and ancillary responses from overseas organisations and external observers were almost equally prolific. To accommodate this core requirement, and to increase the *reliability* of each of the case studies, databases were developed as outlined later in the discussion of organisation and primary analysis. The data collection techniques themselves are summarised in the following sections.

Documentation

As wide a variety of documents as possible was accessed for each managing organisation under review. These comprised:

- letters, memoranda, and other communiques;
- agendas, notices, minutes of meetings, and other similar reports;
- administrative documents such as proposals and progress reports;
- formal studies of the same organisations;
- Internet sites for the organisations concerned (where these were available), together with third party sites;
- media releases and reports - print and electronic media.

As used in relation to the case studies, one of the main applications of documents lay in corroborating and augmenting evidence from other sources:

- Corroborating information obtained from other sources - and even where the documentary evidence was contradictory rather than corroboratory, the documents at least afforded a basis for further inquiries;
- Enabling feasible inferences to be drawn although, erring on the side of caution, these are to be treated more as clues worthy of further investigation rather than as definitive findings.

With the Australian cases - particularly with the Great Barrier Reef Marine Park Authority - additional valuable documentation was retrieved from libraries in related organisations, such as the Australian Institute of Marine Science at Cape Ferguson and the Cooperative Research Centre for Ecologically Sustainable Development of the Great Barrier Reef at James Cook University in Townsville.

Surveys Using Interviews and Structured Questionnaires

Recognising that investigative questions need to be both grounded in theory and linked directly to the objectives of the research, a set of standardised, general questions was developed to reflect the theoretical focus of the inquiry and the research questions. The case study questions fell into eight groups, all of which explored various characteristics of a particular organisation or its environment. Consistent with the research questions, the characteristics of external environments examined through the investigative questions were heterogeneity,

turbulence, complexity, hostility, and restrictiveness, and linked with this group, the agility of an organisation with respect to its environment. Various factors within each organisation were also examined, including its complexity, its degrees of centralisation, formalisation, and delegation, the levels of sophistication of the organisation's control and information system, and key elements of its infrastructure. Using this standardised set of questions - necessarily couched in terms applicable to all cases selected - in the comparison was necessary also in order to assure the acquisition of comparable data from the several cases. Nevertheless, specific questions were asked subsequently in relation to each case to bring out idiosyncratic features that were of potential interest in themselves. Questions were pre-tested as interview and questionnaire items on subjects with relevant practical and educational backgrounds. Respondents - almost without exception - proved most cooperative in providing additional material, in updating information, and in clarifying points raised with them throughout the course of the Project. These contacts were generally through E-mail. A proposal for ethical clearance for the interviews and questionnaires was submitted to the University Human Research Ethics Committee, the project meeting the specific criteria necessary for exemption from approval.

Interviews

In the Australian case studies (the Great Barrier Reef Marine Park and the Central Plateau Conservation Area), focused interviews were conducted with key officers in both managing agencies. Interviews ranged from 45 minutes to 2.5 hours duration, although the mean time was close to one hour. As indicated in the case study protocol, interviews were based upon interview *pro formas* (essentially following the substance of the Questionnaires noted below) although an open-ended character was maintained, with opinions and insights being sought from respondents.

Although these interviews were a crucial source of case study evidence, it was recognised that they were, of their nature, verbal reports only, and that as such, they were subject to the problems of bias, poor recall, and inadequate or inaccurate articulation. It was accordingly necessary to utilise triangulation, seeking corroboration from other sources. A related issue stemmed from the fact that in deriving information from members of

the organisations under study, the interview information was essentially subjective. This was, however, offset by objectively deriving information on the same matters from disinterested outside observers, as recommended by Starbuck (1976) in his monumental review of the literature on organisation-environment relationships.

Structured Questionnaires

In the more remote cases - the Ngorongoro Conservation Area, the Annapurna Conservation Area, the Peak District National Park, and the New Jersey Pinelands - structured questionnaires were substituted for interviews. The content of these questionnaires followed, as far as possible, that of the interview *pro formas.* As with interviews, information from questionnaires was corroborated with material from other sources, and information was derived both objectively and subjectively.

As indicated above, questionnaires were used to obtain independent information from outside observers. Approaches to these external observers were made on the basis of their particular knowledge and understanding of an organisation and its environment, and their ability to provide objective, independent, and informed opinion. These qualities derived from various backgrounds, including previous work at a senior level in an organisation under study, current policy-level status in a body linked with one of the organisations, senior appointment in an organisation operating in an analogous domain, and senior academic research with interests in an organisation and/or its domain.

The questionnaires consisted of eight groups of questions asking respondents to rate various characteristics of the relevant organisation or its environment. There was also scope for respondents to make any appropriate comments. The questionnaires comprised a few questions consisting of a series of numerical ranges, however almost all questions were based upon seven-point Likert-type scales, labelled only at the two extremes, and with some scale reversals to improve reliability. The questionnaires were despatched under cover of a supporting letter to respondents who currently headed or worked within organisations, and to outside observers who were judged to have sufficient familiarity with the particular organisation to address the detailed questions. Response

rates of 74 per cent and 86 per cent were achieved for internal and external respondents respectively, yielding an overall response of 81 per cent.

Archival Records

Although there was little uniformity in the availability of these records, they did provide additional corroboration in some instances, particularly where there were organisational records, organisation charts, and previously collected data which were able to be used in conjunction with other sources. Archival records were of greatest significance in the Australian cases - especially the Central Plateau Conservation Area - however the Internet provided some unexpected archival-type material in sites which had not been updated for lengthy periods.

Direct Observation

Field visits were made to the Townsville Offices of the Great Barrier Reef Marine Park Authority, and to the Hobart and outlying operating offices of the Tasmanian Parks and Wildlife Service as the managing agency for the Central Plateau Conservation Area. These visits created opportunities for direct observations during occasions when other evidence (*e.g.,* from interviews) was being collected. Although these direct observations were not included in the case study protocol, they nevertheless afforded useful insights and corroboration.

ANALYSING AND INTERPRETING CASE STUDY EVIDENCE

Within the overall case study research strategy, the propositions set out in the previous Chapter provided the theoretical framework for the analytic tactic by focusing on *what* should be studied in order to satisfactorily address the *how* research questions identified earlier in that Chapter. This analytic tactic then underpinned the specific analytic *approach* selected for use in each of the case studies - explanation-building.

ORGANISATION AND PRIMARY ANALYSIS OF INDIVIDUAL CASES DURING DATA COLLECTION

Organising the data on each of the case studies into a form which was readily manipulated involved progressively condensing the raw data on each case by reconciling redundancies, classifying, arranging, and editing into a manageable and accessible form which then served as the primary resource on that case - effectively a case record. This organisation was initially achieved with databases set up using *HyperCard 2.3.1* on the Macintosh platform to facilitate storing and editing field notes. Eventually it was decided to change to *FileMaker Pro 2.0 for the Macintosh* to take advantage of the more advanced features of this package, particularly in organising case study evidence. There was considerable primary analysis inherent in this organising process, consistent with Miles and Huberman's ideal model for data collection and analysis in which both these aspects are interweaved from the start (Miles and Huberman, 1994). Analysis during data collection made it possible to alternate between thinking about the existing data and generating approaches for collecting new - sometimes better quality - data. Key aspects of the organisation and primary analysis in each case study included constructing matrices - especially useful in preliminary explanations, identifying coherent themes and patterns, as well as displaying data in the form of organisation charts and flow charts to facilitate examining data. Both of the computer software packages used to create and maintain databases *(HyperCard* and *FileMaker Pro)* facilitated much of this.

SECONDARY ANALYSIS AND INTERPRETATION OF INDIVIDUAL CASES

The results of the primary analysis built into the organising process formed a springboard to secondary analysis of the individual cases. As indicated in Figure 3.1, the individual cases were developed against a framework of critical variables derived from the literature, as reflected in the Research Questions. This stage equates to Edwards 1998 idea of *exploratory description,* and to Eckstein's earlier (1975) conception of the *configurative-idiographic: idiographic* is apposite here because the goal is not to generalise to other cases or to develop theory, and *configurative* equally apt in that principal concern focuses on achieving an organised and coherent presentation of the cases. For these cases, the data from

the questionnaire responses were validated *via* multiple correlation, then summarised in selected descriptive statistics covering both the external environment and the core dimensions and allied factors of organisational structure.

The statistical measures utilised were determined using *GB-STAT 6.5.4 Pro* on the Macintosh platform, and by manual calculation of measures of skewness according to an extension of Bowley's measure (as advocated by Groeneveld and Meeden, 1984), resulting in a measure which has less imperfections and easier interpretation than the software skewness measures based on standard deviations or cubed deviations. The descriptive statistics for individual organisations were subsequently compared with the overall pattern of data as part of the broader assessment of the variables. Within the general tactic of this assessment, the pattern-matching logic used in building explanations meshed well with the multiple-case design, as well as helping to strengthen the internal validity of the cases. Matrices continued to assist sorting out cause-and-effect relationships, complemented by developing causal networks from the primary analysis.

CROSS-CASE ANALYSIS: CASE-COMPARISON

In moving from analysis of the individual cases to cross-case analysis, the replication logic spanning all six cases fostered *external validity.* The analytic techniques used to pursue the comparisons drew upon the results of both the primary and secondary analyses of individual cases. As Edwards (1998) has observed, description cannot be entirely separated from theory development, the cases here providing a foundation of sound descriptive work. Edwards, together with Yin (1981), demonstrated case-comparison to be a most valuable approach for cross-case analysis, and this technique proved to be particularly apposite here in reducing the tension between the unique, contextually specific nature of single organisations, and the need to make sense across the six sites.

Such comparisons, as Diesing (1971) notes, are particularly suited for developing typological theory which, in contrast to a general explanatory theory, is cast in the form of contingent generalisations and has the capability for more discriminating explanations. Contrast, for example, a

general explanatory theory such as 'structure follows strategy' (Chandler 1962, 1977) with a richer, more differentiated theory comprised of contingent generalisations that identify the different conditions under which different types of strategy lead to different types of structure, or one which takes into account the reciprocal character of the structure-strategy relationship. The second and third types of differentiated theory clearly have greater explanatory power, and also have far greater practical value for those who make decisions on organisational design, because they permit more discriminating diagnoses of emerging situations.

As the basic building block for conventional cross-case analysis, matrices formed the main qualitative instruments, enabling organisation of the data into increasingly economical displays, and allowing the full set of six cases to be worked with simultaneously both for factors in the environments of organisations and for factors in the structures of the organisations. Through this approach, some key links between environmental variables and structural variables were established.

Analytical focus was achieved by proceeding sequentially as the theoretical focus sharpened, *firstly,* categorising by using a variety of approaches which included *partitioning variables* at the outset (complexity, for example, was "unbundled" into horizontal, vertical, and spatial differentiation) to avoid monolithism and data blurring, as well as later in the analysis where a variable was not relating as well to another as the conceptual framework had suggested (as, for example, were delegation and infrastructure), *scanning for clusters* and overlapping clusters of underlying factors, and *scrutinising for patterns* of and within variables involving similarities and differences and, where appropriate, patterns of processes involving connections in time and space (as recommended by Dey, 1999). *Secondly,* synthesising by connecting categories through reassembling the data in fresh ways and, in instances in which new patterns did not present themselves, recombining divided variables in their original format as far as possible to avoid the excessive differentiation which can lead to complexity and poor mapping of linkages. *Finally,* creating typologies which focused on the extent to which categories were apparent in agencies, including the systematic linking of core categories to others and refining categories that needed further development.

CROSS-CASE ANALYSIS: AN HEURISTIC APPROACH

The descriptive foundation provided by the cases permitted the material to be approached heuristically through an adaptation of Edwards' (1998) conceptual framework for case-based exploration which utilises some features of Becker's (1968) building-block technique. The aim was to develop a fabric of distinctions and relationships that would open up the essential qualities of the set of cases, and complement the more traditional approach of case-comparison. Two tactics were used here: *firstly,* relationships between dependent and independent variables were explored through multiple regression and correlation analysis, the use of canonical analysis having been rejected as inconsistent with the exploratory character of this study where the primary interest is in the influence of environmental factors on each dependent variable *in its own right,* consistent with the view espoused by Cohen and Cohen (1983). Given the limited size of the data set, some instability in the output from the multiple regression was anticipated. It was considered that this would nevertheless form a potentially valuable source of information when taken in conjunction with the other approaches. The statistical measures utilised here were determined using *SPSS Version 8.0 for Windows. Secondly,* a large-scale descriptive matrix was constructed to maintain order in the data from all six cases, the objective being to array coherently the basic data for each of the major variables. A preliminary trial study had earlier been undertaken using *NUD*IST 4* on the Windows platform, but this produced spurious results, some of which were traced to corruptions whilst importing files. In any event the package did not appear to offer particular advantages over the systematic approach which was adopted. In this approach, cases were systematically juxtaposed in order to determine whether any patterns or relationships amongst the variables might exist, and where these were revealed, to draw out ways of explaining the linkages, iteration continuing until all combinations of the six cases had been explored. Given the systematic approach to knowledge from the six diverse cases, the provisional theory accordingly represents the product of a progressive conceptual refinement.

Prediction was made possible by the existence of associations where it was possible to specify the degree of relationship, and although such correlations do not in any way prove causality - association being a

necessary, but not a *sufficient* condition for a causal relation - the greater the *magnitude* of the association, the greater the likelihood of a truly causal relation. As against this, it was recognised that a true causal association might exist when there was only a meagre relation between two variables, because an event may be produced by several factors, all of which may be important because their small influences combine to cause an event (Labovitz and Hagedorn, 1981; Corbin and Strauss, 1990). *Consistency* was also sought, as this characteristic increases the plausibility of a causal interpretation through a relation persisting from one case to the next, the variety of conditions heightening confidence in the causal nature of the relation. Although it was not always possible to establish a *time priority* (where the causal variable must occur or change before the dependent variable), it was treated as a further criterion for establishing causal relationships, along with *non-spurious relation* (where an association cannot be explained by a third variable), and the existence of *rationales* justifying particular relationships.

* * * *

Analysing and modifying the various matrices, supplemented by the outcomes of the multiple regression, and embodying the understanding which emerged through feedback of the results of searches and analyses made it possible to reconcile the explanations stemming from the two phases of the cross-case analysis, and confirmed that the synergistic effect which had been sought in the amalgam of heuristic and conventional comparative study of cases had indeed been achieved. The joint comparative approach clarified the patterns of similarities and differences displayed by the contingency factors, making it possible to identify the forms of interrelationship amongst variables, the variety of different causal patterns that can occur, and the conditions under which each type of causal pattern occurs. Through helping to identify common elements and to isolate significant differences in explanations, in making it feasible to consider higher-order classifications, and in linking categories and exploring them to formulate and test theories grounded in the data, this approach to comparison proved most useful for developing a differentiated theory.

PART 2

THE CASE STUDIES

PART 2

THE CASE STUDIES

The six chapters making up Part 2 comprise case studies on each of the individual protected areas, each case study following the same pattern:

The Natural and Socio-Cultural Environments
Evolution of the Present Framework
Primary Data Analysis
- Validation of Source Data (see below)
- Descriptive Statistics (see below)
- Assessment of Variables in the External Environment
- Assessment of Variables in the Core Dimensions and Allied Factors of Organisational Structure

VALIDATION OF SOURCE DATA

As indicated in the research design, to ensure the quality of the research design, the use of multiple sources of evidence during data collection was pivotal in establishing construct validity. To this end, the validity of the data from respondents within agencies was determined by eliciting information from outside observers through questionnaires. As part of this validation, it was necessary to establish the consistency of the data emanating from the respondents within agencies as well as from the outside observers themselves.

Graphical plots and statistical tests were used to assess whether the data sets were normally distributed. Normal probability plots - the most reliable of the graphical approaches - showed that the data for all but two variables closely approached normal distributions, this visual analysis being complemented by measures of skewness which with the same two exceptions exhibited values of zero or which deviated negligibly from zero, confirming the normality of the bulk of the data. The only two variables to exhibit more than nominal departures from normality were *Technological Complexity* and *Environmental Agility*. In both cases the Groeneveld and Meeden skewness measures at 0.022 and 0.049 respectively were considered to be insufficient to justify logarithmic transformation as correlation and regression analysis has been shown to

be quite robust when the normal assumption is violated to such a limited extent, well below the threshold of ±0.100 at which skewness may constitute a problem.

Given that each data set was effectively a normal distribution, analysis was accordingly possible *via* the Pearson product-moment correlation, making multiple correlation appropriate for determining the degree of correlation:

- amongst agency respondents;
- amongst outside observers;
- between agency respondents and outside observers.

The Pearson correlation *(r)* was particularly apt for the purposes of validating the data, as it gives a valuable indication of the relationships between each pair of variables. In the Pearson correlation - an ordinal scale indicator of relationship strength - equal differences in *r* values do not, however, reflect equal differences in the strength of the relationship between the two variables, its value primarily lying in revealing both the strength and direction of the relationship between the two variables, *i.e.,* whether the relationship is direct or inverse. On the other hand, with the squared coefficient (*viz.,* the coefficient of determination) - a ratio scale indicator of relationship strength - equal differences in r^2 reflect equal differences in the strength of the relationship. So whilst it does not address the direction of the relationship, it does provide a more precise interpretation of the strength of that relationship. Both these measures were employed in validating the data to take advantage of their respective strengths. The multiple correlations for each aspect of the validation are set out in the first Table in each of Chapters 4 - 9.

DESCRIPTIVE STATISTICS

In selecting a means of summarising the data, it had already been established that the data sets could be treated as normally distributed, and accordingly it was decided for summary purposes to use the arithmetic mean as the measure of central tendency on the grounds that, apart from reflecting all the values of the data sets, it would facilitate the derivation of further statistical measures, and accordingly offset the disadvantages which adhere to this measure. In considering which measure of dispersion should complement the mean, a *relative* measure

of dispersion rather than the standard deviation was chosen as it would provide an indication of the average *degree* of internal variation which an initial inspection disclosed characterised some of the data. The standard deviation has the disadvantage of measuring the average *amount* of variation expressed in the original units of measurement, and as such an absolute measure it is unsuitable for comparative purposes. Comparisons were facilitated by using a relative measure which provided a feel for the magnitude of the variability of the data relative to the magnitude of the average. The relative measure chosen was the coefficient of variation (C_v), as in measuring the spread of data relative to the centre of the data sets, this coefficient provided an indication of the average *degree* of variation. By reflecting the extent to which an arithmetic mean may be considered to be representative of the data as a whole, the coefficient of variation provided a valuable guide to the reliability of the data distributions. In expressing the standard deviation as a percentage of the mean, the coefficient of variation removed any difficulties associated with absolute variation, especially across multiple data sets. The basic distributional characteristics of each of the variables also provided the necessary information required for the selection of subsequent statistical techniques.

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CHAPTER 4

THE GREAT BARRIER REEF MARINE PARK AUSTRALIA

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THE GREAT BARRIER REEF MARINE PARK AUSTRALIA

THE NATURAL AND SOCIO-CULTURAL ENVIRONMENTS

The Great Barrier Reef comprises an heterogeneous collection of reefs located near the edge of the eastern continental shelf off Queensland, where a combination of warm surface currents and proximity to deep oceanic water offer a conducive environment for coral reef development. The Reef extends some 2,000 kilometres from Lady Elliott Island just south of the Tropic of Capricorn northwards into Torres Strait, where the Reef culminates, by convention, in the Murray Islands Group. Bordered to the east by the deep Coral Sea Basin and the Queensland Trench, the shallow Coral Sea Platform, and the northern margin of the Tasman Sea, this shelf area forms the principal locus for the Great Barrier Reef Region as defined in Section 3.1 of the *Great Barrier Reef Marine Park Act* 1975. This definition establishes the area from which the segments of the Great Barrier Reef Marine Park (GBRMP) itself are drawn. The area under management is larger than the combined areas of Victoria and Tasmania or, internationally, is roughly equivalent to Italy, Norway, or Malaysia.

The GBRMP encompasses 2900 individual reefs, ranging in size from less than one hectare to more than 10000 hectares. There are some 300 vegetated and unvegetated coral cays, together with 618 continental islands. From a distance of 150 kilometres offshore from Cape York, the line of reefs approaches the coast until off Cape Weymouth it lies roughly 40 kilometres out. The lagoon in this area is relatively shallow (generally less than 36 metres), and the main sequence reefs run roughly parallel to the coast to just off Innisfail, before gradually receding to terminate in the Swain Reefs 200 kilometres off Perforated Point. Inshore further to the south lie the Capricorn and Bunker Groups of reefs which lie on a geological ridge roughly halfway between the mainland coast and the outer edge of the continental shelf. Although nearer the coast (averaging 80 kilometres), the contours of the shelf are such that these are the deepest reef waters, ranging down to 145 metres.

As shown in Figure 4.1, the GBRMP is almost contiguous with the Great Barrier Reef World Heritage Area (GBRWHA) inscribed on the World Heritage List in 1981. The Queensland islands are essentially all that differentiate the GBRWHA from the Marine Park, although the original bounds of the Park also excluded a small proportion of waters under Queensland's jurisdiction, representing exceptions to the general principle that the Park extends from low water mark on the Queensland coastline and islands to the edge of - and in some localities, beyond - the continental shelf. However in *Australia's Ocean Policy* released in December 1998, the Federal Government indicated its intention to include the previously excluded areas in the GBRMP to bring the boundary of the Marine Park, as far as possible, into alignment with the boundaries of the World Heritage Area. To this end, in January 1999, the Commonwealth proposed incorporating into the Marine Park all currently excluded aquatic areas - more than 6,000 square kilometres (Hill, 1999) - the rationale offered by the Federal Minister for the Environment and Heritage being that:

> Many of these areas were excluded from the park originally due to a lack of understanding of their ecological significance. We now better understand how these areas contribute to the overall health of this important region. Many of the areas we are seeking to add to the park have significant seagrass beds and are vitally important to the region's dugong population. The decline in dugong numbers prompted the Howard Government to implement the world's first series of dugong sanctuaries along the coast. The increased protection afforded to the areas we will be adding to the park will help in our efforts to ensure the survival and recovery of dugong populations.
>
> Hill, 1999

Formal adoption of the Commonwealth's proposal commenced in August 2000 with an additional 1,000 square kilometres being gazetted to the Marine Park, the Federal Environment Minister, Senator Robert Hill, indicating that six more areas were soon to be included in the Marine Park, with a further ten being assessed. The eighteen month delay coupled with the piecemeal adoption of the proposal reflect a level of accord between the Queensland and Commonwealth Governments which belies the confidence which Senator Hill expressed in early 1999. Despite Senator Hill's insistence that many of the original exclusions stemmed from lack of understanding of their ecological significance - a proposition upon which he again relied in announcing the new areas - it is perhaps no coincidence that the exceptions were made primarily in

FIGURE 4.1 THE GREAT BARRIER REEF MARINE PARK
(Source: GBRMPA, 1998)

areas where there were existing or potential harbours or prospective development sites, and in which the potential impact of activities on the Reef was judged to be minimal.

The tropical climate of the Great Barrier Reef is the product of a complex array of forces. *Firstly,* there are two aspects of the southern hemisphere circulation: the equatorial low pressure zone during summer and the sub-tropical high pressure zone during winter. *Secondly,* there are the pronounced effects of the adjacent continental land mass and the oceanic effects of the South Pacific. *Thirdly,* the wind patterns in the region are dominated by the south-east trade winds for much of the year, with north-westerlies prevailing during January to March under the influence of the inter-tropical monsoonal front. *Fourthly,* rainfall in the region varies seasonally, with summer dominated by the monsoon and cyclonic activity (Kenchington, 1990; Coveney, 1993).

The nature conservation values of the GBRMP derive from its status as the largest coral reef system in the world and its richness in terms of biodiversity stem from its manifold faunal, floral, and geomorphological resources. Within the Park there are some 400 species of coral, 1,500 fish species, and 4,000 species of mollusc, together with a great variety of sponges, anemones, marine worms, echinoderms, and crustaceans. Of the whales, humpback, minke, and orca are present in Park waters, as are a number of dolphin species. The area provides a habitat for many threatened species including the nesting grounds for green and loggerhead turtles, as well as habitat for four other species of marine turtle. The inshore beds of sea grass provide major feeding grounds for the dugong, whilst the many seagrass species which grow throughout the Park constitute important food sources for other grazing animals, including the turtles (Bowen, 1994). Many of the algae carried within the Marine Park serve as food for turtles, fish, molluscs, and sea urchins, whilst calcareous algae form an important component of reef building processes, although algae are also amongst the non-reef-building organisms which replace reef-building corals (Lucas *et al,* 1996).

Although the GBRMP generally extends only up to low water on the mainland and islands, the intimate links between terrestrial and aquatic environments makes it desirable to consider briefly the cays and continental islands. These support over 240 bird species, including

some breeding colonies of sea birds and breeding sites of land birds. The arboreal vegetation of islands within the Marine Park varies with the locality, the southernmost islands being typically *Pisonia*, whilst some of the more northerly islands and cays support wet tropical rainforest - including endemic palms, ferns and cycads - interspersed with some sclerophyll forests, swamps, and mangrove communities. The Low Isles off Port Douglas represent the southerly limit of reef platforms that support mangroves, corals, and seagrasses together - an atypical conjunction of these ecosystems. The great diversity of life forms, especially in the endemic species, makes the GBRMP an area of enormous scientific importance (Ludescher, 1996).

The islands of the Great Barrier Reef are intimately and inextricably linked to the cultural and economic characteristics of the GBRMP even though they do not properly form part of the Marine Park. Culturally, the islands are of archaeological significance and, with the Reef itself, are of contemporary importance to the Aboriginal and Torres Strait Islander communities of the Queensland coast. These communities have access to marine and near-shore resources which have historically played an important role in their economy. European exploration coupled with the navigational hazards of the Reef resulted in about 30 shipwrecks and eventually a large number of lighthouses, some of which remain of historical importance. The Reef is a significant economic region which is subject to a constant increase in users undertaking a wide range of activities. The value of economic activity in the area is estimated at more than one billion dollars Australian annually through commercial tourism, commercial fishing and recreational fishing and boating. The indirect economic value has been estimated to be an additional one billion dollars Australian through the transport, retail, and food industries. Shipping and associated port activity are also economically important, as is aquaculture (ANAO, 1998).

EVOLUTION OF THE PRESENT FRAMEWORK

The precursor of the GBRMPA, the Great Barrier Reef Committee, was founded in 1922 under the auspices of the Royal Geographical Society to promote research and conservation on the Reef. The Committee facilitated the historic 1928-1929 Great Barrier Reef Expedition, and established Australia's first coral reef field research station on Heron Island. It also played a significant rôle in highlighting major conservation matters, notably the *Acanthaster* Phenomenon (more emotively known as Crown-of-Thorns Starfish outbreaks), pressures from foreign fishing and tourism which highlighted the lack of protection for the Reef in the 1960s, and the controversial proposals in the 1960s and 1970s to mine coral limestone and drill for oil in the Reef region. Reforming in 1982 as the Australian Coral Reef Society, it became a forum for discussion and information transfer among those committed to ecological sustainability of reefs, its original mantle having passed to the GBRMPA.

Emanating from some of the earlier conservation controversies, the idea that the Great Barrier Reef should become a marine park was first mooted in 1963 by the Wildlife Preservation Society of Queensland. However it was not until 1972 that in the Commonwealth Parliament, the House of Representatives Standing Committee on Wildlife Conservation recommended that a programme of conservation for the Great Barrier Reef be established and that the Great Barrier Reef be set aside as a marine national park. The next year, a Federal Government initiative saw the passage of the *Seas and Submerged Lands Act* 1973 establish overtly Commonwealth jurisdiction over, and title to, the seabed below low water mark outside State internal waters.

This was followed by the passing of the Commonwealth's *Great Barrier Reef Marine Park Act* 1975. The Act provided for the establishment, control, care, and development of the Great Barrier Reef Marine Park through provisions which include:

- establishment of the GBRMPA consisting of a full-time Chairman and two part-time members; all members are appointed by the Governor-General, with one of the part-time members normally being nominated by the Queensland Government (Parts II and III of the Act); the first members were appointed in 1976; in 1995, a further part-time position was created to represent the interests of the Aboriginal communities adjacent to the GBRMP;

- specification of the GBRMPA's functions including recommending areas for inclusion in the GBRMP, carrying out and arranging for research, preparing zoning plans, establishing management plans, providing information and advice to the Minister on intergovernmental and financial matters, and assuring educational and advisory services (Part II of the Act);
- establishment of the Great Barrier Reef Consultative Committee to advise the Minister and the GBRMPA, the Committee normally to comprise at least one-third of members nominated by the Queensland Government (Part IV of the Act); the first members were appointed in 1976; in practice, this Committee represents a wide cross-section of public and private interests in the Reef, including tourism, fishing, science, conservation, local government, Aboriginal communities, and such industries as sugarcane growing.

The Great Barrier Reef Ministerial Council was established under the Emerald Agreement in 1979 to coordinate policy on the Great Barrier Reef between the Commonwealth and Queensland Governments at Ministerial level. A related outcome of the Emerald Agreement was the principle of complementary management, through which the GBRMPA is responsible for the development of management policy, planning, and guidelines, whilst day-to-day management (DDM) of the Marine Park is undertaken by the Queensland Government - the enabling Act sanctioning the performance of GBRMPA functions in cooperation with Queensland agencies. Originally applied only to the Capricornia Section of the Reef, complementary management was extended to all other parts of the Reef by virtue of a further agreement in 1988.

Since 1991, the GBRMPA has been the subject of a number of reviews and other studies. Some reviews focused on the Great Barrier Reef Aquarium (*e.g.,* Deloitte, Touche, Tohmatsu [1994], Hardcastle & Richards [1996]), others on day-to-day management (*e.g.,* Burston [1996], Macquarie University [1991]), whilst still others took as their main concern the Authority as a whole (*e.g.,* Whitehouse [1993], Management & Technology Consulting [1995], Brown [1997], Australian National Audit Office [1998]). Given the wide ambits of the inquiries launched by the last group, it was inevitable that some of these would impinge on the way in which the GBRMPA is organised.

Following Whitehouse's 1992-1993 Review, several changes were made which had an impact on the design of the Authority. The major changes included:

- restructuring the Authority's organisational arrangements and reporting lines;

- moving the location of the Authority's CEO from Canberra to Townsville;
- maintenance of the Canberra based liaison unit;
- using the Great Barrier Reef World Heritage Area 25 Year Strategic Plan (which was being developed at the time of Whitehouse's Review) to provide the broad strategic framework within which the future operations of the Authority should be conducted.

Other changes which occurred as a result of Whitehouse's Review but which were more peripheral to the organisation's design included:

- focusing DDM programs more on specific outputs and products and giving greater attention to effective liaison between the staff of the Queensland Department of the Environment (then the agency responsible for day-to-day management) and GBRMPA staff, and to the training and skill of day-to-day management staff; permitting short term secondments between the Authority and the Queensland Department of the Environment;
- placing emphasis on the development of management plans and area statements;
- orienting the Authority's corporate plans to issues and programs with identifiable targets and performance indicators;
- more emphasis on socio-economic research including the recreational and cultural significance of the Great Barrier Reef Region.

Two virtually parallel reviews of the GBRMPA commenced in 1996: the Australian National Audit Office (ANAO) started the fieldwork for a compliance review in October, and the Minister for the Environment appointed a consultant (Ron Brown of Ron Brown & Associates Pty Ltd) in November. As the ANAO (1998) intimated, these reviews overlapped not only in time but also in scope.

Perhaps the most significant aspect of the ANAO review relates to the system and procedures for DDM. The ANAO expressed the view that in this area of inter-governmental operations, effective management would be most likely where the administrative systems and procedures are "seamless" across the two government systems. "Seamless" was seen as characterised by:

- cooperation;
- no duplication;
- free flowing communication;
- consistency/compatibility of planning processes and the resulting plans;
- adequate quality assurance and accountability mechanisms controlling effective plan implementation.

In general, the ANAO considered that the GBRMPA organisational structure was externally imposed and had evolved into one which generated a variety of structural, planning, and management information shortcomings limiting efficiency and effectiveness, communication/liaison limitations, and a lack of quality assurance of DDM tasks. A further problem attributed to the evolved structure by the ANAO was that it imposed an excessive number of management levels between the Queensland Government field officers and the GBRMPA officer responsible for the DDM function. The Queensland Department of the Environment refuted the interpretation of DDM implicit in the ANAO's Report, maintaining that there should be no direct functional or reporting link of this sort, citing alternative communication links on programme delivery at other levels. Among the ANAO's chief concerns was that its examination of "the extended organisational structure for managing the GBRMP" revealed that the functionally structured GBRMPA did not mirror the regional structure for field management established by the Queensland Government. This stance is reminiscent of the isomorphism of the institutional perspective noted in Chapter 2.

The sort of situation to which the ANAO Performance Audit Report refers is not unexpected, given the diverse range of Commonwealth, State, and local government agencies - quite apart from the two principal DDM agencies - which may be implicated in the administration of the GBRMP (*e.g.,* surveillance-compliance activities may involve the Australian Maritime Safety Authority, Coastwatch, the Australian Federal Police, the Australian Fisheries Management Authority, the Queensland Police, the Queensland Department of Primary Industry and its associated Boating and Fisheries Patrol). The variety of structures, regions, and zones used by different agencies, make it inevitable that the planning, reporting, and accounting for the organisations will differ, and necessitate translation of reports, statistics, and accounts.

From the standpoint of the present work, the most relevant finding of Brown's review was that the GBRMPA could benefit from an organisational restructuring which focussed on the Authority's core activities and which included downsizing the executive level. The core activities were identified as:

- advising the Minister in relation to the care and development of the Marine Park;
- preparing zoning plans;

- managing commercial use;
- managing the jointly funded DDM programme;
- ensuring appropriate research is commissioned through the CRC Reef Research Centre and the Australian Institute of Marine Science and individual researchers;
- ensuring the provision of educational, advisory, and informational services.

The focus on these core activities was suggested to be in the context of the following critical issues as outlined in the GBRMPA's corporate plan:

- conservation, biodiversity, and World Heritage;
- coastal development, ports, shipping, and oil spills;
- tourism and recreation;
- fisheries;
- water quality;
- Aboriginal and Torres Strait Islander relationships.

Brown considered that the restructuring proposals would create a narrowed focus which in turn should lead to better and more timely outcomes on the critical issues, and potentially make worthwhile savings to the operating budget of the GBRMPA which could be diverted to DDM activities. As part of Brown's review, the GBRMPA commissioned KPMG to undertake some detailed assessments, including coverage of the efficiency of Corporate Support Services, the External Services Section of the Authority, and the Great Barrier Reef Aquarium. The outcomes from this were that no compelling reason had been found to change the dispersed structure of Corporate Support, that the External Services Section be restructured as the national and international services/project division of the Authority, and a recommendation that the Aquarium should be established as a business unit within the GBRMPA and be supervised by a management board.

Formal responses to these various reviews verged on perfunctory, however their cumulative effects coupled with extensive internal assessment culminated in a decision in late 1997 to move to an issues-based organisational structure. This restructuring, which became effective in mid-1998, concentrated on providing a tighter focus for the Authority through ensuring clear internal reporting lines and accountability based on the major critical issues of:

- Tourism and Recreation;
- Conservation, Biodiversity, and World Heritage;

- Fisheries;
- Water Quality and Coastal Development.

These core issues are considered to be crucial to the well-being of the Great Barrier Reef Marine Park and the World Heritage Area and, along with the key support services of program delivery (including indigenous cultural liaison), day-to-day management coordination, information support services, and corporate services, are considered crucial to the effective management of the Great Barrier Reef, and these are strategically analysed and planned as part of the corporate planning process.

PRIMARY DATA ANALYSIS

Prior to analysing the information obtained by interview and questionnaire, the levels of correlation for this primary data were established:

- amongst respondents from within the GBRMPA;
- amongst outside observers;
- between GBRMPA respondents and outside observers.

After validation, the primary data were summarised in the form of key descriptive statistics, before the analysis proceeded to assessments of variables in the GBRMPA's external environment and in the core dimensions and allied factors of the Authority's organisational structure.

VALIDATION OF SOURCE DATA

As shown in Table 4.1, data from respondents within the Great Barrier Reef Marine Park Authority (GBRMPA) yielded a coefficient of multiple correlation of 0.882 (significant at the 0.01 level). This translates into a coefficient of multiple determination of 0.778, confirming a poor level of correlation amongst respondents (this was, in fact, the lowest level of correlation among respondents from any agency).

TABLE 4.1 GREAT BARRIER REEF MARINE PARK AUTHORITY DATA CORRELATIONS AMONGST AND BETWEEN AGENCY RESPONDENTS AND OUTSIDE OBSERVERS

Coefficient Type	Correlation amongst Agency Respondents *N= 6*	Correlation amongst Outside Observers *N=4*	Correlation between Agency and Outside Respondents
Coefficients of Multiple Correlation *[R]*	0.882	0.981[a]	0.929
Coefficients of Multiple Determination *[R^2]*	0.778	0.962	0.863

All correlations significant at the 0.01 level except [a] Correlation significant at the 0.001 level
Source: Survey Data

By way of contrast, correlations between the responses of observers outside the GBRMPA were significantly higher, Table 4.1 revealing a coefficient of multiple correlation of 0.981 significant at the 0.001 level, this level of correlation being confirmed by the coefficient of multiple determination of 0.962. Nevertheless, there were significant discrepancies on *Environmental Agility,* on which the responses from observers outside the GBRMPA showed a correlation of only 0.128. The arithmetic means of raw data from respondents within the GBRMPA were compared with the mean responses from the outside observers, and from Table 4.1 it can be seen that the Great Barrier Reef Marine Park exhibited a strong coefficient of multiple correlation of 0.929 at a significance level of 0.01, with a coefficient of multiple determination of 0.863.

DESCRIPTIVE STATISTICS

Selected descriptive statistics for responses on both the external environment and the core dimensions and allied factors of organisational structure are summarised in Table 4.2.

In assessing the external environment in which the GBRMPA manages the Marine Park, respondents within the Authority, as well as outside observers, provided reasonably diverse assessments. Here, *restrictiveness* presented the most disparate series of assessments, varying by an average of 29.3 per cent about the mean of the data set. This was the highest coefficient of variation in this category, although the assessments of *hostility* and *technological complexity* also varied significantly. At the other end of the variability spectrum, the assessments of *turbulence,* with a coefficient of variation of 10.8 per cent, were relatively more uniform than any of the other variables, although

TABLE 4.2 GREAT BARRIER REEF MARINE PARK SELECTED DESCRIPTIVE STATISTICS

- EXTERNAL ENVIRONMENT
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

	Arithmetic Mean [1]	*Coefficient of Variation (%)*
External Environment		
Heterogeneity	5.8	13.6
Turbulence	12.2	10.8
Hostility	12.6	20.2
Technological Complexity	4.8	19.1
Restrictiveness	4.2	29.3
Core Dimensions and Allied Factors of Organisational Structure		
Delegation	13.5	30.1
Sophistication of Control and Information System	44.8	14.9
Complexity	19.4	19.0
Centralisation	36.6	15.2
Formalisation	30.6	7.7
Environmental Agility	32.9	9.9
Infrastructure	20.4	12.5

1 Based on a confidence level of 95 per cent. *Source: Survey Data*

heterogeneity was also of low dispersion. In assessments of the core dimensions and allied structural factors, internal and external respondents displayed the lowest relative dispersions in assessments of *formalisation* and *environmental agility,* whilst at the other end of the spectrum, the assessments of the level of *delegation* display the largest dispersion, with a coefficient of variation of 30.1 per cent.

ASSESSMENT OF VARIABLES IN THE EXTERNAL ENVIRONMENT

Substantial portions of this assessment derive from information provided by respondents within the GBRMPA and outside observers during interviews, in their additional comments on questionnaire items, or in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited.

Heterogeneity

The GBRMPA serves more than sixty stakeholder groups, ranging from indigenous people living in remote communities, through to vicarious users in the affluent suburbs of Sydney and Melbourne, and almost everything in between. The areas from which the stakeholder groups derive include fishing (recreational, commercial, and indigenous), tourism (hotel, ship, pontoon-based, offshore and onshore), shipping (export, import, internal domestic, port authorities), governments (local, State, and Federal), public interest groups, for whom the Reef occupies an iconic status, and a variety of non-governmental organisations (NGOs) *e.g.,* Greenpeace, Humane Society, Australian Conservation Foundation, Coastal Network. The quantitative data (mean scores and relative dispersions) for the GBRMPA and the other organisations under review are set out in Table 4.3, together with the overall measures.

The quantitative data displays a mean for the environment of the GBRMPA which is of reasonable magnitude in absolute terms but tangibly below the overall mean as shown in Table 4.3. The inconsistency between the magnitude of the statistical measures and the number of stakeholder groups may be attributable to the variable impact of GBRMPA's stakeholders, some non-governmental organisations, for example, having considerably less influence than, say, the shipping interests.

TABLE 4.3 COMPARISON OF DESCRIPTIVE STATISTICS
- EXTERNAL ENVIRONMENT - HETEROGENEITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**5.8**	**13.6**
Ngorongoro Conservation Area Authority	5.9	18.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	5.9	11.8
Peak National Park Authority	6.4	8.3
Pinelands Commission	6.4	8.2
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	6.0	16.7
Over All Six Organisations	6.1	13.1

Source: Survey Data

Turbulence

The GBRMPA faces a very dynamic environment. Amongst the major technical changes is an enhanced capacity to move people on high-speed catamarans, these vessels also making it possible to reach increasing proportions of the Reef on day trips. Technological developments also enhance the capacity to monitor vessels and people *e.g.,* the *Argos* satellite-based system for environmental data telemetry and geopositioning, and the *Inmarsat* mobile communications satellite system.

A major cultural change may be embodied in developments in Native Title over the sea. The changes and instability are not chaotic, GBRMPA's external environment tending not to fluctuate in any predictable manner because of the diverse nature of forces upon it. There are some large-scale cycles that affect the Authority's environment as, for example, El Niño (or more properly *ENSO* - El Niño and the Southern Oscillation) and Crown-of-Thorns, to which may be added electoral and economic cycles that would also have an effect - especially business cycles affecting tourism.

To enable a comparison of the turbulence in the environments of the GBRMPA and the other organisations under study, Table 4.4 shows the means and coefficients of variation for all six organisations.

TABLE 4.4 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TURBULENCE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**12.2**	**10.8**
Ngorongoro Conservation Area Authority	12.6	12.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	11.4	9.9
Peak National Park Authority	12.1	14.6
Pinelands Commission	11.2	19.8
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	11.1	19.1
Over All Six Organisations	11.7	15.4

Source: Survey Data

The environment of the GBRMPA exhibits a level of turbulence somewhat higher than the mean of the six organisations, and equal second with the level shown by the Peak National Park Authority's environment. These quantitative findings square with the information gleaned from other sources: essentially, the environment of the GBRMPA is very dynamic.

Hostility

Because of its dynamic environment and the high diversity of stakeholder groups, risk is inherent in the GBRMPA's situation. The combination of this risk with the sheer number of stakeholders and their disparate views generates an environment which is at once hostile *and* innocuous, culminating in a mean for environmental hostility which in both absolute and relative terms is of reasonable magnitude, although as shown in Table 4.5, tangibly below the overall mean. The risk elements in the GBRMPA's environment are exacerbated by the general lack of agreement on how to operationalise World Heritage on such a large spatial scale - the same factors which limit the impact of GBRMPA's initiatives. The change in political environment with respect to the GBRMPA is considered by some observers to be very volatile, and the

TABLE 4.5 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HOSTILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**12.6**	**20.2**
Ngorongoro Conservation Area Authority	13.6	19.9
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	12.1	14.6
Peak National Park Authority	14.7	21.7
Pinelands Commission	12.0	20.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	13.5	23.8
Over All Six Organisations	13.0	20.8

Source: Survey Data

changes in the social, economic, and technological aspects of the environment are probably more political in character. An additional but

related factor here is that stakeholders are fairly polarised *e.g.,* the State of Queensland *versus* the Commonwealth, industry *versus* regulation.

The quantitative data (mean scores and relative dispersions) for the GBRMPA and the other organisations under review are set out in Table 4.5, together with the overall measures. This information suggests an intermediate level of hostility in the GBRMPA's environment, the Authority's data falling just below the mean of the six organisations. To some extent, this reflects the climate of risk which is associated with the GBRMPA's dynamic environment and diverse stakeholder groups, and bears out the level of hostility suggested by other evidence.

Technological Complexity

The activities of the GBRMPA are becoming significantly affected by technology and increasingly sophisticated - in addition to the expanding range of the catamarans, the availability of satellite-based vessel monitoring systems will have far-reaching consequences. The Authority is well-served by information technology in relation to all aspects of the management of the Marine Park, including marine science within each of the critical issues, program delivery, information support (which embraced monitoring and research together with information technology services and library services), corporate services, and communication. These observations are consistent with the quantitative data on technological complexity where, as shown in Table 4.6, the scores fall above the mean of the six agencies examined in this work, and in absolute terms indicate reasonably substantial sophistication and technological complexity.

In addressing technological complexity, three of the four outside observers interpreted 'environment' in particular ways, the common feature of which was that it was taken as *including* only those specific outside elements with which the Authority interfaces in the course of its operations, and as *excluding* those environmental elements with which the Queensland Parks and Wildlife Service interacts in its day-to-day management of the Marine Park. This particular conception is tantamount to the idea of the 'task environment' commonly accepted in the literature, and whilst these respondents did not apply it to other

aspects of the GBRMPA's environment, they maintained that their ratings of the technological complexity of the GBRMPA's environment would have been appreciably higher had the Authority been actively involved in the day-to-day management of the GBR. It is conceivable that other respondents may have taken a similar approach, but they did not comment on the matter.

TABLE 4.6 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TECHNOLOGICAL COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**4.8**	**19.1**
Ngorongoro Conservation Area Authority	4.9	22.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	4.0	20.4
Peak National Park Authority	5.3	21.1
Pinelands Commission	4.7	21.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.6	26.0
Over All Six Organisations	4.7	21.3

Source: Survey Data

Restrictiveness

The GBRMPA faces a veritable cornucopia of legal, political, and social constraints. The legal constraints include the change in Australia's responsibilities due to international conventions such as the Biodiversity Convention, some of the implications of Native Title over the sea, the socio-economic problems of reducing fishing effort in Reef waters, and the volatile political environment with most of the Queensland coastal electorates being marginal seats Federally. Nevertheless, as disclosed in Table 4.7, the quantitative rating is below the mean of the six organisations under examination, and this suggests that the GBRMPA is faced with, but not dominated by, a variety of constraints. There is, undeniably, a complex pattern of restraining influences, the strength of which patently varies.

TABLE 4.7 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - RESTRICTIVENESS

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**4.2**	**29.3**
Ngorongoro Conservation Area Authority	4.6	27.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	3.7	45.9
Peak National Park Authority	4.9	25.0
Pinelands Commission	4.1	35.3
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.7	32.9
Over All Six Organisations	4.4	31.8

Source: Survey Data

ASSESSMENT OF VARIABLES IN THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

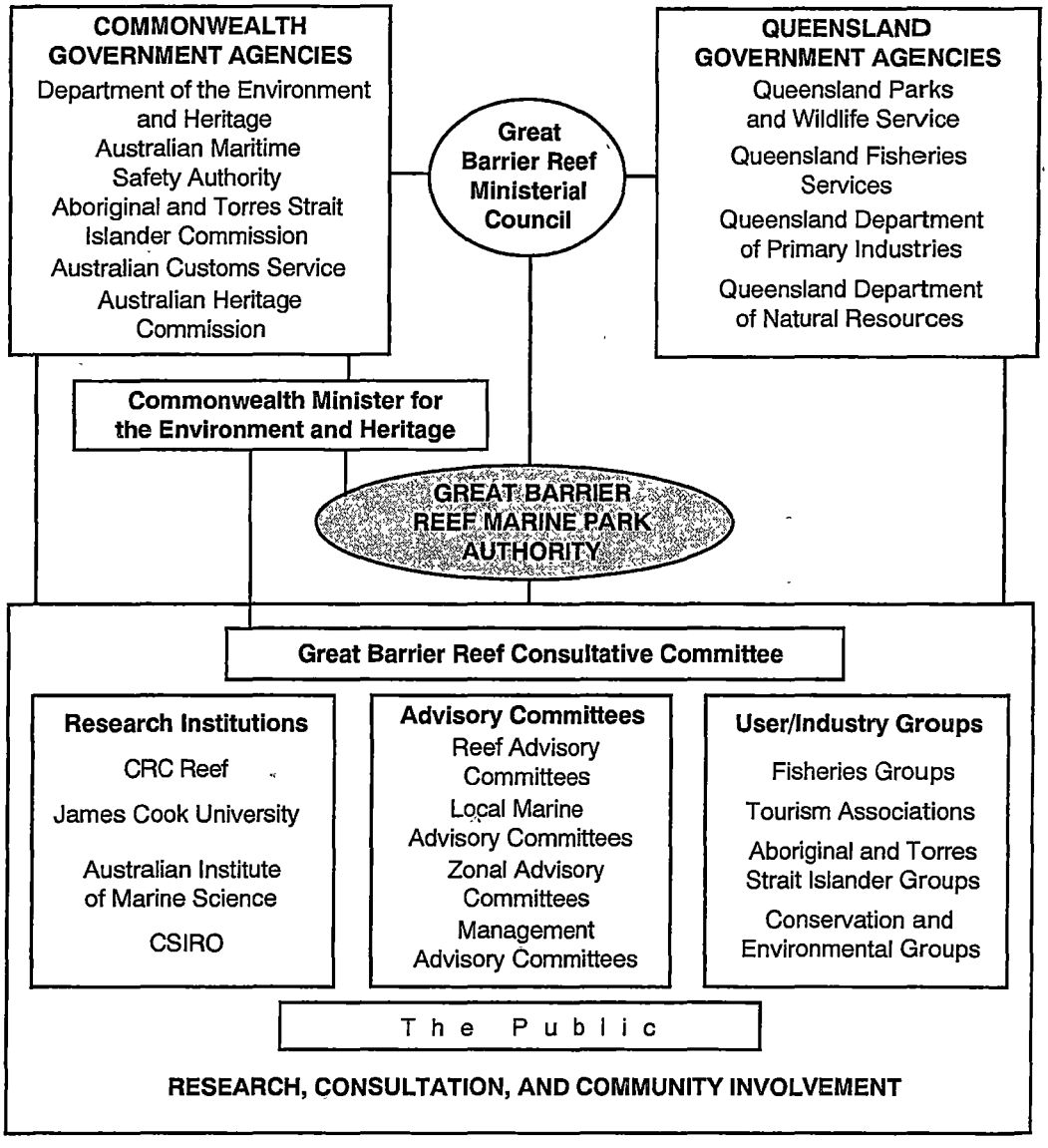
As with the assessment of environmental variables, appreciable portions of the assessment here derive from information provided by GBRMPA respondents and outside observers during interviews, in their additional comments on questionnaire items, or in the course of other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited. For a proper understanding of the core dimensions and allied structural factors of the Authority, each dimension and factor needs to be viewed against the frameworks provided by the chart of external relationships (Figure 4.2) and the organisation chart (Figure 4.3).

Delegation

The flow of delegation is from the Commonwealth Minister for the Environment and Heritage to the Authority and on to the Chair and Chief Executive Officer. The decision-making authority in GBRMPA is

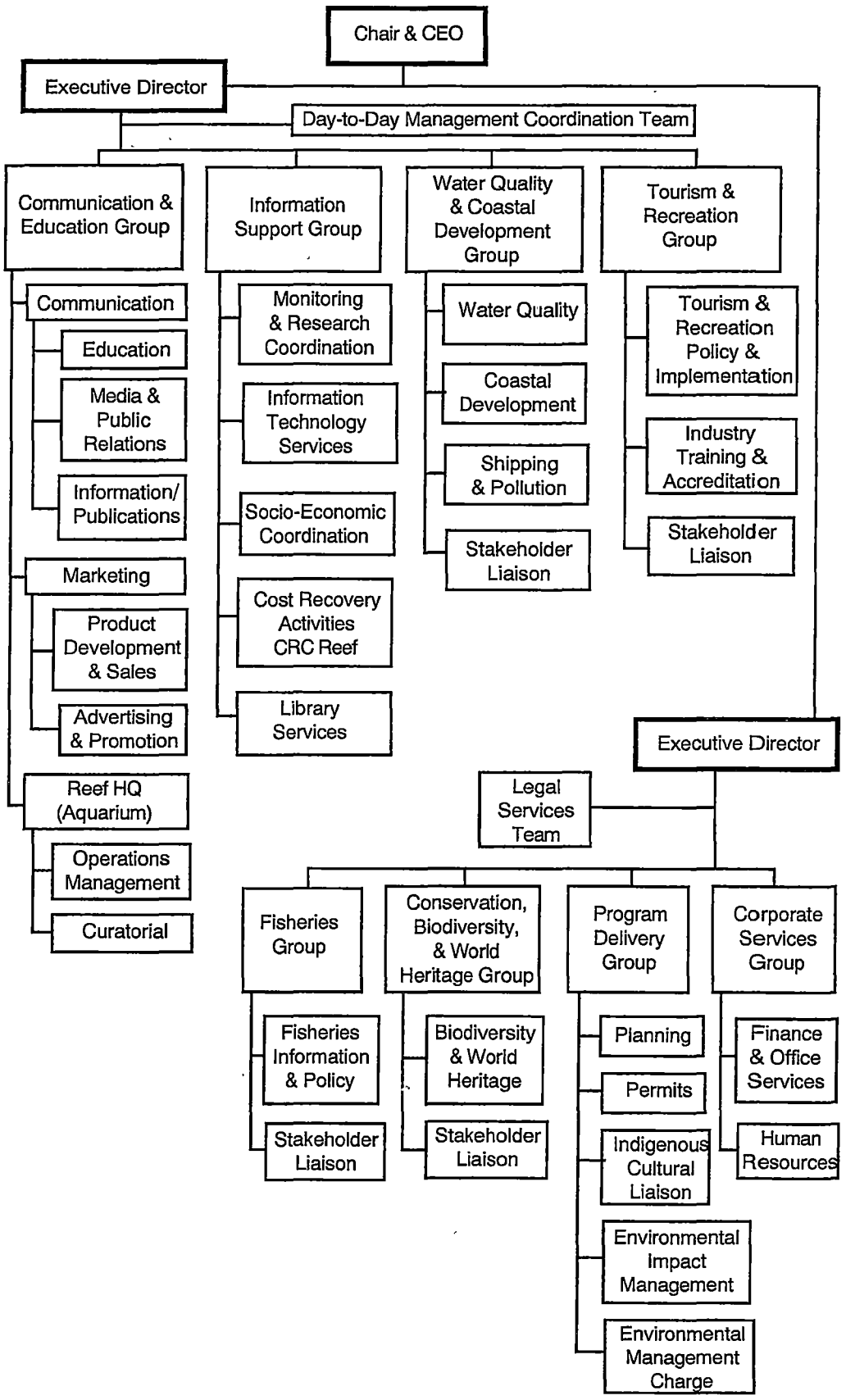
concentrated in the Chair and CEO, who delegates to a level consistent with the responsibilities of particular officers. The key classes of decision authority which the Chair and CEO has delegated to the Executive Directors and through them to the Directors of the various departments include development, marketing, and public relations in connection with new initiatives and services, changes in the marketing and public relations tactics for existing activities, and, within certain limits, negotiating with staff or their unions about pay and conditions. In terms of the way in which delegation is perceived by people within GBRMPA and by outside observers, there was considerable variation in the ratings

FIGURE 4.2 GREAT BARRIER REEF MARINE PARK AUTHORITY CHART OF PRINCIPAL EXTERNAL RELATIONSHIPS



(Source: GBRMPA, 2000)

FIGURE 4.3 ORGANISATION CHART OF THE GREAT BARRIER REEF MARINE PARK AUTHORITY
(as at July 2001)



(Source: GBRMPA, 2001)

given by respondents (confirmed by the high coefficient of variation at 30.1 per cent), although there was neither a clear polarisation nor any apparent correlation with their internal or external status. As a statutory authority, the GBRMPA is typically more unfettered in relation to delegation than many agencies of the Commonwealth Government. The degree of delegation is often significantly greater than in departments, and there is considerable variation in the type of decision delegated. As an absolute quantum, this is broadly supported by the statistical measures, even though in relative terms, the mean score for delegation in the GBRMPA lies just below the mean for all six organisations, as shown in Table 4.8.

TABLE 4.8 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DELEGATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**13.5**	**30.1**
Ngorongoro Conservation Area Authority	11.2	23.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	15.4	24.2
Peak National Park Authority	11.4	25.7
Pinelands Commission	17.8	31.0
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	15.7	37.8
Over All Six Organisations	14.4	34.0

Source: Survey Data

The management of the Great Barrier Reef Marine Park also presents an unusual aspect to delegation which needs to be highlighted: there is a significant level of delegation from the GBRMPA to the Queensland Parks and Wildlife Service with respect to day-to-day management of the Marine Park. The level of delegation here is very high, and as pointed out by the Australian National Audit Office (ANAO, 1998), this necessitates a corresponding level of accountability and verification, issues which will be considered below as part of the examination of the sophistication of the control and information system.

Sophistication of Control and Information System

In exhibiting some limitations in refinement and technological advancement, the GBRMPA's control and information system demonstrates a degree of sophistication which lies in the middle of the range advanced in the research design. However although several respondents within GBRMPA maintain that the control and information system generally helps to reduce uncertainty in their decision making, some respondents within the Authority and most outside observers remain unconvinced of the effectiveness and efficiency of the system. The most common reason cited for these limitations in sophistication was the questionable adequacy of the data used for management and external reporting. Data insufficiency was also identified in the ANAO audit of GBRMPA's management information systems, the ANAO attributing it to unnecessary complexity in the Authority's planning systems and procedures (ANAO, 1998).

Evidence from other sources corroborates the contention of unnecessarily complex planning systems and procedures, and given the statement to the ANAO from the Queensland Department of the Environment that any change in planning and reporting could be accommodated *subject to* certainty as to the GBRMPA's actual requirements, it was apparent that a need for greater clarity existed. The ANAO accordingly recommended that the GBRMPA's information requirements be clearly expressed and linked to its strategic planning structure, day-to-day management reporting requirements, and reports to Parliament. The Authority agreed with this recommendation, indicating that both information requirements and performance indicators would be identified for outcomes and outputs for inclusion in corporate and business plans. Evidence is mixed as to whether this has been optimally achieved, a comment which can also be applied to the remediation of the deficiencies identified by the ANAO in the Authority's risk assessment systems and procedures. The development of these systems and procedures was recommended so that the consequent information can be better used for management, reporting, and the development of a fraud control plan. The evidence presented in Table 4.9 places the average GBRMPA score for this variable just below the mean for all the organisations, which nevertheless presents at a reasonably substantial level of sophistication.

TABLE 4.9 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - SOPHISTICATION OF CONTROL AND INFORMATION SYSTEM

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**44.8**	**14.9**
Ngorongoro Conservation Area Authority	45.9	17.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	44.7	13.9
Peak National Park Authority	45.6	17.1
Pinelands Commission	47.1	8.9
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	47.1	10.9
Over All Six Organisations	45.9	13.3

Source: Survey Data

From the GBRMPA data and related information emerges a model which approaches the theoretical situation in which the sophistication of control and information systems is inversely related to complexity, formalisation, and centralisation. In the case of the Authority, the intermediate level of sophistication in the GBRMPA control and information system is associated with an organisational structure low in complexity and centralisation, yet relatively high in formalisation, an inflation which perhaps reflects a public service orientation.

Complexity

The complexity of the work of the GBRMPA can be gauged to some extent from the issues-based organisational structure to which the Authority moved in 1998 as depicted in the organisation chart (Figure 4.3), a structure which is based on the major critical issues of Tourism and Recreation, Conservation, Biodiversity, and World Heritage, Fisheries, and Water Quality and Coastal Development. These critical issues represent the main thrusts of the Authority's work in the Marine Park, and each of the four Critical Issues Groups is bound into intricate

networks comprising their own dedicated Reef Advisory Committees, government agencies at both the Commonwealth and Queensland State levels, and a plethora of other committees, institutions, and interest groups as outlined in the chart of the GBRMPA's principal external relationships (Figure 4.2).

The measures in Table 4.10 reveal the average rating for complexity in the GBRMPA to be essentially the same as the mean for the six organisations.

TABLE 4.10 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**19.4**	**19.0**
Ngorongoro Conservation Area Authority	20.4	17.6
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.4	14.0
Peak National Park Authority	20.9	19.7
Pinelands Commission	19.8	17.1
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	20.2	14.7
Over All Six Organisations	19.8	16.7

Source: Survey Data

When the organisation chart and the chart of the GBRMPA's principal external relationships are read in conjunction, it is possible to discern the three aspects which make up the composite complexity of the Authority: specialisation and departmentation are well-established - indicating a well-developed level of horizontal differentiation, although despite the compound nature of the organisation chart, there are comparatively few levels in the hierarchy, connoting low vertical differentiation. Since the quantitative data for this study was obtained, GBRMPA's Canberra-based Parliamentary and Ministerial Liaison Unit has closed, leaving Townsville as the Authority's sole base, giving rise to a finding of no spatial differentiation. This latter finding, along with the low vertical differentiation, suggests that the overall complexity of the Authority ought to be considered as low, in contradistinction to what is shown by the summary data in Table 4.10.

Centralisation

Its status as a Commonwealth statutory authority imbues the GBRMPA with a Janus-like character insofar as centralisation and delegation are concerned. On the one hand, as noted previously, the Authority is perhaps less hindered in relation to delegation than many of the agencies of the Commonwealth Government, but at the same time, the culture of the Australian Public Service inevitably permeates the GBRMPA, despite the fact that employment conditions are mostly covered by the GBRMPA Certified Agreement, with Commonwealth legislation affecting only special matters. The consequence of this is that there is some transfer of bureaucratic principles - including centralisation - to the Authority from the more conventional departmental manifestations of public administration.

Respondents were in general agreement that some of the GBRMPA's centralisation is due to the complexities induced by the need for close cooperation with other government agencies at the Commonwealth and State levels, in particular, with Environment Australia and the Queensland Parks and Wildlife Service. However, to an extent, the GBRMPA is sequestered by its status as a statutory authority, and some respondents considered that the Authority's physical remoteness from Canberra may reduce its exposure to the influences which otherwise perpetuate bureaucratic attributes such as centralisation.

TABLE 4.11 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - CENTRALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**36.6**	**15.2**
Ngorongoro Conservation Area Authority	40.1	11.1
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	36.0	15.9
Peak National Park Authority	40.6	9.7
Pinelands Commission	35.1	14.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	36.2	13.4
Over All Six Organisations	37.2	14.0

Source: Survey Data

Whatever the cause, the low degree of centralisation indicated in Table 4.11 is below the mean for the six organisations, and was inherent in the reports from respondents from within the Authority and from outside observers, the coefficient of variation at 15.2 per cent verifying this low variability.

As noted under *delegation,* both the *degree* and *type* of delegation differ between other Commonwealth Government agencies and the GBRMPA, with the Authority's divisional form providing detailed input into decisions although retarding the speed of response to new information. The inverse relationship which theory suggests should exist between delegation and centralisation exists only weakly in the case of the GBRMPA. Overall, the manner in which the Authority has structured its operations in managing the Marine Park shows a degree of decentralisation which reflects some of the qualities - both functional and dysfunctional - of analogous agencies of the Commonwealth Government.

Formalisation

Each of the four critical issues groups includes a high proportion of professionals who, possessing tertiary qualifications and considerable scientific or comparable experience, enjoy considerable freedom within the bounds set by overall policy. There was a correspondingly low degree of formalisation in these core groups, as there was in some parts of other groups including Information and Support together with Communication and Education. The latter group incorporates the "Reef HQ", that is, the Aquarium, which relies upon a significant complement of volunteers for its operations, and accordingly might be expected to depend upon considerable formalisation through written operating instructions and procedures. This is not the case, however, and the Aquarium staff - salaried and volunteer alike - are allowed considerable discretion in performing their duties. Table 4.12 sets out some comparative measures for formalisation in the six organisations being examined, the GBRMPA average rating being virtually on the overall mean and exhibiting a very low variability.

TABLE 4.12 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - FORMALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**30.6**	**7.7**
Ngorongoro Conservation Area Authority	30.9	9.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	30.9	7.1
Peak National Park Authority	31.0	9.7
Pinelands Commission	29.8	10.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.2	10.7
Over All Six Organisations	30.5	8.9

Source: Survey Data

Beyond the data in Table 4.12, the Authority has some units which show a high degree of formalisation, such as the Corporate Services Group, the finance component of which has necessarily to use clearly defined procedures and rules, whilst the human resources function has explicit job descriptions and is subject to a reasonably high degree of supervision in relation to the administration of the current GBRMPA Certified Agreement, together with various pieces of Commonwealth legislation covering such matters as superannuation, long service leave, and maternity leave. Similarly, within the Program Delivery Group, areas such as environmental impact management and the administration of permits come under close scrutiny insofar as ensuring compliance with set standards.

Environmental Agility

GBRMPA's awareness of the external environment is considered to suffer from few curbs, although outside observers, particularly, considered that the Authority is increasingly under attack externally and that it devotes too much time and effort to crisis management. The Authority appears to be well aware of technological developments in its area, particularly with respect to the changes to vessel capabilities, vessel monitoring systems, and the change in the capacity to mine in areas adjacent to the Marine

Park, such as the shale oil mine at Gladstone. Effective intelligence-gathering on political/legal/social developments that might affect it is a product of the Authority's diverse advisory structure. There are nevertheless "frequent and unanticipated salvos out-of-the-blue, particularly from the Democrats", as it was put by one outside observer.

TABLE 4.13 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - ENVIRONMENTAL AGILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	32.9	9.9
Ngorongoro Conservation Area Authority	33.4	9.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	31.3	11.0
Peak National Park Authority	31.1	14.4
Pinelands Commission	29.8	17.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.8	14.6
Over All Six Organisations	31.5	13.0

Source: Survey Data

The measures contained in Table 4.13 establish the level of the Authority's environmental agility - the second highest amongst the six organisations - and display a very low coefficient of variation at 9.9 per cent. The Authority's capacity to deal with change in the external environment and its ability to respond to demands placed upon it from that environment is limited by its preoccupation with organisational reviews and "fighting fires". GBRMPA has tried to adapt to changes in the external environment *via* a radical restructure which may succeed but which has resulted in the accusation being levelled - again by an outside observer - that the Authority has been too inward looking.

Infrastructure

Through focusing the organisation on the critical issues, the structure which the Authority introduced in 1998 made it essential that internal boundaries become more permeable, and this characteristic appears to have obviated many of the problems which otherwise would overlap

areas of responsibility in GBRMPA. Each of the four critical issues groups carries responsibility for overall tasks within their jurisdictions, and *prima facie,* there would seem to be little scope for the present internal boundaries to induce problems between the principal operational groups in GBRMPA, although two key outside observers independently suggested that they expected some of the groups which provide support to the critical issues groups to defend their own specialised domains. There were also intimations that at least one of the critical issues groups may be inclined to try to absorb segments of another group, perhaps working through its associated Reef Advisory Committee.

Not surprisingly, the official line contrasts with this, maintaining that where any commonality of interest emerges between critical issues groups, the groups concerned are to be mutually supportive, and further, that they are to cooperate in their use of the appropriate specialist positions in the support groups. Notwithstanding these divergent outlooks, core and support work in GBRMPA seem so far to be integrated in practice, the quantitative data lending some measure of support for this position. Certainly, the Authority appears to possess infrastructure appropriate to its needs, as judged by its capacity to engage in, and coordinate disparate activities. Comparisons of the means in Table 4.14 confirms the GBRMPA's infrastructure as exceptional in both relative and absolute terms.

TABLE 4.14 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - INFRASTRUCTURE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	**20.4**	**12.5**
Ngorongoro Conservation Area Authority	20.9	12.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.6	10.2
Peak National Park Authority	20.0	5.8
Pinelands Commission	18.0	14.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	19.5	16.9
Over All Six Organisations	19.5	13.3

Source: Survey Data

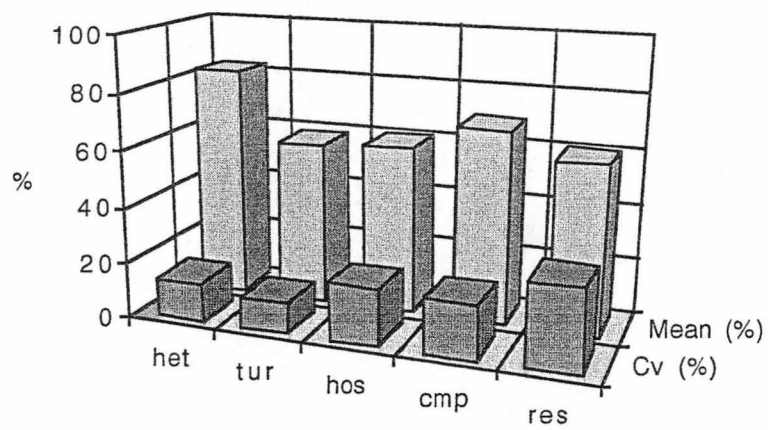
SUMMARY

EXTERNAL ENVIRONMENT

To provide an overview of the environment of the GBRMPA, the statistical measures for the five aspects of the Authority's environment are summarised graphically in Figure 4.4. In order to create a comprehensive picture of this environment, the actual means have been converted into percentages, allowing the relative potency of each environmental variable to be judged.

The external environment of the GBRMPA presents some complex aspects. On the one hand, with in excess of sixty stakeholder groups, there is considerable *prima facie* heterogeneity, which is supported by the absolute magnitude of the mean. There is, however, a disparity between this finding and the relative magnitude of the GBRMPA's mean,

FIGURE 4.4 GREAT BARRIER REEF MARINE PARK AUTHORITY
EXTERNAL ENVIRONMENT - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

het	Heterogeneity	tur	Turbulence	hos	Hostility
cmp	Technological Complexity			res	Restrictiveness

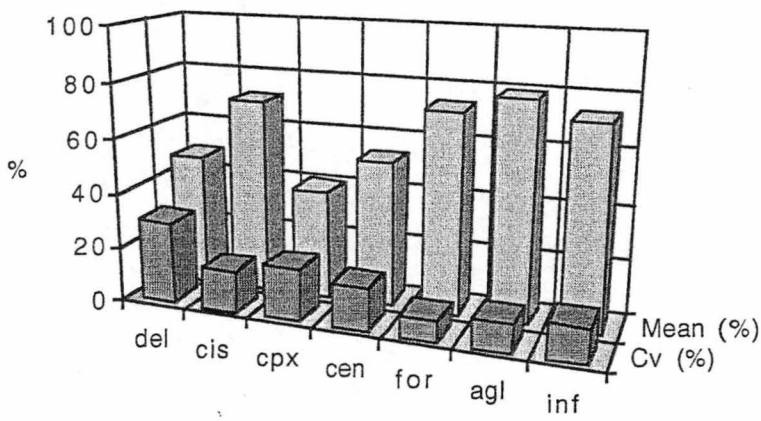
which falls below the overall mean, a discrepancy which may be ascribed to the variable impact of GBRMPA's stakeholders. Turbulence in the Authority's environment appears to be characteristically intense, as may be seen graphically in Figure 4.4, these quantitative findings squaring with the information gleaned from other sources. Essentially, the environment of the GBRMPA is very dynamic, although the diverse nature of forces upon it and the incidence of large-scale cyclic activity

make forecasting difficult. The number of stakeholders, their polarisation, and the diversity of their views generate an environment which is quite hostile, a hostility which is heightened to the level indicated in Figure 4.4 by the lack of agreement on how to operationalise World Heritage on such a large spatial scale. The technological complexity of the GBRMPA's environment is created by such elements as the information technology which is used by the Authority in managing the Marine Park, whilst in terms of restrictiveness, an amalgam of legal constraints, socio-economic problems, and a volatile political environment combine to constrain the Authority's activities.

CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

As with GBRMPA's environment, an overview of the core dimensions of the Authority's organisation together with ancillary structural factors is created by the relevant statistical measures as graphically summarised in Figure 4.5, and again, the means have been converted into percentages.

FIGURE 4.5 GREAT BARRIER REEF MARINE PARK AUTHORITY
CORE DIMENSIONS AND ALLIED FACTORS
OF ORGANISATIONAL STRUCTURE - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

del	Delegation	cis	Sophistication of Control & Information System		
cpx	Complexity	cen	Centralisation	for	Formalisation
agl	Environmental Agility			inf	Infrastructure

Delegation is from the Chair and CEO in whom the decision-making authority is concentrated in line with the responsibilities of the Executive Directors and the Directors of the critical issues groups and support units who report to them. Although the average rating is below the overall mean, the GBRMPA is generally less encumbered in relation to

delegation than many Commonwealth Government agencies. The high level of delegation to the Queensland Parks and Wildlife Service with respect to day-to-day management of the Marine Park presents some accountability problems. Opinions were divided on whether the control and information system in GBRMPA helps to reduce uncertainty in decision making, planning systems and procedures frequently being cited as unnecessarily complex. Highlighted also was the need to articulate information needs with the strategic planning structure and with the reporting requirements for day-to-day management and Parliament. The complexity of the Authority is considered to be low, despite the intricate networks made up of the Critical Issues Groups, Reef Advisory Committees, and Commonwealth and Queensland State Government agencies. There is well-developed horizontal differentiation, low vertical differentiation, and effectively no spatial differentiation.

Some of the functional and dysfunctional qualities of analogous agencies of the Commonwealth Government are apparent in the GBRMPA, part of the Authority's centralisation stemming from the need to cooperate with other government agencies at the Commonwealth and State levels. The Authority's divisional form provides detailed input into decisions although retarding the speed of response to new information. A low degree of formalisation characterises the Critical Issues Groups and the Aquarium, generated by the backgrounds of, or special demands on staff, whereas other units, such as the Program Delivery Group, show a high degree of formalisation. The Authority's environmental agility is limited by its preoccupation with organisational reviews and "fighting fires". The GBRMPA is moderately well-informed of political/legal/social developments that might affect it, a product of the Authority's diverse advisory structure. In terms of infrastructure, the four critical issues groups carry responsibility for overall tasks within their respective jurisdictions, and there should be little scope for present internal boundaries to induce problems between the principal operational groups. Opinions differ on whether any potentially destructive competition exists between units, but in any event the Authority appears to possess infrastructure appropriate to its needs, as judged by its capacity to engage in, and coordinate disparate activities.

The major challenge facing GBRMPA is the uncertainty about how to operationalise the World Heritage concept at large spatial scales. This has meant that GBRMPA has spent far too much time focusing on

activities, with the consequence that developments at the spatial scale of the whole World Heritage Area are probably restricted, but have become icons of the conservation movement. In this respect it was considered that the conservation movement has been irresponsible as it fails to understand the big issues and spends far too much time focusing on the predicaments posed by the Hinchinbrook Island and Magnetic Quays developments.

One further significant problem stems from the relative activity of ministers at the State and Federal levels - some ministers can be highly interventionist, others *laissez faire*. Yet another difficulty stems from the role of public participation and consultation in fulfilling a resource management function - some internal and external respondents are definitive in their views that the GBRMPA *over* consults, whilst others say that it appears to consult, but that as junior staff have their own agendas, the consultation is not genuine.

THE CASE STUDIES
CHAPTER 5

THE NGORONGORO CONSERVATION AREA TANZANIA

THE CASE STUDIES
CHAPTER 5

THE NGORONGORO CONSERVATION AREA TANZANIA

THE NATURAL AND SOCIO-CULTURAL ENVIRONMENTS

The Ngorongoro Conservation Area (NCA) is located in the Arusha Region of northern Tanzania, south-east of the Serengeti National Park, from which the NCA was hived-off in 1959 and established as a separate conservation area. To the east, the NCA is bordered by the Rift Valley escarpment, to the north lies the Loliondo Game Controlled Area, whilst densely populated agricultural lands fringe the NCA to the south. Figure 5.1 shows the Tanzanian and African contexts of the NCA.

In area, the NCA occupies 8290 square kilometres, and contains a World Heritage Area of 8094 square kilometres. The NCA forms part of the Serengeti-Ngorongoro Biosphere Reserve under UNESCO's Man and the Biosphere Programme. Ecologically, the NCA forms part of the Serengeti ecosystem, along with reserves in Tanzania and Kenya. The Serengeti ecosystem supports the greatest remaining concentration of large plains mammals in Africa, and is the sanctuary of an estimated four million different animals and birds.

There are five main topographical regions:

- the Crater highlands, at a mean elevation of 2300 metres with some parts rising to more than 3000 metres, including the rim of the Ngorongoro Crater, which is one of the largest, unflooded, inactive, unbroken calderas in the world;
- the undulating Salei Plains at an average altitude of 1400 metres - these are dissected by Ulduvai Gorge;
- the Gol Mountains, rising 500 metres above the plains;
- a portion of the plains of the eastern Serengeti that includes Lakes Ndutu and Masek;
- the Kakesio Hills and Eyasi escarpment to the south.

Potkanski (1994), Perkin and Stocking (1994)

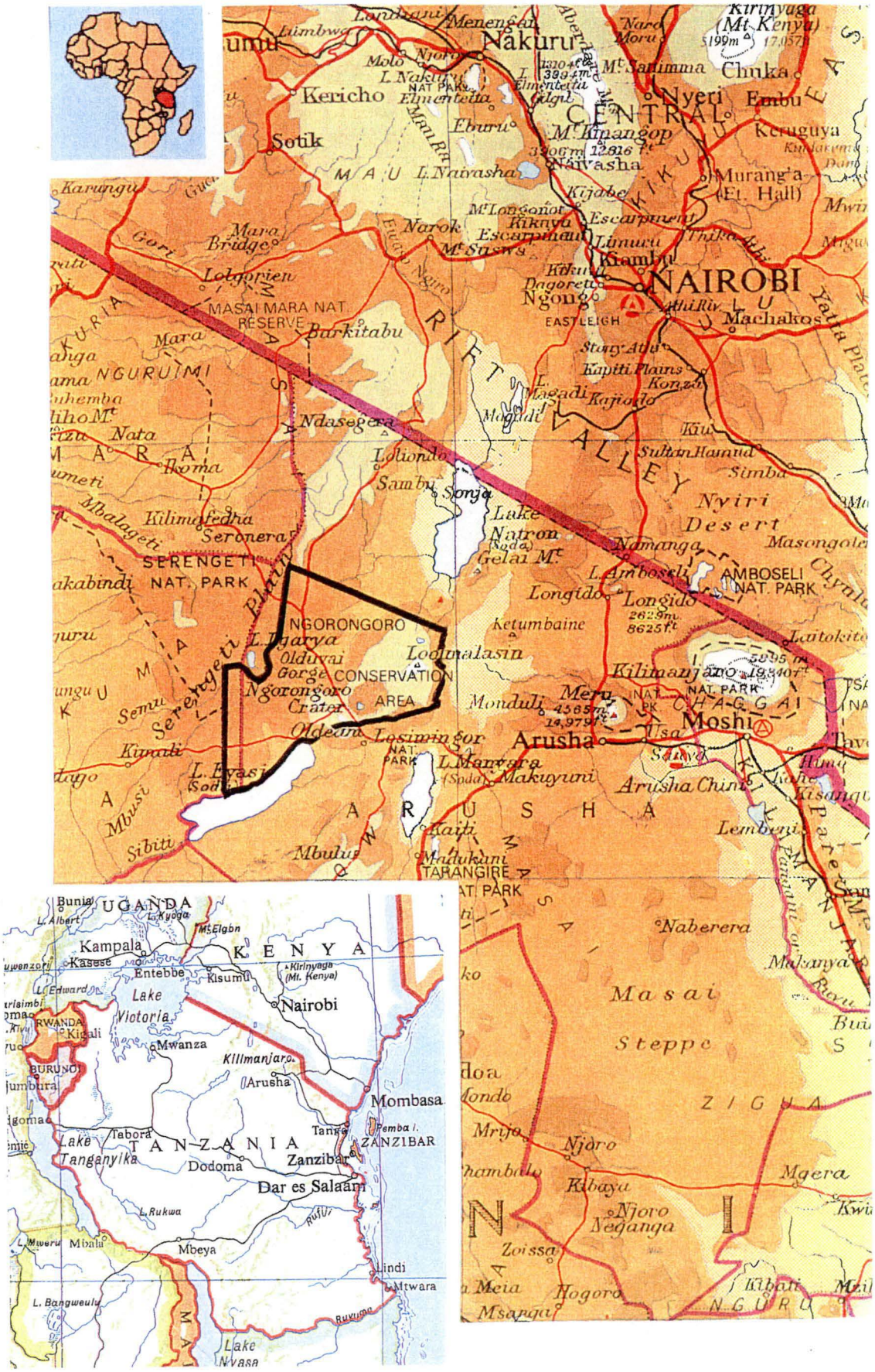


FIGURE 5.1 THE NGORONGORO CONSERVATION AREA
(Source: Tanzania Tourist Board, 1998)

The natural and cultural values of the NCA derive from the multiple habitats generated by the variable climate and the diversity of landforms and altitudes. For example, the mean annual rainfall ranges from 430mm in the lowlands to more than 1700mm in the highlands. The steep slopes are typically covered by scrub heath and remnant montane forests, grasslands undulate outside the Crater walls, whilst the Crater floor itself is mainly open grassy plains interspersed with freshwater and brackish lakes, swamps, and diverse woodlands. The NCA exhibits a great variety and density of wildlife, with established populations of ostrich, wildebeest, zebra, gazelle, flamingo, black rhinoceros, hippopotamus, and lion, together with seasonal migrations of various species from the Serengeti. Part of the cultural value of the NCA is contained in the fossil record, which has major significance for research on human evolution.

The Maasai, who comprise the main human population of the NCA, have become progressively more divorced from their traditional practices since cultivation was banned in 1975, although pastoralism continues, with roughly 300,000 domestic livestock grazing some 75 per cent of the NCA. Apart from the Maasai, who number about 26,000, pastoralism extends to surrounding communities which utilise areas within the NCA during drought. As the Maasai have become more sedentary, land-use conflicts have increased, exacerbated by reduced veterinary services following diminished funding by the Ngorongoro Conservation Area Authority (NCAA), a reduction which has itself been a function of reduced tourism revenue.

In the early 1990s, scarce food resources prompted a temporary relaxation of the prohibition on cultivation, many of the areas cultivated being totally unsuitable for agriculture. Extensive encroachment on some slopes may result in the excision of these areas from the Conservation Area, and has had a significant impact on water catchment values, vegetation cover, and wildlife. Degradation of the NCA has also been brought about by trampling and overgrazing, there is a threat from vehicle tracks becoming excessively enlarged, largely due to pressure from tourism, and there is the constant threat of poaching - particularly of the black rhinoceros and leopards - which is difficult to control.

EVOLUTION OF THE PRESENT FRAMEWORK

The Serengeti-Ngorongoro ecosystem has a long history of wildlife protection dating back to 1929. The Game Reserve in the central Serengeti established in that year later formed the nucleus of the Serengeti National Park when this was created in 1951, embracing as well the Ngorongoro Highlands. Pastoralism and cultivation were allowed to continue, although cultivation was prohibited in 1954 throughout the Park, sparking off a five-year controversy, both pastoralists and cultivators reacting strongly to these new restrictions.

In an effort to resolve the conflict, governmental discussions led to the publication in 1956 of a white paper recommending that the Park be partitioned. The Ngorongoro Crater formed the core of the portion which was to be set aside exclusively for the conservation of wildlife and forests, while the rest of the Park would be opened up for cultivation and pastoralism. The proposal became something of a *cause célèbre* amongst conservationists in North America and Europe, and under considerable pressure, the Government appointed a Committee of Enquiry in 1956. Ultimately, the recommendations of this Committee formed the basis of the *Ngorongoro Conservation Ordinance No. 413* of 1959, which split the original Serengeti National Park into two separate units. The western section, together with a new northern extension, became the present-day Serengeti National Park to be devoted exclusively to wildlife, research, and tourism. The eastern portion, including more than half of the Serengeti plains and the whole of the Ngorongoro Highlands, became the Ngorongoro Conservation Area.

In the Ngorongoro Conservation Area, pastoralists retained their rights of habitation, cultivation, and socio-economic development. The loss of water sources in the newly formed Serengeti National Park prompted the Government to agree to provide the Maasai with a variety of benefits and social services within the NCA, particularly water development projects (MLNRT, 1990).

Since independence in 1961, there have been a number of declarations on the value of wildlife and wild places, the landmarks being Prime Minister Julius Nyerere's *Arusha Manifesto* of 1961, and President Ali

Hassan Mwinyi's 1990 statement of the Government's commitment to wildlife conservation, emphasising the government's resolve to implement a policy of "conservation for the people" (WCMC, 1992).

However less than a decade after the establishment of the NCA, there was a major policy debate over the future of the Area. During the late 1960s, the Ministry of Agriculture proposed that the size of the Conservation Area be reduced by some 65 per cent, and that the de-gazetted lands be used for intensive cultivation and grazing (MLNRT, 1990). By 1972, however, the pendulum had swung in the opposite direction, and at the international level there were pressures from conservationists for the NCA to become an exclusive wildlife area. In 1975, a compromise was reached and the *Ngorongoro Conservation Ordinance* was revised (*Game Parks Law (Miscellaneous Amendments) Act No. 14* of 1975). Government commitment to the multiple-use philosophy was maintained through the creation of the Ngorongoro Conservation Area Authority with a mandate of conserving and developing the natural resources of the Area *and* safeguarding and promoting the interests of the resident Maasai. As part of the new measures, a ban was placed on cultivation throughout the NCA because of concern at erosion and destruction of habitat for both wildlife and the domestic stock grazed by the Maasai (Lucas, 1992). In an effort to ameliorate the effects of this ban and to improve the food supply in the Area, a branch of the Regional Trading Company was opened at the NCAA's Headquarters (MLNRT, 1990).

Maasai pastoralists and their livestock were permitted limited occupancy on the Crater floor until the beginning of the 1974 dry season, after which no permanent residence or livestock grazing was allowed within the Crater, although the Maasai were permitted to continue to bring livestock into the Crater to access salt licks (Perkin, 1997). The ban on cultivation in the NCA remained in effect until 1992, when it was temporarily lifted by the Prime Minister in an endeavour to improve the food security situation in the Area. Alternative ways of providing for the needs of the NCA residents were to be sought in the meantime (NCAA, 1992).

A significant aspect of the evolution of the NCA framework lies in the Ngorongoro Conservation and Development Project (NCDP) which

stemmed from a workshop convened in Seronera in the Serengeti National Park in 1985 (MLNRT, 1986). The goal of the NCDP was conceived as building the capacity of the NCAA to plan for and manage the full range of development pressures facing the Area. The Project was instituted as an ongoing collaborative venture of the NCAA, the Tanzanian Ministry of Natural Resources and Tourism, and the IUCN. Three phases of the Project have been identified:

Phase I	the formulation of a long-term management strategy for the NCA;
Phase II	strengthening the capacity of the NCAA to formulate a management plan for the Area;
Phase III	strengthening the capacity of the NCAA to implement the completed strategy and management plan.

(Malpas and Perkin, 1997)

Approaches seeking to integrate human habitation with protected area management have for the most part evolved elsewhere, and whilst such approaches may be applicable to the East African situation, they will inevitably require modification to meet the unique historical, social, and economic conditions prevailing there. The NCA represents an experiment in land-use more similar to the European model of a protected landscape - as, for example, the Peak National Park (see Chapter 7) and the French regional nature parks - in which human habitation has been permitted throughout all or significant portions of a protected area.

The Ngorongoro Conservation Area Authority is one of five parastatals (autonomous or semi-autonomous state-owned enterprises) which fall under the broad jurisdiction of the Permanent Secretary of the Ministry of Tourism, Natural Resources and the Environment which administers all natural resources in Tanzania.

In summary, the NCA has been subject to two distinct approaches to multiple land-use management since its establishment in 1959. From the period 1959 to approximately 1974, human habitation was combined with natural resource conservation throughout the Area. However, the need for zoning to prohibit human habitation in some areas was identified in the Area's draft management plan in 1968. Management of

the Area has followed zones since this time, in which the Ngorongoro Crater and Northern Highland Forest Reserve have been afforded a higher degree of conservation protection. This zoning came fully into effect in 1974, when permanent habitation in the Ngorongoro Crater was prohibited. This coincided with restrictions on resource use in the wider NCA, with the total ban on cultivation in the Area in 1975. Since 1974 therefore, the Ngorongoro Crater has effectively been managed as a core protected area (conforming to IUCN management category II), with the remainder of the NCA being managed as a buffer zone to both the Ngorongoro Crater and the adjacent Serengeti National Park (Thompson, 1997). This is analogous to the situation in the Annapurna Conservation Area in Nepal (see Chapter 6).

PRIMARY DATA ANALYSIS

Prior to analysing the information obtained by questionnaire, the levels of correlation for this primary data were established:

- amongst respondents from within the NCAA;
- amongst outside observers;
- between NCAA respondents and outside observers.

After validation, the primary data were summarised in the form of key descriptive statistics, before the analysis proceeded to assessments of variables in the NCAA's external environment and in the core dimensions and allied factors of the Authority's organisational structure.

VALIDATION OF SOURCE DATA

As shown in Table 5.1, data from respondents within the Ngorongoro Conservation Area Authority (NCAA) yielded a coefficient of multiple correlation of 0.963 (significant at the 0.001 level), translating a coefficient of multiple determination of 0.927, indicating a high level of correlation (the second highest) amongst respondents.

TABLE 5.1 NGORONGORO CONSERVATION AREA DATA CORRELATIONS AMONGST AND BETWEEN AGENCY RESPONDENTS AND OUTSIDE OBSERVERS

Coefficient Type	Correlation amongst Agency Respondents *N= 2*	Correlation amongst Outside Observers *N=5*	Correlation between Agency and Outside Respondents
Coefficients of Multiple Correlation *[R]*	0.963[a]	0.958	0.910
Coefficients of Multiple Determination *[R^2]*	0.927	0.918	0.828

All correlations significant at the 0.01 level except [a] Correlation significant at the 0.001 level

Source: Survey Data

Correlation between the responses of observers outside NCAA is revealed by Table 5.1 as a multiple correlation coefficient of 0.958 significant at the 0.01 level, a level of correlation which is confirmed by the coefficient of multiple determination at 0.918. This represents the lowest level of correlation amongst all the agencies. The arithmetic means of raw data from respondents within NCAA were compared with the mean responses from the outside observers, and from Table 5.1 it can be seen that the Ngorongoro Conservation Area exhibited a mid-range coefficient of multiple correlation (the third highest), 0.910 at a significance level of 0.01, with a coefficient of multiple determination of 0.828.

DESCRIPTIVE STATISTICS

Selected descriptive statistics for responses on the external environment together with the same measures on the core dimensions and allied factors of organisational structure are summarised in Table 5.2.

The assessments of the external environment of the Ngorongoro Conservation Area Authority (NCAA) were typically some 40 per cent more dispersed than those of the core dimensions and allied factors of organisational structure. Diversity marked the assessments of the external environment of the NCAA by respondents within the Authority, as well as by outside observers. *Restrictiveness* presented the most diverse series of assessments, varying by an average of 27.8 per cent

about the mean of the data set. The assessments of *technological complexity, hostility,* and *heterogeneity* also varied significantly, whilst at the other end of the continuum of dispersion, the assessments of *turbulence,* with a coefficient of variation of 12.0 per cent, were relatively

TABLE 5.2 NGORONGORO CONSERVATION AREA SELECTED DESCRIPTIVE STATISTICS
- EXTERNAL ENVIRONMENT
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

	Arithmetic Mean [1]	*Coefficient of Variation (%)*
External Environment		
Heterogeneity	5.9	18.3
Turbulence	12.6	12.0
Hostility	13.6	19.9
Technological Complexity	4.9	22.0
Restrictiveness	4.6	27.8
Core Dimensions and Allied Factors of Organisational Structure		
Delegation	11.2	23.3
Sophistication of Control and Information System	45.9	17.8
Complexity	20.4	17.6
Centralisation	40.1	11.1
Formalisation	30.9	9.2
Environmental Agility	33.4	9.0
Infrastructure	20.9	12.2

1 Based on a confidence level of 95 per cent. *Source: Survey Data*

more uniform than the other variables. Amongst the core dimensions and allied factors of organisational structure, two ranges of variabilities were demonstrated, the first running from *environmental agility* with a coefficient of variation of 9.0 per cent through *formalisation* and *centralisation* to *infrastructure.* The second, higher range of variability, includes *complexity, sophistication of control and information systems,* and *delegation,* the last of which shows the highest relative dispersion of 23.3 per cent.

ASSESSMENT OF VARIABLES IN THE EXTERNAL ENVIRONMENT

Substantial portions of this assessment derive from information provided by respondents within the NCAA and outside observers in their additional comments on questionnaire items or in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited.

Heterogeneity

In relative terms, the environment of the NCAA exhibited a nett heterogeneity score which fell below the mean of the agencies examined here, as shown in Table 5.3. However in absolute terms, the environment was rated as quite strongly heterogeneous, showing the combined effects of some cultural diversity but more particularly the highly heterogeneous character of the NCAA's organisational setting.

TABLE 5.3 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HETEROGENEITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	5.8	13.6
Ngorongoro Conservation Area Authority	**5.9**	**18.3**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	5.9	11.8
Peak National Park Authority	6.4	8.3
Pinelands Commission	6.4	8.2
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	6.0	16.7
Over All Six Organisations	6.1	13.1

Source: Survey Data

As an element in the NCAA's environment, the essentially homogeneous Maasai exhibit something more akin to heterogeneity at the cultural level, generated by the fact that no single organisation can speak for all residents of the NCA, a situation which also limits their capacity to negotiate with the NCAA. Some residents are already members of emerging small independent NGOs such as the Ngorongoro Pastoral

Survival Trust, the Ngorongoro Pastoralist Development Organisation, and the Ngorongoro Environmental People's Organisation. However none of these has an NCA-wide constituency. Two others are based outside the NCA, and although neither of these is very active or has a strong constituency in the NCA, their very existence heightens the level of heterogeneity.

Local communities *are* represented on the Pastoral Council, a local community council established in 1992 to improve dialogue between the NCAA and the indigenous residents of the NCA. Community representation on the Pastoral Council includes six Ward Council Chairmen, thirteen Village Council Chairmen, two non-Maasai representatives, three traditional leaders, and two women, alongside six senior NCAA staff, and the Ngorongoro District Council Chairman.

Apart from the Minister for Natural Resources and Tourism who is responsible for selecting the NCAA Board members and for approving and amending the annual budget of the Authority, the key aspects of the NCAA's organisational environment are, *firstly,* the following agencies of the Tanzanian Government with which the Authority needs to interact regularly:

- TANAPA - Tanzania National Parks. Whilst having no legal status within the NCA, TANAPA cooperates closely with the NCAA over the common boundary between the NCA and the Serengeti National Park;
- Tanzania Department of Antiquities - Manages the Ulduvai Gorge Museum and is responsible for overseeing the management of palaeontological and archaeological resources within the NCA;
- Tanzania Forestry Division - Responsible for the management of the Northern Highland Forest Reserve;
- Ngorongoro District Council - The NCA falls entirely within the Ngorongoro District and comprises one of the three administrative divisions of the District. The District Council has primary responsibility for health care and education in the NCA.

Amongst the other national and international organisations with which the NCAA needs to interact with varying frequencies are:

- The Institute of Resource Assessment at the University of Dar-es-Salaam (previously BRALUP - the Bureau of Resource Assessment and Land Use Planning);

- The Tanzania Association of Tour Operators (TATO) and the Association of Tanzania Travel Operators (ATTO), representing between them over 100 tour firms;
- The International Institute for Environment and Development (IIED).

Amongst the major donors to the NCAA which also constitute key components of the heterogeneity of the environment of the Authority are:

- the Norwegian Agency for Development Cooperation;
- the Frankfurt Zoological Society;
- the Food Aid Counterpart Fund of the European Union;
- the German Ministry for Economic Cooperation and Development (BMZ);
- the World Conservation Union (IUCN);
- the Friends of the Serengeti;
- the Danish International Development Assistance (DANIDA).

Turbulence

As highlighted in Table 5.4, the environment of the NCAA exhibited the highest relative score on turbulence, although in absolute terms, the level of turbulence was only of moderate proportions. Some of the more prominent elements in the Authority's environment which contribute to turbulence include the character of land-use conflicts which have changed as the Maasai become progressively more sedentary, the oscillation in the viability of pastoralism as access to water for livestock changes, and the shifting incidence of cattle theft which influences the choice of tolerable areas. Together, these factors have converted food security into a constantly shifting issue for pastoralists who traditionally relied on cattle and small scale cultivation.

Other instabilities in the NCAA's environment have resulted from overgrazing, which has contributed to a gradual decrease in the number of Maasai cattle, and which has been exacerbated by diseases which strain the resources of veterinary services. Even the considerable increases in tourism have not always been supported by appropriate infrastructure, and these, coupled with high season overcrowding, have led to significant increases in erosion as well as strained facilities. Changes of this sort only serve to intensify the concerns, especially among international donor organisations, that the NCAA's conventional

TABLE 5.4 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TURBULENCE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.2	10.8
Ngorongoro Conservation Area Authority	**12.6**	**12.0**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	11.4	9.9
Peak National Park Authority	12.1	14.6
Pinelands Commission	11.2	19.8
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	11.1	19.1
Over All Six Organisations	11.7	15.4

Source: Survey Data

approaches to biodiversity conservation place unacceptable burdens on poor local communities (Homewood *et al.,* 1997).

The degree of unpredictable change confirms a relatively unstable environment for the NCAA. There is, for example, significant conflict between the Authority and the Maasai - in their own right and through various NGOs. Some other organisations (for example, ACAP - see Chapter 6) adopt an approach to planning and a flexibility in coping with unanticipated events which lessen the effects of environmental unpredictability. In the case of the NCAA, the gestation of the General Management Plan (GMP) in 1994-1995 appears to have magnified the divisive and dysfunctional effects of the changes involved, effects which will be examined under *hostility.* The GMP itself was a consequence of the growing pace of change which increased the need for a detailed management plan to guide management of the NCA (Tukahirwa, 1997).

Hostility

In terms of hostility, the environment of the NCAA showed scores which fell above the mean of the agencies examined here, and second highest after the environment of the Peak National Park Authority as shown in Table 5.5. Pastoralists and wildlife have co-existed in African rangelands for many hundreds of years, although with few of the tensions evident

today. In the past, human and livestock populations were relatively small and widely dispersed, and domestic animals were managed to minimise the risks of predation and disease transmission. However, as competition for scarce grazing and water resources increases, the potential for conflicts between wildlife managers and livestock owners grows as pastoralists and agro-pastoralists move into new areas and/or live in the vicinity of protected areas. The main factors driving this transformation are increasing demographic pressure, the expansion of cultivation, and the reduction in rangeland resources, through privatisation for commercial agriculture and ranching, and nationalisation for conservation.

TABLE 5.5 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HOSTILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.6	20.2
Ngorongoro Conservation Area Authority	**13.6**	**19.9**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	12.1	14.6
Peak National Park Authority	14.7	21.7
Pinelands Commission	12.0	20.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	13.5	23.8
Over All Six Organisations	13.0	20.8

Source: Survey Data

There is significant dissatisfaction with the lack of genuine participation in planning, as the selectivity which seems to typify participation in the NCA does not consistently represent anything approaching the full range of views in the community. One commentator refers to the NCAA as "running the Area as a fiefdom barely accountable to anyone" (Survival, 1999). As noted under *turbulence,* the manner in which the General Management Plan was developed evoked considerable controversy arising from land rights which have been a major concern of residents since the NCA was gazetted and, stemming from this issue, from the extent of public participation in the *planning process* and consequential differences in the goals of conservation and community development. From an on-going perspective, the GMP for the NCA provides for the involvement of indigenous residents in the *management process,* but this falls short of empowering them sufficiently to participate in decision

making. Although the Pastoral Council displays an apparently favourable balance between NCAA and local community representatives (noted under *heterogeneity*), it is less democratic than it appears: experience elsewhere in Tanzania suggests that Ward or even Village Councillors cannot necessarily be expected always to represent the interests of the wider community (URT, 1994). In addition, the seven indigenous representatives are appointed by the NCAA, and accordingly cannot be expected necessarily to serve the interests of their nominal constituencies.

Technological Complexity

From the scores on technological complexity as set out in Table 5.6, the environment of the NCAA falls just above the mean of the agencies examined in this work, although management decisions in the NCAA do not appear to be heavily dependent upon either technically sophisticated information or technology.

TABLE 5.6 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TECHNOLOGICAL COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.8	19.1
Ngorongoro Conservation Area Authority	**4.9**	**22.0**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	4.0	20.4
Peak National Park Authority	5.3	21.1
Pinelands Commission	4.7	21.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.6	26.0
Over All Six Organisations	4.7	21.3

Source: Survey Data

Given the controversial situation with respect to participatory planning and management, technological improvements within the agro-pastoralism of the indigenous Maasai would not be expected, and in practice are not found.

Restrictiveness

As outlined in Table 5.7, scores on restrictiveness were above the mean, bearing out the general picture gleaned from other sources. As noted earlier under *heterogeneity,* the capacity of the Maasai to negotiate with the NCAA is restricted by the fact that no single organisation can speak for all residents of the NCA. Management decisions appear to be made without adequate information on the extent to which resources and resource-users are matched. Various commentators have argued that conservation goals have been achieved at the expense of development goals, because of restrictions on grazing, burning, and agriculture, and further that the Pastoral Council should include democratically elected representatives of the different NCA communities *and* be given real influence in NCA as a body that was not subordinated but parallel to the NCAA (see, for example, Galvin, 1998). A common criticism has been that local pastoral inhabitants see very few benefits from wildlife. Conservationists, on the other hand, argue that livestock mismanagement underlies the decline in pastoral livelihoods. However, the need for alternative sources of income is highlighted by the widespread decline in the ratio of livestock to people among pastoral populations, attributed largely to human population growth and shortages of grazing land. Concerns over the impacts of cultivation, and the compatibility of wildlife and agro-pastoralism have led to suggestions that community-based tourism and improved livestock management may make a growing contribution to livelihoods (Potkanski, 1997).

TABLE 5.7 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - RESTRICTIVENESS

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.2	29.3
Ngorongoro Conservation Area Authority	**4.6**	**27.8**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	3.7	45.9
Peak National Park Authority	4.9	25.0
Pinelands Commission	4.1	35.3
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.7	32.9
Over All Six Organisations	4.4	31.8

Source: Survey Data

ASSESSMENT OF VARIABLES IN THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

As with the assessment of environmental variables, appreciable portions of the assessment here derive from information provided by NCAA respondents and outside observers in their additional comments on questionnaire items or in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited. The organisational structure of the Ngorongoro Conservation Area Authority forms the context of the core dimensions and allied factors of the Authority's structure. A chart of the main structural elements of the Authority is accordingly provided as Figure 5.2 to furnish a background against which to project the discussion of each dimension and factor.

Delegation

The NCAA exhibited a nett score on delegation which fell well below the mean of the six organisations and was, in fact, the lowest set of scores overall, as summarised in Table 5.8. Presidential linkages aside, the flow of delegation is effectively from the Minister for Natural Resources and Tourism to the NCAA Board of Directors and on to the Conservator

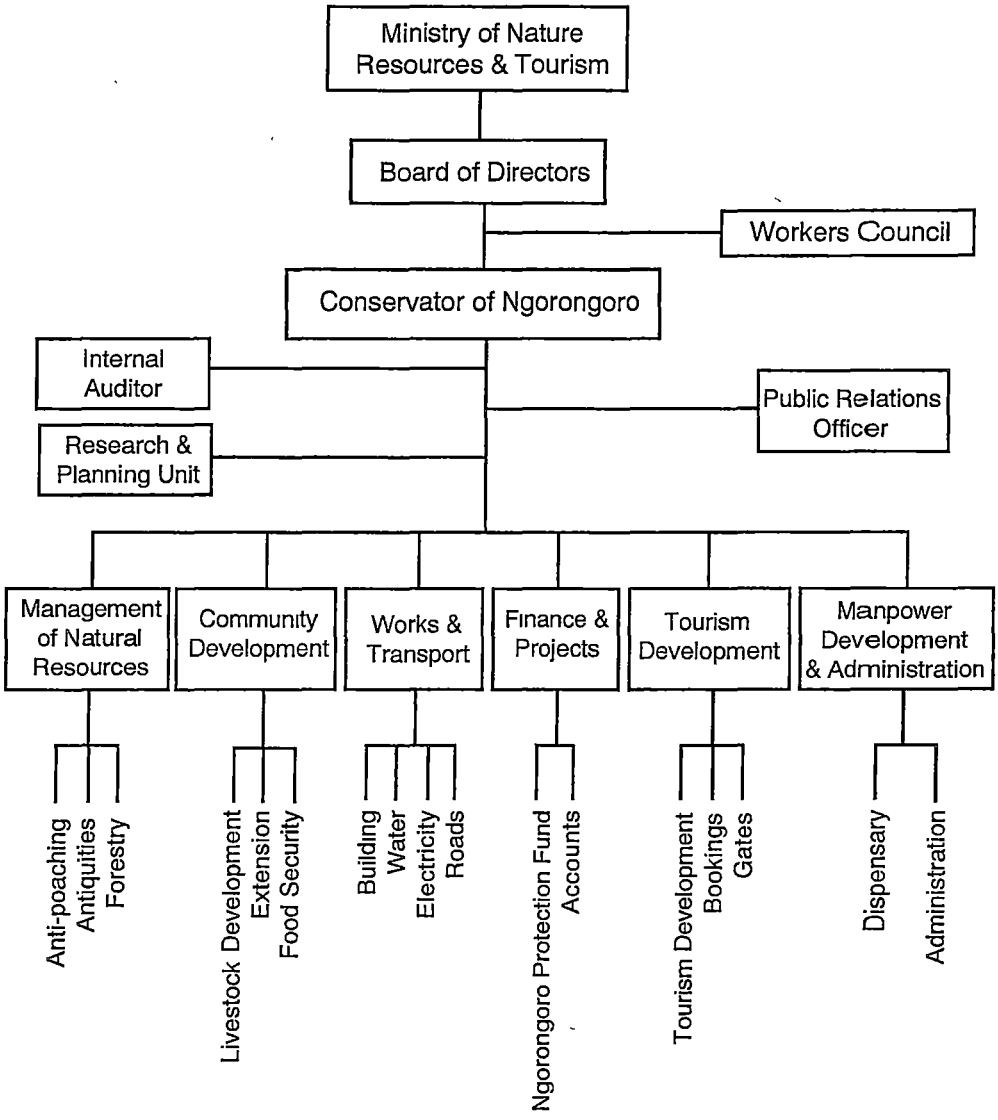
TABLE 5.8 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DELEGATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	13.5	30.1
Ngorongoro Conservation Area Authority	**11.2**	**23.3**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	15.4	24.2
Peak National Park Authority	11.4	25.7
Pinelands Commission	17.8	31.0
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	15.7	37.8
Over All Six Organisations	14.4	34.0

Source: Survey Data

FIGURE 5.2 ORGANISATION CHART OF THE NGORONGORO CONSERVATION AREA AUTHORITY

(as at April 2000)



Total staff establishment: 360
Source: NCAA (2000)

as the chief executive officer of the NCAA, the Conservator also serving as Secretary to the Board (URT, 1975). The decision-making authority in NCA is concentrated in NCAA's Board of Directors, which conducts closed meetings, and the agenda and minutes are confidential, even though, as a parastatal, the NCAA might in principle be expected to be accountable to the public. All matters of income and expenditure are also secret (Taylor and Johansson, 1998). The Board devolves its executive decision authority to the Conservator, who retains much of the ultimate practical decision-making capacity, delegation being in the main

confined to that which is necessary for day-to-day operations. Critical strategic areas are generally retained by the Conservator, and include senior staffing matters and employee relations.

Sophistication of Control and Information System

Although in the quantitative terms of Table 5.9, the NCAA is marginally above the mean of the six organisations, key outside observers indicate that the Authority possesses a control and information system which has only the modest degree of sophistication necessary for the current needs of the Authority. Given the system's level of sophistication, the theoretical expectation of an organisational structure of moderate complexity and formalisation is in fact achieved on the basis of the actual ratings on these variables, although the attributes of the third variable in this set, centralisation, are rather ambiguous. Relatively, the NCAA presents the second highest measure of centralisation of the six organisations reviewed here, yet it offers only a modest level in absolute terms. There is sufficient evidence to support the contention that the NCAA's control and information system is *capable* of reducing internal uncertainty for NCAA decision makers, although as the Authority's sensitivity to the human aspects of its external environment is arguable insofar as participation in planning and management are concerned, it is unclear whether it can be concluded that the control and information system *is* appropriate to *both* the external and internal environments.

TABLE 5.9 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - SOPHISTICATION OF CONTROL AND INFORMATION SYSTEM

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	44.8	14.9
Ngorongoro Conservation Area Authority	**45.9**	**17.8**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	44.7	13.9
Peak National Park Authority	45.6	17.1
Pinelands Commission	47.1	8.9
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	47.1	10.9
Over All Six Organisations	45.9	13.3

Source: Survey Data

Complexity

As may be seen in Table 5.10, the ratings of the NCAA's complexity are, in relative terms, also marginally above the mean of the six organisations examined, although in absolute terms, the Authority exhibits only a modest level of complexity, a contention which is lent support by the basic form of the organisation structure. The organisation chart depicted in Figure 5.2 provides intimations of all three aspects of the NCAA's complexity: there is only moderate specialisation and departmentation - denoting an intermediate level of horizontal differentiation, the number of levels in the hierarchy indicates low vertical differentiation, and the comparative spread of NCAA field offices - both zonal headquarters and outposts - reflects a medium level of spatial differentiation relative to some of the other organisations under review.

TABLE 5.10 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	19.4	19.0
Ngorongoro Conservation Area Authority	**20.4**	**17.6**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.4	14.0
Peak National Park Authority	20.9	19.7
Pinelands Commission	19.8	17.1
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	20.2	14.7
Over All Six Organisations	19.8	16.7

Source: Survey Data

Centralisation

Ratings of the degree of centralisation in NCAA are significantly above the mean of the six organisations considered here, as indicated in Table 5.11. Nevertheless from an absolute standpoint, the Authority falls midway between the poles of centralisation and decentralisation. The degree of centralisation in an organisation reflects both the degree of influence that top management has over key parts of the decision making process, together with the amount of discretion that first-line supervisors

have over the critical elements of their jobs. As intimated under *delegation,* decision-making authority flows from the Board of Directors to the Conservator before filtering through each department consistent with their responsibilities. The Workers Council, a body elected by NCAA staff to represent their interests (in a sense analogous to the Pastoral Council which it predates) serves as a formal means of *internal* participation in decision making. The Conservator is patently in a position to exercise a high degree of influence over pivotal parts of the decision process, although managerial and supervisory staff *do* have discretion over the critical parts of their jobs commensurate with their level in the organisation and their remoteness from NCAA headquarters. As a consequence of the particular mix of forces in the NCAA, the inverse relationship which theoretically ought to exist between delegation and centralisation subsists only partially in the case of the NCAA, a view which is corroborated by other sources.

TABLE 5.11 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - CENTRALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	36.6	15.2
Ngorongoro Conservation Area Authority	**40.1**	**11.1**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	36.0	15.9
Peak National Park Authority	40.6	9.7
Pinelands Commission	35.1	14.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	36.2	13.4
Over All Six Organisations	37.2	14.0

Source: Survey Data

Formalisation

Table 5.12 shows that in relative terms there is considerable similarity amongst the overall ratings of formalisation in the six organisations under review. Nevertheless, some departments in the NCAA itself were found to be highly regulated, such as the unit responsible for Finance and Projects, in which employees have explicit job descriptions and are supervised closely, there are clearly defined procedures and rules, and

managers follow closely the overall policy manual in the making of day-to-day decisions. Other organisational units, such as Management of Natural Resources, have a significant component of professionals with tertiary qualifications and considerable scientific training. These units evince less formalisation, the professional staff having considerable freedom, although supervisors and managers have to follow overall policies and operate much the same as those in the more routine departments. These differences were substantiated by the quantitative data, the absolute level of formalisation in terms of the written and unwritten elements of job standardisation falling into the mid-range between high and low formalisation, high formalisation being equated with consistency and uniformity of output achieved through job incumbents having minimal discretion over what, when, and how tasks are to be performed, and low formalisation, by contrast, involving considerable latitude and freedom to exercise discretion, relatively little programmed behaviour, and a minimum of standardised guidelines.

TABLE 5.12 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - FORMALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	30.6	7.7
Ngorongoro Conservation Area Authority	**30.9**	**9.2**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	30.9	7.1
Peak National Park Authority	31.0	9.7
Pinelands Commission	29.8	10.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.2	10.7
Over All Six Organisations	30.5	8.9

Source: Survey Data

Environmental Agility

Table 5.13 compares the ratings of the six organisations under study: that the NCAA reveals the highest rating of all the organisations examined here is, according to outside observers, attributable largely to the significant network of bodies from which it has the capacity to draw information. The two dimensions of environmental agility need to be considered separately. The extent to which an organisation maintains

awareness of its environment is the first dimension of environmental agility, a dimension which includes other organisations operating in the same task environment, together with technological, political, legal, and social factors. Amongst the other organisations operating in or overlapping the same task environment as the NCAA are a number of agencies of the Tanzanian Government, including the Ministry for Natural Resources and Tourism, TANAPA - Tanzania National Parks, the Tanzanian Department of Antiquities, the Tanzanian Forestry Division, and the Ngorongoro District Council with respect to health care and education in the NCA. Also sharing an interest in the task environment of the NCAA are some of the national and international organisations identified under heterogeneity, and major donors to the NCAA. The foundations for the NCAA's awareness of the main currents and undercurrents in the country lie in the Tanzanian composition of both the Board of Directors and the NCAA staff, and this is enhanced by the information available to it from such organisations as the Pastoral Council, the Workers Council, and NGOs/INGOs such as the associations of tour and travel operators.

TABLE 5.13 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - ENVIRONMENTAL AGILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	32.9	9.9
Ngorongoro Conservation Area Authority	**33.4**	**9.0**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	31.3	11.0
Peak National Park Authority	31.1	14.4
Pinelands Commission	29.8	17.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.8	14.6
Over All Six Organisations	31.5	13.0

Source: Survey Data

On the second dimension of environmental agility, the extent to which an organisation responds appropriately to its environment, the NCAA does not present as positively. There is a marked difference between the Authority being aware of, for example, the objections voiced by the Maasai and actually responding to those concerns. On the other hand,

there is some, albeit limited evidence, of the Authority's ability to deal with changes in its external environment, as for example the Ngorongoro Conservation and Development Project which has stimulated considerable interaction between the NCAA and both the Ministry of Natural Resources and Tourism and the IUCN, and joint schemes with organisations such as the Frankfurt Zoological Society. On balance, however, the degree of flexibility in the NCAA's existing policies and structure does not appear to facilitate the Authority's ability to adapt to externally induced change.

Infrastructure

There is no evidence to indicate that internal boundaries between units of the NCAA structure interfere with achieving solution to problems which overlap one or more of the functional areas of responsibilities. Work tends to be divided so that each department or section deals with, and is responsible for, the whole of an overall task, with meetings between relevant departments or sections being used to resolve any residual difficulties, such as those which arise in relation to the provision of appropriate support. The quantitative responses shown in Table 5.14 substantiate this finding, essentially confirming that the Authority has an infrastructure which enables the organisation to engage in the very disparate activities for which it is responsible and which facilitates the coordination of these roles.

TABLE 5.14 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - INFRASTRUCTURE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	20.4	12.5
Ngorongoro Conservation Area Authority	**20.9**	**12.2**
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.6	10.2
Peak National Park Authority	20.0	5.8
Pinelands Commission	18.0	14.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	19.5	16.9
Over All Six Organisations	19.5	13.3

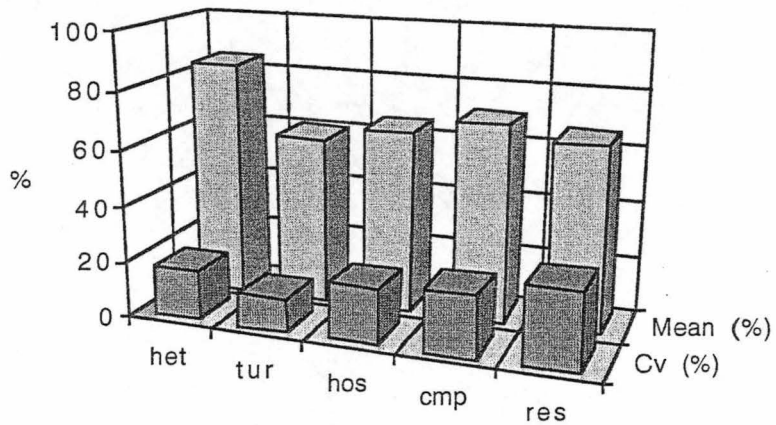
Source: Survey Data

SUMMARY

EXTERNAL ENVIRONMENT

To provide an overview of the environment of the NCAA, the statistical measures for the five aspects of the Authority's environment are summarised graphically in Figure 5.3. In order to create a comprehensive picture of this environment, the actual means have been converted into percentages, allowing the relative potency of each environmental variable to be judged.

FIGURE 5.3 NGORONGORO CONSERVATION AREA AUTHORITY
EXTERNAL ENVIRONMENT - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

het	Heterogeneity	tur	Turbulence	hos	Hostility
cmp	Technological Complexity			res	Restrictiveness

In terms of heterogeneity, the environment of the NCAA is strongly heterogeneous, showing the combined effects of some cultural diversity but more particularly the highly heterogeneous character of the NCAA's organisational setting, key aspects of which are Tanzanian Government agencies, other national and international organisations, and major donors. Pastoralists who traditionally relied on cattle and small scale cultivation endure food security as a constantly shifting issue under the influence of land-use conflicts, oscillation in the viability of pastoralism, and the shifting incidence of cattle theft. The turbulence which this indicates is magnified by other instabilities such as overgrazing, livestock disease, and deficiencies in tourism infrastructure. Gestation of the General Management Plan appears to have magnified the divisive and dysfunctional effects of the changes involved. Hostility manifests as

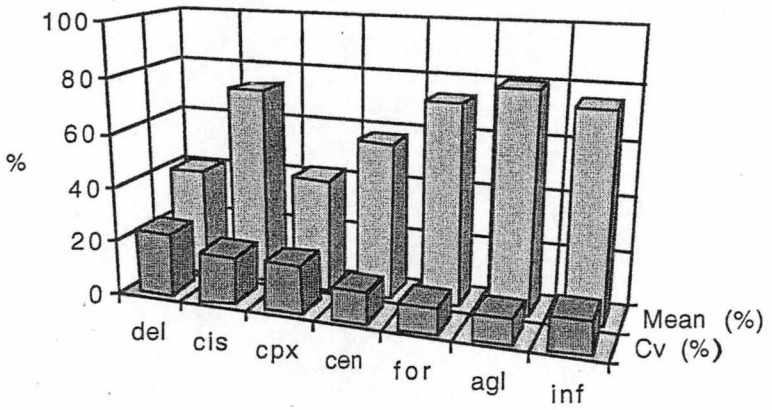
increasing conflicts between wildlife managers and livestock owners in both new pastoral areas and areas bordering on protected areas. The main factors driving this are increasing demographic pressure, the expansion of cultivation, the reduction in rangeland resources, and lack of genuine participation in planning. In terms of technological Complexity, management decisions in the NCAA do not appear to be heavily dependent upon either technically sophisticated information or technology. Controversies over participatory planning and management render it unlikely that there will be technological improvements within agro-pastoralism. Restrictiveness in the NCAA's environment is shown by the way in which management decisions appear to be made without adequate information on the extent to which resources and resource-users are matched, whilst conservation goals have been achieved at the expense of development goals. The Pastoral Council serves a subordinate role to the NCAA, restricting its potential contributions. .

CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

As with the NCAA's environment, an overview of the core dimensions of the Authority's organisation together with ancillary structural factors is created by the relevant statistical measures as graphically summarised in Figure 5.4, and again, the means have been converted into percentages.

On delegation, the NCAA displays the lowest rating of all six organisations. Decision-making authority is concentrated in the Board of Directors, the meetings, agenda, and minutes of which are clandestine. The Board devolves its executive decision authority to the Conservator, who retains much of the ultimate practical decision-making capacity, including strategic areas, delegation being in the main confined to that which is necessary for day-to-day operations. The control and information system has only the modest degree of sophistication necessary for the current needs of the Authority, and although the system is *capable* of reducing internal decision uncertainty, given the Authority's questionable sensitivity to the human aspects of its external environment and participation, it is unclear whether it can be concluded that the control and information system *is* appropriate to *both* the external and internal environments.

FIGURE 5.4 NGORONGORO CONSERVATION AREA AUTHORITY
CORE DIMENSIONS AND ALLIED FACTORS
OF ORGANISATIONAL STRUCTURE - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

del	Delegation	cis	Sophistication of Control & Information System		
cpx	Complexity	cen	Centralisation	for	Formalisation
agl	Environmental Agility			inf	Infrastructure

Of the three aspects of the NCAA's complexity, there is an intermediate level of horizontal differentiation, low vertical differentiation, a medium level of spatial differentiation. In terms of centralisation, the Workers Council serves as a formal means of *internal* participation in decision making, although the Conservator exercises a high degree of influence over pivotal parts of the decision process. Managerial and supervisory staff have limited discretion equated with level in the organisation and physical remoteness. Departments such as Finance are highly regulated, whilst others, including Management of Natural Resources, have less formalisation, professional staff having some autonomy, although supervisors and managers have to observe overall policies and operate much the same as those in the more routine departments. NCAA's environmental agility lies in the Tanzanian composition of both the Board of Directors and the NCAA staff, and this is enhanced by the information available to it from other organisations. However, a marked difference exists between the Authority's awareness and actual response. The degree of flexibility in the NCAA's existing policies and structure does not appear to facilitate it's ability to adapt to externally induced change. On infrastructure, internal boundaries between units do not appear to interfere with achieving solution to problems which overlap one or more areas of responsibilities. Core and support work seem to be largely integrated, and tasks maintained within each department, with only minimal need for conflict resolution meetings.

THE CASE STUDIES
CHAPTER 6

THE ANNAPURNA CONSERVATION AREA NEPAL

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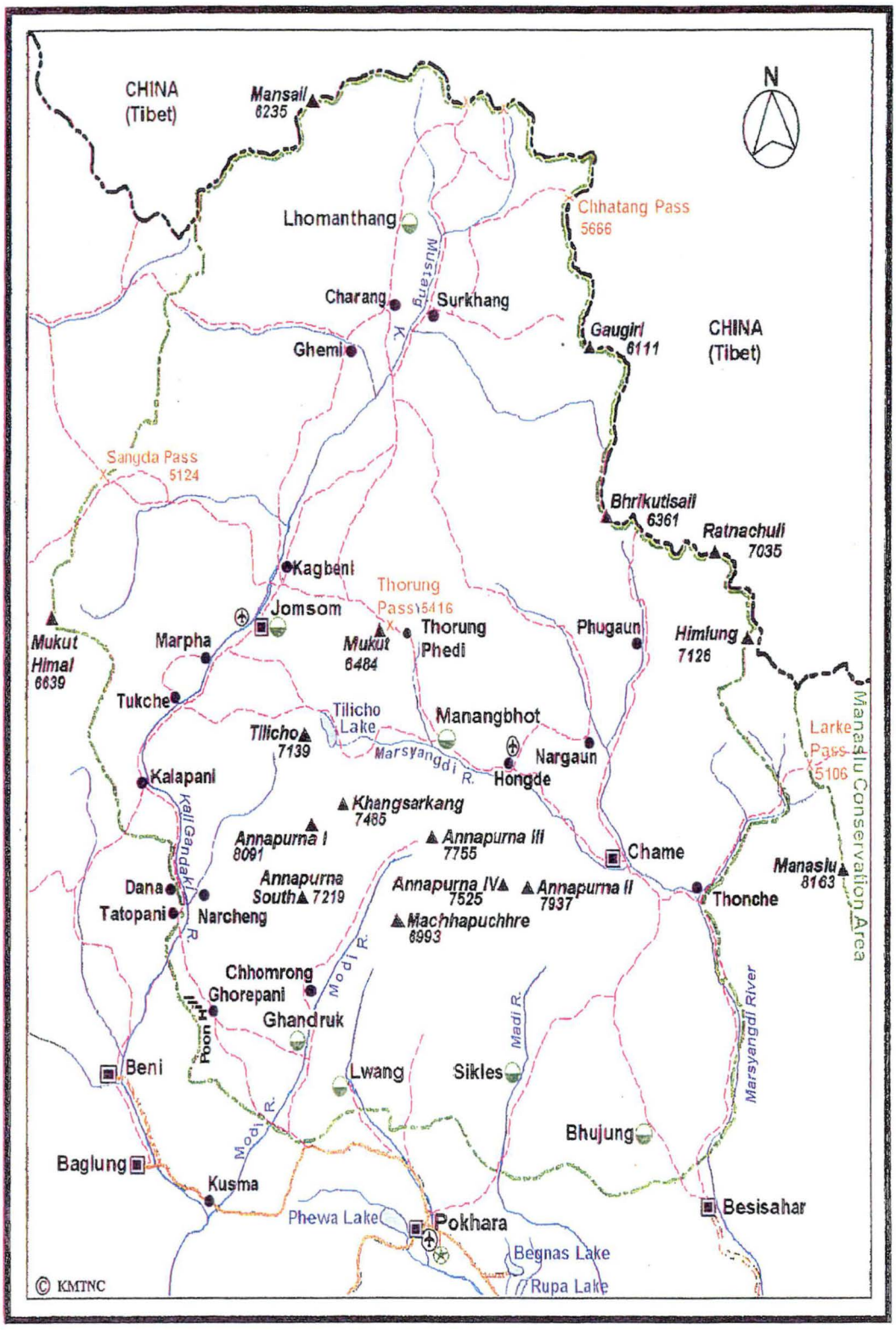
CHAPTER 6

ANNAPURNA CONSERVATION AREA NEPAL

THE NATURAL AND SOCIO-CULTURAL ENVIRONMENTS

Located roughly 200 kilometres to the west of Kathmandu, Nepal's capital city, and to the north of Pokhara, the Annapurna Conservation Area (ACA) encircles the major peaks of the Annapurna Himal and includes the catchments of three major river systems over an area of 7,629 square kilometres (see Figure 6.1). The ACA includes the Himalayan biogeographical divide, the Kali Gandaki Valley, and the Area therefore supports species from both the eastern and western Himalaya, in addition to flora and fauna typical of the trans-Himalayan zone. From the standpoints of physiography, climate, and biodiversity, the Annapurna region is a microcosm of Nepal.

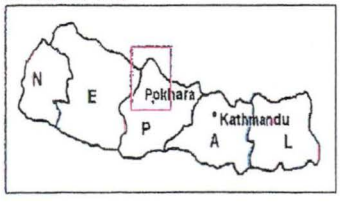
Physiographically, the ACA covers the entire Annapurna Massif, including the Annapurna Sanctuary, the valleys of the Marsyangdi and Kali Gandaki Rivers, Manang, Thorung La, Muktinath, and Jomsom. Despite the small area of the ACA, it presents the greatest range of altitude on Earth; a ground interval of roughly 100 kilometres can equate with altitude varying from less than 1000 metres to the summit of Annapurna I which, at 8091 metres, is the World's eighth highest mountain. This altitudinal range and associated climate produce exceptionally high vegetation diversity. There is a wide range of microclimates which, at the lower altitudes to the south of Annapurna, support the subtropical broadleaf forests typical of lower altitudes, with the mixed broadleaf rhododendrons characterising the temperate evergreen forests at increasing elevations. At the other extreme, the alpine steppes and arid environments which exist to the north of the Annapurna Himal are distinguished by coniferous forests on dry ridges, and juniper species on the subalpine and semi-desert areas. The annual rainfall ranges from over 3000 mm on the southern slopes of the Annapurna Himal to less than 300 mm in the rain shadow area such as Jomsom and even less in the Manang area (Lucas, 1992). Something of the biological diversity of the ACA may be gauged from the fact that the



LEGEND

International boundary	
Conservation Area boundary	
District Headquarters	
ACAP Headquarter	
ACAP Field Offices	
Airstrips	
Peaks and Passes	
Villages	
Rivers and Lakes	
Roads	
Major Trails	

LOCATION MAP



Km 10 5 0 10

Scale 1 : 1,000,000

FIGURE 6.1
ANNAPURNA CONSERVATION AREA

(Source: KMTNC, 1999a)

ACA occupies 5 per cent of the area of Nepal, yet possesses over half the species of mammals, birds, reptiles, and amphibians in the Country, together with some 18 per cent of Nepalese plant species (with populations of 101 species of mammals, 474 bird species, 39 species of reptiles, 22 amphibian species and 1,226 plant species [KMTNC, 1997]). The region contains the habitats of various rare and endangered wildlife species such as the snow leopard, red panda, blue sheep, and musk deer.

The biological diversity of the ACA has its counterpart in a rich cultural diversity. It is inhabited by over 120,000 people of varying ethnicity, for despite clear Tibetan cultural affinities amongst all the dominant groups - Gurung, Magar, Thakali, and Manangi - there is considerable local variation within and between groups (Gurung, 1995). Such distinctive cultural characteristics derive not only from ancestral origins and religions but also from exposure to other influences, such as the Thakali trade contact with India, and Manangi commerce throughout South-East Asia. The Gurung and Magar are predominantly subsistence farmers and/or stock-raisers, with some living a semi-nomadic existence following seasonal pastures. Along with other Tibeto-Nepalese groups, these two have adopted Hindu religious beliefs and practices, although they remain basically Buddhist, unlike the Thakali, with whom Hinduism holds sway.

It is possible to distinguish three main areas of the ACA that differ climatically and culturally. These are separated by considerable physical barriers, and whilst very different from each other are, in general, internally homogeneous. These regions are:

Annapurna South of the main range	Largely Gurung villages. Hindu with some Buddhist.
Mustang North of the main range	A separate "Kingdom". Culturally close to Tibet. Buddhist.
Manang North of the main range	Also more Tibetan-like, but traditionally great travellers and traders.

The economy of the ACA is based on the attraction of the region's natural and cultural features - the Conservation Area represents the most popular trekking destination in Nepal, attracting roughly 60 per cent of Nepal's total trekkers. The economic benefits of this go far beyond the employment which mountain trekking generates, which on average,

equates with one porter for each trekker. However, the influx of large numbers of trekkers, coupled with poverty, intensive agriculture, overgrazing, and a high growth rate in population, have all combined to degenerate the natural and cultural resources of the ACA. Sustainability of natural resources in their social, cultural, and natural context is essential to avoid placing the ACA environment in jeopardy.

EVOLUTION OF THE PRESENT FRAMEWORK

Among the institutional mechanisms set up in Nepal to coordinate environmental administration, the Council of Ministers at the apex holds the ultimate responsibility for coordinating policy issues and administrative matters, whilst the National Planning Commission is expected to coordinate environmental considerations in formulating periodic development plans, development planning itself beginning in 1956. *Via* the Fourth Plan (1970-1975), Nepal embarked on a modern era of wildlife conservation with the *National Parks and Wildlife Conservation Act* in 1973 emphasising the protection of biological diversity through the establishment of national parks and wildlife reserves. The Fifth Plan (1975-1980) included the key institutional component of the Department of National Parks and Wildlife Conservation which presently works with a network of National Parks, Wildlife Reserves, Conservation Areas [including the Annapurna Conservation Area], and a Hunting Reserve to conserve, restore, and manage the rich and varied fauna, flora, and landscape of the country (Nepal; Ministry of Forests and Soil Conservation, 1999).

The Sixth Plan (1980-1985) is also of particular relevance here in that it incorporated a number of environmental issues, including the *King Mahendra Trust for Nature Conservation Act,* 1982 [1] which provided the legal underpinning for that institution. The King Mahendra Trust for Nature Conservation (KMTNC) was established with the mandate of conserving, preserving and managing natural areas and wildlife with a view to improving the quality of human life. The KMTNC is prominent amongst the national non-governmental organisations (NGOs) actively

1 *King Mahendra Trust for Nature Conservation Act* [2039 B.S.] Volume 32, No. 32 [Law #12] (KMTNC, undated [a]).

working in the environmental field in Nepal since the relaxation of the Panchayat System's political restrictions following Nepal's transition to democracy (United Nations, 1992). The 1990 Constitution of the Kingdom of Nepal was, in fact, promulgated with a strong commitment on environmental protection, and several such NGOs have been quite effective in articulating the cause of environmental issues.

The creation of the KMTNC followed the realisation that there is a mutually dependent relationship between nature conservation and economic development. Marking the introduction of this new concept in protected area management in Nepal, the Trust became fully functional in 1984, its activities being guided by a Board of Trustees, comprising eminent national and international personalities. The Trust receives no budgetary support from the Government, but is funded entirely by charitable donations from Nepalese and foreign sources, and support is afforded by a network of international chapters.

The Trust has evolved as a people-oriented institution reliant on popular support in its conservation efforts, its philosophy being to encourage the people's confidence in their ability to determine their own development and conservation priorities. The KMTNC's role in this process is that of a catalyst. The Trust approaches the problems aiming not to seek a solution on its own but to try to help the people find answers. This approach to problem solving seeks to bring about attitudinal changes for conservation and development among the people rather than impose pre-determined ideas. The community is involved from the design to the implementation of any projects under the *aegis* of KMTNC as they are the ultimate beneficiaries and stakeholders. This underlies the Trust's focus on both long-term research and conservation projects being undertaken at the Nepal Conservation Research and Training Center and the emphasis on community-based programmes (KMTNC, 1999).

In 1985, a directive from His Majesty King Birendra required the KMTNC to investigate an appropriate protected status for the Annapurna region. Supported by the World Wildlife Fund (WWF) a six month field survey generated a feasibility study which proposed the concept of a "conservation area" which was seen as conserving natural and cultural values side-by-side with the development of tourism. It was advocated

that the administrative organisation should be small, local participation be viewed as essential, and area operations be self-sustained through entry and user fees. This concept was launched in 1986 by H.R.H. Prince Gyanendra, Chairman of KMTNC, on the WWF's 25th Anniversary, and management began as a project from 1986 ahead of legislation to define a conservation area as providing for "the protection, improvement, and multiple use of natural resources according to principles that will ensure the highest sustainable benefit for present and future generations in terms of aesthetic, natural, cultural, scientific, social and economic values" (Lucas, 1992). In July 1989, the Nepalese Parliament passed a bill to amend the existing *National Parks and Wildlife Conservation Act* 1973 to authorise conservation area status as an addition to the types of protected areas already provided for.

The Annapurna Conservation Area Project (ACAP) aims to integrate environmental conservation with development that can sustain the Area's reserve base. The immediate stimulus for the Project lay in environmental problems originating locally in the Annapurna area which had been exacerbated by increasing pressure from burgeoning tourism. Socio-economic problems also loomed large in this biologically and culturally rich area. Consistent with the overall philosophy espoused by the KMTNC, the ACAP focuses on protecting the environment, improving local living standards, and developing a more "sensitive" form of tourism. One of its most important functions has been to develop and teach courses in environmental education in local schools.

The Project, at first, was implemented to trial the integrated approach in conservation and development based on the Trust's underlying philosophy that effective conservation of natural resources, and improvement in the circumstances in which the local inhabitants live, cannot be achieved without active participation of the local community in all stages of a project, from planning through to implementation and evaluation. Through their active participation, it was assumed that local people would be in a position to channel the benefits of the programmes to their interest and one day would be able to take over responsibility for the conservation of the ACA.

The programmes of ACAP have been executed in stages, which has enabled ACAP to expand its coverage gradually, based on the cumulative experience of previous programmes. For example, ACAP was implemented in Ghandruk in December 1986 as a pilot project covering only one Village Development Committee (VDC) with an area of 200 km^2. In 1990, it was expanded to cover 16 VDCs which altogether had an area of 1500 km^2. The Nepalese Government formalised the conservation area status of the ACAP in July 1992 and confirmed the KMTNC's responsibility for managing the designated Conservation Area for a period of ten years. ACAP then covered 55 VDCs and is the largest protected area in Nepal. The whole areas of Manang and Mustang and a large part of Kaski, Myagdi, and Lamjung Districts are covered by the Project.

In December 1996, the Government of Nepal gazetted the *Conservation Area Management Regulations*, 2053 B.S., which provide the current legal framework for the management of conservation areas, including the ACA (KMTNC, 1999b) . Following the approval of these *Regulations*, several meetings attended by all senior officers of KMTNC/ACAP were held in Pokhara to discuss the impacts and implications of the Regulations. Although field offers expressed their satisfaction at receiving the long due legal recognition for the Conservation Area, several concerns, particularly relating to limited authority of the Conservation Area Management Committees and administration of funds raised by them, have been raised for further review, consultation, and amendment. To strengthen the jurisdiction of ACAP, a liaison officer from the Ministry of Forests and Soil Conservation and 3 non-gazetted staff from the Department of National Parks and Wildlife Conservation have been deputed to work as regular staff.

Even though the major issues related to conservation and development appear similar throughout the Annapurna region, priority programmes differ between areas depending upon the particular opportunities and problems of the area. Accordingly ACAP has formulated area specific programmes such as heritage conservation in the Upper Mustang, tourism management in Ghandruk, Manang, and Jomsom, agroforestry in Lwang, integrated agricultural development in Sikles, and poverty alleviation and livestock genetic conservation in the Bhujung area. Even though priority is given to area specific programmes by the regional Unit

Conservation Offices, core programmes are common to all, based on the multi-land use protected area concept, with the Area divided into five zones:

Special Management Zone	includes areas with scenic beauty which have less than 100 years of settlement history, but facing ecological problems. Resource management is a high priority.
Wilderness Area	includes areas above the upper elevation of seasonal grazing - roughly all terrain above 4500 metres altitude. Fully protected - no use of resources is permitted.
Protected Forest/ /Seasonal Grazing Zone	lies between the Wilderness Zone and the Intensive Management Zone. Selective use of forest resources is permitted.
Intensive Management Zone	includes area under intensive agriculture and human activities. Controls are vital as it serves as a buffer for the protected forest and wilderness areas.
Biotic/ /Anthropological Zone	includes areas where the influence of technology and modern man has not significantly affected the life of the inhabitants. Strict controls over trekking are imposed

(KMTNC, 1997).

In terms of infrastructure, ACAP's programmes and activities are formulated and implemented through Conservation Area Management Committees (CAMCs). Formed at the grassroots level of each of the Village Development Committees (VDCs), these elected bodies are supported by sub-CAMCs where the geography of the area and local management systems make it desirable (Gurung, 1995). The 34 principal and 122 sub-CAMCs are distributed geographically as shown in Figure 6.3, and together bear the main local responsibilities for conservation and development actions. Each CAMC has 15 members, 11 elected by the people and 3 by ACAP (representing, as far as possible, the various ethnic and social groups) who serve for a period of five years, with the relevant VDC Chairman automatically becoming a member of the CAMC (KMTNC, 1997).

PRIMARY DATA ANALYSIS

Prior to analysing the information obtained by questionnaire, the levels of correlation for this primary data were established:

- amongst respondents from within the KMTNC;
- amongst outside observers;
- between KMTNC respondents and outside observers.

After validation, the primary data was summarised in the form of key descriptive statistics, before the analysis proceeded to assessments of ACAP-associated variables in the KMTNC's external environment and in the core dimensions and allied factors of the Trust's organisational structure.

VALIDATION OF SOURCE DATA

As shown in Table 6.1, there was a high level of correlation amongst respondents within KMT, evident from the coefficient of multiple determination of 0.918 linked with the coefficient of multiple correlation of 0.958 (significant at the 0.01 level). Insofar as correlations between the responses of observers outside KMT are concerned, Table 6.1 reveals a coefficient of multiple correlation of 0.988 significant at the 0.001 level, this relatively high correlation being confirmed by the coefficient of multiple determination of 0.976.

TABLE 6.1 ANNAPURNA CONSERVATION AREA
DATA CORRELATIONS AMONGST AND BETWEEN AGENCY RESPONDENTS AND OUTSIDE OBSERVERS

Coefficient Type	Correlation amongst Agency Respondents *N= 3*	Correlation amongst Outside Observers *N=4*	Correlation between Agency and Outside Respondents
Coefficients of Multiple Correlation *[R]*	0.958	0.988[a]	0.884
Coefficients of Multiple Determination *[R^2]*	0.918	0.976	0.781

All correlations significant at the 0.01 level except [a] Correlation significant at the 0.001 level
Source: Survey Data

In order to derive a measure of the correlation between KMT respondents and outside observers, the arithmetic means of raw data from each source were compared. From Table 6.1 it can be seen that the Annapurna Conservation Area exhibited a low (in fact the second lowest)

coefficient of multiple correlation, 0.884 at a significance level of 0.01, the associated coefficient of multiple determination being 0.781.

DESCRIPTIVE STATISTICS

As a synopsis of the data, selected descriptive statistics for responses on both the external environment and the core dimensions and allied factors of organisational structure are summarised in Table 6.2.

TABLE 6.2 ANNAPURNA CONSERVATION AREA SELECTED DESCRIPTIVE STATISTICS
- EXTERNAL ENVIRONMENT
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

	Arithmetic Mean [1]	*Coefficient of Variation (%)*
External Environment		
Heterogeneity	5.9	11.8
Turbulence	11.4	9.9
Hostility	12.1	14.6
Technological Complexity	4.0	20.4
Restrictiveness	3.7	45.9
Core Dimensions and Allied Factors of Organisational Structure		
Delegation	15.4	24.2
Sophistication of Control and Information System	44.7	13.9
Complexity	18.4	14.0
Centralisation	36.0	15.9
Formalisation	30.9	7.1
Environmental Agility	31.3	11.0
Infrastructure	18.6	10.2

1 Based on a confidence level of 95 per cent. *Source: Survey Data*

The assessment of turbulence, with a coefficient of variation of 9.9 per cent, was appreciably more uniform than any of the other variables in the external environment. At the other end of the variability spectrum, *restrictiveness* presented the most disparate series of assessments, varying by an average of 45.9 per cent about the mean of the data set. This was by far the highest coefficient of variation. Amongst the core dimensions and allied factors of organisational structure, the assessments of the level of *delegation* displayed the largest relative dispersion with a coefficient of variation of 24.2 per cent, whilst at the opposite pole, a coefficient of variation of 7.1 per cent ranked the data for

formalisation as the least dispersed. Between these two extremes of variability, the assessments tended to fall into two groups: the first, made up of *centralisation, complexity,* and *sophistication of control and information systems,* was slightly more elevated than the second group comprising *environmental agility* and *infrastructure.*

ASSESSMENT OF VARIABLES IN THE EXTERNAL ENVIRONMENT

Material portions of this assessment derive from information provided by respondents within the KMTNC and outside observers in their additional comments on questionnaire items and in the course of other communications. In accordance with the assurances of anonymity given to all respondents, the only attributions which have been made are those for which a respondent gave written permission to be cited. Secondary sources have, of course, been cited.

Heterogeneity

There are three aspects to examining the heterogeneity of the environment in the Annapurna Conservation Area (ACA): on the one hand, there is in a sense cultural homogeneity, on another, an organisational milieu which can only be described as heterogenous, whilst on a third, programme priorities reflect the particular needs of the various areas of the ACA. The nett effect of these three aspects is reflected in the scores on heterogeneity which, as shown in Table 6.3, are slightly below the mean of all the organisations examined here.

Looking at each in turn: the three main areas of the ACA noted earlier as significantly different climatically *and* culturally are separated by considerable physical barriers, and have also been managed by the King Mahendra Trust for Nature Conservation/Annapurna Conservation Area Project (KMTNC/ACAP) for different lengths of time, as summarised below:

Region	ACAP's Management Started
Annapurna South of main range	1985
Mustang North of main range	1992/93
Manang North of main range	1992/93

TABLE 6.3 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HETEROGENEITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	5.8	13.6
Ngorongoro Conservation Area Authority	5.9	18.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**5.9**	**11.8**
Peak National Park Authority	6.4	8.3
Pinelands Commission	6.4	8.2
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	6.0	16.7
Over All Six Organisations	6.1	13.1

Source: Survey Data

The degree of success and influence is greatest in the area which has had the longest exposure to the managing agency. These three regions are very different to each other, but as previously indicated they are generally homogenous internally, the communities being well-settled, with very few incomers. Nevertheless, there is quite a lot of movement away, particularly of more prosperous males, in which context it should be noted that Annapurna proper is the heart of the Gurkha recruiting area. Many families now live in Pokhara but keep a house and/or land in their traditional villages. The Mustang region is very homogenous with feudal overtones. Typically, village communities have very stable social structures. In the predominantly Hindu areas there is some admixture of Brahmin houses and of the other castes, such as tailors and metal workers.

Turning to the organisational environment, the KMTNC must manage the ACAP within the general context of the Nepalese Government, and needs to interact regularly with the Department of National Parks and Wildlife Conservation within the Ministry of Forests and Soil Conservation, despite holding statutory authority for its operations in the ACA itself (referred to under *hostility* below). The major donors to the ACAP also constitute a key factor in the environment of the KMTNC in its management of the Project. Prominent amongst these donors are:

American Himalayan Foundation
Asian Development Bank
Canadian International Development Agency

CNRS (Centre National de la Recherche Scientifique)
French Embassy in Nepal
Nepalese Ministry of Tourism & Civil Aviation
Netherlands Development Organisation
Overseas Development Administration - UK
Trans-Himalayan Aid Society
World Wildlife Fund (the ACAP is the WWF's largest programme in Nepal)

The heterogeneity of the overall environment is inflated *not only* by the sheer number of these donors, *but also* by the levels of vital support which they contribute to the resources of the ACAP.

Highlighting ACAP's goal of self-sufficiency brings into sharp relief the Village Development Committees which form the underpinning for the Conservation Area Management Committees and their subsidiaries. Although this framework is oriented toward the ultimate independent functioning of the ACA, it also provides a necessary present-day focus in the form of the Unit Conservation Offices - the key centres for KMTNC's field operations. Programme priorities show considerable variation between the ACAP's Northern and Southern Programmes and amongst the seven geographic zones, although integrated tourism management and agro-pastoralism form a common set of priorities in Jomsom, Manang, and Ghandruk, as shown in Figure 6.3 under *Complexity*.

Turbulence

As gauged from the very low degree of unpredictable change, the level of turbulence in the environment of ACAP/KMTNC marks a relatively stable setting, confirmed by the scores shown in Table 6.4 which fall below the overall mean. There is, for example, very little conflict between ACAP and the local people - quite the opposite, in fact, with most of the work which is carried out under the aegis of the ACAP receiving at least tacit support within each community. Although the KMTNC enjoys a degree of theoretical superiority over agencies of the Nepalese government by virtue of its statutory authority over the ACA (detailed under *Hostility*), the reality is that the Trust needs to "coexist not just peacefully, but constructively" with Government agencies, and to this end has to go beyond the cooperative stance which might otherwise be expected.

Based on his familiarity with the area and his links with the KMT, Sir John Chapple, Chairman of the King Mahendra United Kingdom Trust, in his letter dated 21 July 2000, contended that:

> The communities in the Annapurna Conservation Area are changing but slowly. The largest, notable change is in education which in turn has economic and cultural spillover effects. Some relevant technology, such as micro-hydro-electric generating projects, is beginning to make a difference to life styles. In addition, through the leads provided by international non-governmental organisations (INGOs) and non-governmental organisations (NGOs) significant advances in agriculture, livestock, and forestry *have* been made. But the whole area is still recognizably the physical environment, and the housing and farming methods are still distinctively of an earlier era.

The strategic planning undertaken by the KMT together with the Trust's flexibility in coping with unanticipated events mitigates the effects of the low levels of unpredictability in its environment. Many improvements are possible but the rate of achieving success is hard to predict. There is also usually a reluctance to finish any one project and bow out, not just because jobs might be at risk if KMT workers have nothing to do, but also because villagers like the protection provided by outside agencies (NGOs/INGOs) who shield them from pernicious political pressures on a *quid quo pro* basis.

TABLE 6.4 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TURBULENCE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.2	10.8
Ngorongoro Conservation Area Authority	12.6	12.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**11.4**	**9.9**
Peak National Park Authority	12.1	14.6
Pinelands Commission	11.2	19.8
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	11.1	19.1
Over All Six Organisations	11.7	15.4

Source: Survey Data

The relatively stability of the ACAP's environment was compromised by the assassinations in the Nepalese Royal Family in June 2001, and had this tragedy destabilised Nepal to an even more profound extent, turbulence (and, conceivably, heterogeneity) would almost certainly have been affected, particularly had there been any conspicuous and lasting increase in Maoist insurgency.

Hostility

As outlined in Table 6.5, the scores on hostility fall below the mean of all the organisations examined here. There has been no known interference in fifteen years with any environmental work, which is generally welcomed. Although the entire hill region *does* have pockets of Maoist insurgency and thuggery, there has been very little real threat to safety of individuals, and it remains relatively safe to walk anywhere in the ACA. Support and enthusiasm for the King Mahendra Trust's leadership and work varies: it is mainly supportive, because village committees determine how the revenue is to be spent and therefore have some feeling of ownership. This does not pertain in Mustang where the Central Government has kept most of the revenue from visitors, and the King Mahendra Trust carries the blame for this.

Allusion has already been made to the relationship between the KMTNC and agencies of the Nepalese Government, an aspect which is clearly encapsulated in the following quotation:

> The environment is at times quite difficult for some of the KMT workers in the field, but it can be also very rewarding if a scheme or project begins to take hold. KMTNC is unique in that it was the first in the field and has Government laws and regulations which give it statutory authority in designated areas such as ACAP. This authority conveys a kind of primacy in relation to other Government departments with environmental responsibility. This is about as good an environment as any conservation organisation could ask for in theory. In practice it is much more complex than this and requires close cooperation with all official agencies and tactful handling of the envy factor.
>
> Sir John Chapple, personal communication, 21 July 2000

Risk, stress, domination - what may be termed aggressive hostility - are all quite low in the ACA's environment. Isolated and inconsequential elements aside, the level of risk is negligible, the environment offering abundant opportunities for development (the whole *raison d'être* for ACAP), and in coping with what Chapple refers to as "the envy factor", the KMTNC has effectively to resort to some degree of manipulation. The few sources from which the Trust experiences a measure of hostility are hardly crucial to the organisation's objectives, so its environment overall may be deemed benign.

TABLE 6.5 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HOSTILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.6	20.2
Ngorongoro Conservation Area Authority	13.6	19.9
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**12.1**	**14.6**
Peak National Park Authority	14.7	21.7
Pinelands Commission	12.0	20.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	13.5	23.8
Over All Six Organisations	13.0	20.8

Source: Survey Data

Technological Complexity

As recorded in Table 6.6, the scores on technological complexity are the lowest of all the organisations studied in this work, borne out by the fact that the decision information required by the KMTNC in its management of the ACA lacks technical sophistication. However this does not eliminate the need to ensure that technology appropriate to, and adapted to the environment locally is provided, as the requirements differ throughout the three regions of the ACA, *and* within each region. For instance, energy can be generated by fuel wood and back burning boilers in Annapurna itself, but not in Mustang where perhaps solar energy is more appropriate (KMTNC, undated[b]). As indicated under

TABLE 6.6 COMPARISON OF DESCRIPTIVE STATISTICS
- EXTERNAL ENVIRONMENT - TECHNOLOGICAL COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.8	19.1
Ngorongoro Conservation Area Authority	4.9	22.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**4.0**	**20.4**
Peak National Park Authority	5.3	21.1
Pinelands Commission	4.7	21.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.6	26.0
Over All Six Organisations	4.7	21.3

Source: Survey Data

turbulence, there have been notable advances in technology at the level of micro-hydroelectric generation, and basic technological improvements within primary industries such as agriculture and forestry. In addition to the need for compatibility with the technical requirements characteristic of particular areas, all technological decisions within the ACAP need to take into account the ultimate goal of self-sufficiency, and accordingly keep the level of sophistication in line with the needs of each area.

Restrictiveness

Again, the scores for restrictiveness are the lowest of all six organisations, as noted in Table 6.7, confirming that there are no significant legal, political, or economic constraints on the operation of the King Mahendra Trust for Nature Conservation, and in fact KMTNC is unique in some respects, given the privileged position which it enjoys *vis-à-vis* other agencies. Whilst the unique regulatory status of the KMTNC in relation to the Annapurna Conservation Area Project (all three regions) affords the Trust a fairly constraint-free arrangement, success nevertheless depends on motivating and involving *all* the participating groups in *all* the local communities. If any one group, however small, thinks that it is excluded in some way, then there are social constraints on success.

TABLE 6.7 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - RESTRICTIVENESS

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.2	29.3
Ngorongoro Conservation Area Authority	4.6	27.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**3.7**	**45.9**
Peak National Park Authority	4.9	25.0
Pinelands Commission	4.1	35.3
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.7	32.9
Over All Six Organisations	4.4	31.8

Source: Survey Data

ASSESSMENT OF VARIABLES IN THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

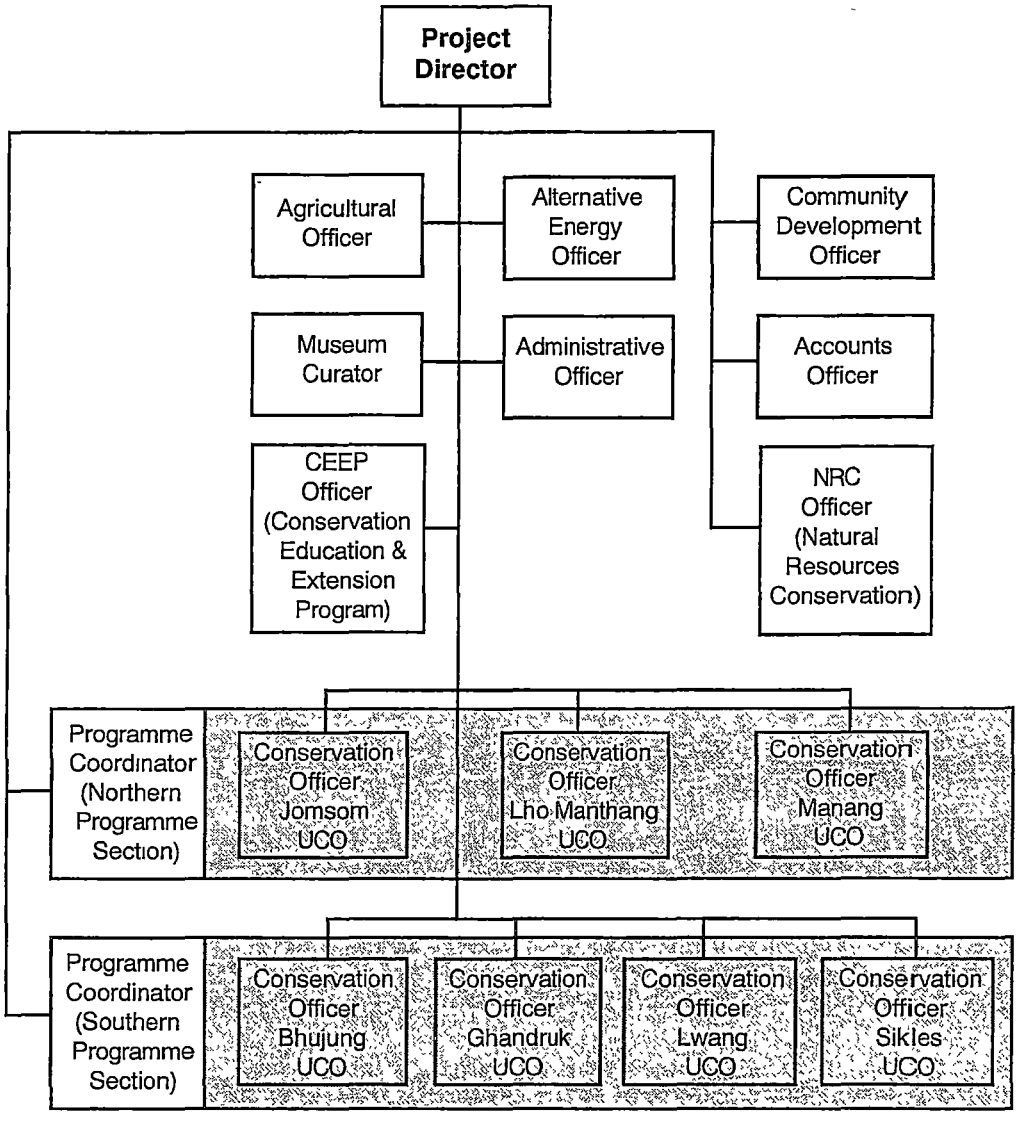
As with the assessment of environmental variables, significant portions of the assessment here rely upon information provided by respondents within the KMTNC and outside observers in their additional comments on questionnaire items and in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited. Any consideration of these core dimensions and allied factors must be placed in the context of the organisational structure itself, and accordingly Figure 6.2 comprises a chart of the main structural elements of the ACAP, to serve as background against which to project the discussion of each dimension and factor.

Delegation

As an NGO, the KMTNC evinces a somewhat more positive approach to delegation compared with many Nepalese governmental agencies. This is in line with the above average scores recorded for this variable shown in Table 6.8. In general, not only is the *degree* of delegation significantly

greater than in the Ministries and departments, but the *type* of decision delegated also varies considerably.

FIGURE 6.2 ORGANISATION CHART OF THE ANNAPURNA CONSERVATION AREA PROJECT
(KING MAHENDRA TRUST FOR NATURE CONSERVATION)
(as at February 2001)



All positions except those in UCOs are based at the Directorate Office in Pokhara

UCO = Unit Conservation Office

Source: Bajracharya, S.B., 2001, personal communication.

Amongst the key classes of decision authority which the King Mahendra Trust has delegated to the ACAP Director in relation to the management of the ACA are the development of new initiatives and services, marketing and public relations tactics for new activities, changes in the marketing and public relations tactics for existing activities, the selection and dismissal of senior personnel and, within certain limits, negotiating

with staff or their unions about pay and conditions. During their periods of office, each of the ACAP Directors has delegated decision authority consistent with the responsibilities of particular officers.

TABLE 6.8 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DELEGATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	13.5	30.1
Ngorongoro Conservation Area Authority	11.2	23.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**15.4**	**24.2**
Peak National Park Authority	11.4	25.7
Pinelands Commission	17.8	31.0
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	15.7	37.8
Over All Six Organisations	14.4	34.0

Source: Survey Data

Sophistication of Control and Information System

The degree of sophistication in the control and information system which operates within the ACAP lies above the third quartile, that is, toward the advanced end of the spectrum which was proposed in Chapter 3. It manifests as a relatively refined system which exhibits a level of technological advancement that is consistent with the needs of ACAP. Table 6.9 summarises this finding. The system incorporates the comprehensive information needed for ACAP's strategic planning, and through links with the seven regional Unit Conservation Offices, also facilitates accurate and timely monitoring of activities internal and external to ACAP. Given the tolerably high level of sophistication in the ACAP control and information system, the theoretical expectation of an organisational structure low in complexity, formalisation, and centralisation was borne out by the actual ratings on these three variables. The evidence supports the contention that the ACAP's control and information system does indeed help to reduce uncertainty for decision makers, and is appropriate to ACAP's environment.

TABLE 6.9 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - SOPHISTICATION OF CONTROL AND INFORMATION SYSTEM

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	44.8	14.9
Ngorongoro Conservation Area Authority	45.9	17.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**44.7**	**13.9**
Peak National Park Authority	45.6	17.1
Pinelands Commission	47.1	8.9
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	47.1	10.9
Over All Six Organisations	45.9	13.3

Source: Survey Data

Complexity

Previous reference has been made to programmes which are area specific - essentially the "Programme Priorities" identified in Figure 6.3 which provide a guide to the main thrusts of the KMTNC's work in the ACA, and in so doing, indicate the differentiation which exists within the organisation - its relative complexity.

More specifically, when read in conjunction with the organisation chart depicted in Figure 6.2, the community and organisational context in Figure 6.3 offers hints of all three aspects of the ACAP's complexity: there is clearly visible evidence of minimal specialisation and departmentation - denoting a low level of horizontal differentiation, very few levels in the hierarchy - indicative of little vertical differentiation, and with Unit Conservation Offices dispersed geographically from 15 kilometres to 85 kilometres (an average of 36 kilometres) direct from Pokhara Headquarters - a relatively low level of spatial differentiation. This level

FIGURE 6.3 THE ANNAPURNA CONSERVATION AREA PROJECT COMMUNITY AND ORGANISATIONAL CONTEXT

	Northern Programme			Southern Programme			
Unit Conservation Offices	Lho Manthang	Jomsom	Manang	Ghandruk	Lwang	Bhujung	Sikles
Village Development Committees	7	9	12	5	7	8	7
Conservation Area Management Committees	2	8	6	4	5	6	3
Sub-Conservation Area Management Committees	28	21	5	18	26	10	14
Programme Priorities	Managing controlled tourism on a sustainable basis Promoting heritage conservation Alternative energy Resource allocation Community development	Integrated tourism management Agro-pastoralism		Community development	Poverty alleviation Integrated agriculture & livestock development		Agro-forestry

is, of course, increased where land travel is necessary, as well as when travel is necessary to KMTNC's Headquarters in Kathmandu, some additional 200 kilometres from Pokhara. These conclusions are substantiated by the ACAP scores shown in Table 6.10, which are the lowest of all the organisations examined here.

TABLE 6.10 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	19.4	19.0
Ngorongoro Conservation Area Authority	20.4	17.6
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**18.4**	**14.0**
Peak National Park Authority	20.9	19.7
Pinelands Commission	19.8	17.1
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	20.2	14.7
Over All Six Organisations	19.8	16.7

Source: Survey Data

Centralisation

There was almost universal acknowledgment amongst Respondents that Nepalese public administration adheres fairly closely to the principles inherent in a Weberian bureaucracy, a view that is corroborated by other sources, but only marginally by the scores as summarised in Table 6.11, which are slightly below the mean for the six organisations. Accordingly

TABLE 6.11 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - CENTRALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	36.6	15.2
Ngorongoro Conservation Area Authority	40.1	11.1
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**36.0**	**15.9**
Peak National Park Authority	40.6	9.7
Pinelands Commission	35.1	14.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	36.2	13.4
Over All Six Organisations	37.2	14.0

Source: Survey Data

it is of interest to note that Weber's bureaucratic theory assumed that there is one major structure of authority, and that this is directly related to the primary goal activity of an organisation. This line structure may be very complex and bifurcated, but always has a single centre of authority where final decisions are made - the centralisation concept which forms one of the key tenets of bureaucracy.

In the KMTNC's management of the ACAP, the primacy effect to which Chapple alluded earlier partially insulates the Trust from the forces which otherwise perpetuate these bureaucratic attributes. Even so, there was generally agreement amongst Respondents that it is still prone to some of the difficulties which beset INGOs in their dealings with the Nepalese administration. Even allowing for bias on the part of the INGO concerned, the following extracts form a telling indictment of the administration generally:

> The government employees are generally very helpful, however, they have to work within the framework of a rigid and outdated bureaucratic system. Furthermore, the system does not allow any deviation from the adopted rules regardless of what the circumstances may be.
>
> INGOs such as ours can only conduct business through the (Social Welfare) Council, even if the assistance of another government agency may be needed. For example, if the approval of the Finance Ministry is required, the INGO has to write to the Council, which can conduct business only through its next level of authority, the chain of written communications therefore running to the Ministry of Social Welfare, then to the Finance Ministry. Should the latter require any clarification, even if trivial, it will not contact the INGO directly, but follow the same route back to the original source, with the INGO's response again being channelled through the same route as the original request.
>
> (NSP, 2000)

The basic inference in this sort of criticism is *not only* that Nepalese government agencies exhibit the dysfunctions typically associated with the classical bureaucratic form, *but also* that they eschew the "gang plank" as advocated by Fayol, neglecting to recognise that this does not necessarily violate the scalar principle (Fayol, 1963). It must be said that the few vestigial traces of this sort of centralisation which KMTNC exhibits appear to be largely due to the complexities induced by the need for close cooperation with other official agencies and, at higher organisational levels, the associated handling of what Chapple referred to earlier as the envy factor. But these are necessary peccadillos. Overall, the manner in which the KMTNC has structured its operations in managing the ACAP shows a degree of decentralisation which is quite atypical of Nepalese government agencies. As noted under *delegation,* both the *degree* and *type* of delegation differ between Government agencies and the KMTNC, with the latter's largely geographic divisionalisation facilitating rapid responses to new information, as well as providing more detailed input into decisions.

Formalisation

As indicated in Chapter 2, the Hage and Aiken stance on formalisation adopted here takes into account both the written *and* unwritten aspects of job standardisation. It is of interest to note that internal and external Respondents who have particular familiarity with the KMTNC gave

identical ratings on the written aspects, but differed markedly on the unwritten aspects of formalisation, polarising on the degree of freedom which staff enjoy in their decision making. These differences almost certainly reflect the disparate management styles which have characterised ACAP management since 1986, styles which themselves echo the manner in which the Project has evolved.

TABLE 6.12 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - FORMALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	30.6	7.7
Ngorongoro Conservation Area Authority	30.9	9.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**30.9**	**7.1**
Peak National Park Authority	31.0	9.7
Pinelands Commission	29.8	10.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.2	10.7
Over All Six Organisations	30.5	8.9

Source: Survey Data

Staffed largely by professionals, a fairly low level of formalisation might be legitimately expected in ACAP. The quantitative data summarised in Table 6.12 suggest this to be the case, but not to the degree that might have been anticipated. The Conservation Officers, for example, *do* enjoy significant levels of freedom commensurate with the varied priorities in their regions, but there is still a need to adhere to policies in line with the objectives of the relevant Programme Section and of the Project overall. Additionally, the jobs of administrative and financial officers tend to be as programmed as their counterparts in other types of organisation.

Environmental Agility

Within KMT, consciousness of, and sensitivity to events occurring in the external environment is generally at a high level. When ACAP started, there were virtually no other organisations, except government departments, working in the area. There has always been good cooperation *on the ground* with government departments (*e.g.*, forestry,

education), the "envy factor" usually coming into play at higher levels. The KMT maintains close contact with the various NGOs and INGOs which touch the Annapurna region in the course of their work in Nepal, and many new, often academically based schemes which emerge are grounded at least in part in the ACA. The KMT generally maintains excellent awareness of technological developments, mainly because so many reports of such developments relevant to rural and mountain communities come flooding into the KMT offices. The difficulties are knowing what to do with this information, and how to raise new funds. Being entirely Nepali staffed and with all but three Trustees living in Nepal, the Trust is very well aware of the political, legal, and social currents in the country.

Insofar as dealing with changes in its external environment in relation to the ACA is concerned, the KMT maintains awareness of new ideas and possibilities, of which three "current" sets can be distinguished: *firstly,* regional cooperation in South Asia (although this is not as relevant to ACAP as it is to other KMT programmes such as tiger and rhinoceros conservation), *secondly,* the moves by the World Bank and the UN Development Programme for Sustainable Human Development to set up an endowment fund for conservation in Nepal - a scheme with considerable promise but which makes slow progress with the US Government in Washington (by comparison such a fund was set up in Bhutan in 1992 and is now very strong), and *thirdly,* joint schemes with the World Wildlife Fund and the Kadoorie Foundation which already exist, as do others with such organisations as the American Himalayan Foundation and the Zoological Society of London.

In relation to KMT's responses to demands from the external environment in relation to its management of the ACA, the Trust's reactions vary according to different approaches being taken to particular problems and to different overall circumstances. There is now a strategic plan which does set priorities, which almost by definition exclude some worthwhile activities because the Trust cannot do everything. There is a feeling that more ought to be taken on in order to save the whole environment of Nepal. This is often discussed and new schemes are taken on usually as the result of an individual's or country's enthusiasm and funding, as for example externally generated ideas about indigenous pheasants and about snow leopards which are currently being examined. In adapting to

changes in the external environment in relation to its management of the ACA, the Trust is reasonably flexible in outlook but somewhat constrained by existing programmes, projects, and schemes and the structure they have generated. KMT *does* transfer, re-train and take on more staff but it is not very easy to do. Overall, the quantitative data summarised in Table 6.13 support these findings, with the KMT scores falling almost precisely on the mean of all the organisations examined.

TABLE 6.13 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - ENVIRONMENTAL AGILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	32.9	9.9
Ngorongoro Conservation Area Authority	33.4	9.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**31.3**	**11.0**
Peak National Park Authority	31.1	14.4
Pinelands Commission	29.8	17.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.8	14.6
Over All Six Organisations	31.5	13.0

Source: Survey Data

Infrastructure

Given the integrated nature of the Project, and notwithstanding the disparate regional priorities, internal boundaries between organisational units do not appear to interfere with solving problems which overlap areas of responsibilities. In fact, where programme priorities are common to different regions - as in the cases of integrated tourism management and agro-pastoralism in Jomsom, Manang, and Ghandruk - there is positive mutual support between the Unit Conservation Offices concerned as well as between the UCOs and the appropriate specialist positions in the Directorate Office. This is also indicative of the extent to which core and support work are integrated in practice, with overall support emanating from the quantitative data summarised in Table 6.14. In other situations where there is no overlap between programme priorities, each UCO carries responsibility for overall tasks within their

bailiwick. The opinion was expressed that the secondment of staff to the ACAP from the Nepalese Ministry of Forests and Soil Conservation, and from the subsidiary Department of National Parks and Wildlife Conservation serves to catalyse some levels of interaction between officers within the ACAP itself, thereby increasing the Project's capacity to engage in, and coordinate disparate activities - the essence of infrastructure.

TABLE 6.14 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - INFRASTRUCTURE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	20.4	12.5
Ngorongoro Conservation Area Authority	20.9	12.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area	**18.6**	**10.2**
Peak National Park Authority	20.0	5.8
Pinelands Commission	18.0	14.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	19.5	16.9
Over All Six Organisations	19.5	13.3

Source: Survey Data

SUMMARY

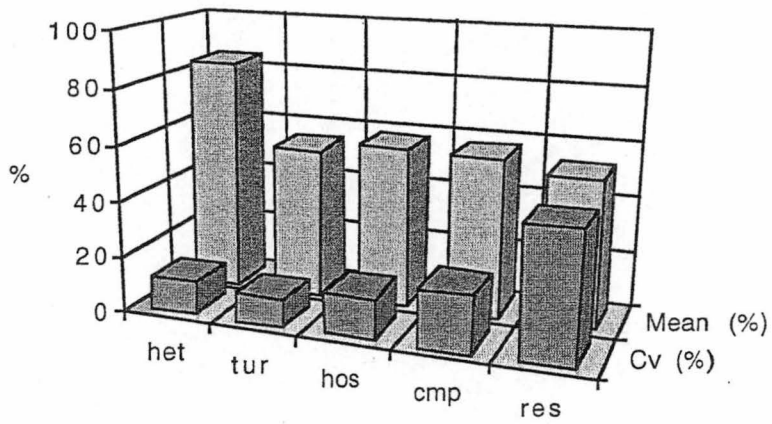
EXTERNAL ENVIRONMENT

The statistical measures for the five aspects of the environment of the KMTNC are summarised graphically in Figure 6.4, providing an overview of the Trust's environment in its management of the Annapurna Conservation Area Project. The actual means have been modified to percentages to create a comprehensive picture of this environment, allowing the relative potency of each environmental variable to be judged.

There are three distinct aspects to the heterogeneity of this environment: cultural homogeneity, an heterogenous organisational milieu, and programme priorities reflecting the particular needs of the various areas

FIGURE 6.4 KING MAHENDRA TRUST FOR NATURE CONSERVATION AS MANAGER OF THE ANNAPURNA CONSERVATION AREA PROJECT

EXTERNAL ENVIRONMENT - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

het	Heterogeneity	tur	Turbulence	hos	Hostility
cmp	Technological Complexity			res	Restrictiveness

of the ACA - a framework which is oriented toward the ultimate independent functioning of the ACA. The nett effect of these three aspects is reflected in the scores on heterogeneity which are slightly below the mean of all the organisations examined here. Insofar as turbulence is concerned, there is very little conflict between ACAP and the local people, most of the work receiving at least tacit support within each community. The Trust's strategic planning together with its flexibility in dealing with unanticipated events moderates further the effects of the low levels of unpredictability in its environment. In the same vein, hostility is of a very low order, because village committees determine how revenue is to be spent which creates a feeling of ownership. By contrast, in Mustang, the Central Government retains most of the revenue from visitation, and the Trust is held culpable. The statutory authority accorded the Trust confers a primacy in relation to other Government departments with environmental responsibility which is theoretically desirable. The practical ramifications are that close cooperation is required with all official agencies, together with tact in handling the envy factor. The environment of the KMTNC in managing the ACAP may be deemed benign. With technological complexity, as well as the need for compatibility with the technical requirements which characterise particular areas, all technological decisions need to take into account the ultimate goal of self-sufficiency, and accordingly keep the level of sophistication in line with the needs of the inhabitants of each area.

Restrictiveness is very low, with no significant legal, political, or economic constraints on the KMTNC which has a privileged position *vis-à-vis* other agencies. Success nevertheless depends on motivating and involving *all* the participating groups in *all* the local communities.

CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

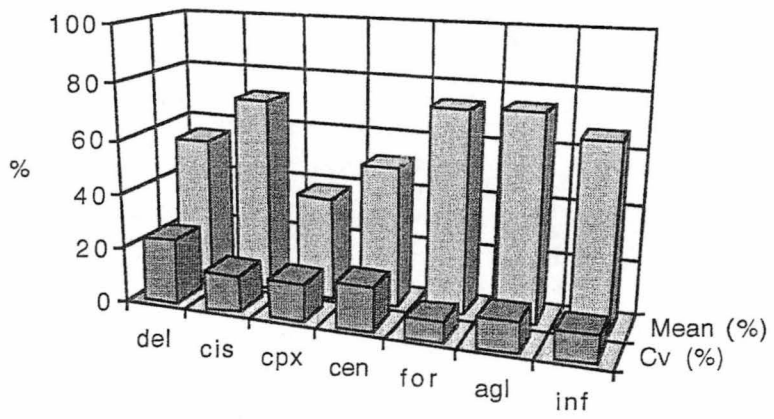
Figure 6.5 summarises in graphical format the relevant statistical measures with the means expressed as percentages. This creates an overview of the core dimensions of the Trust's organisation together with ancillary structural factors.

In addition to the KMTNC displaying the third highest mean score for delegation and substantially higher than the overall mean, the Trust also exhibits an advanced rating in absolute terms. Taking a tighter focus, not only is the *degree* of delegation in the KMTNC significantly greater than in the Nepalese Ministries and departments, but the *type* of decision delegated also varies considerably.

The Trust's control and information system manifests as relatively refined and exhibiting a level of technological advancement consistent with the needs of the Project. The system incorporates the comprehensive

FIGURE 6.5 KING MAHENDRA TRUST FOR NATURE CONSERVATION AS MANAGER OF THE ANNAPURNA CONSERVATION AREA PROJECT

CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

del	Delegation	cis	Sophistication of Control & Information System		
cpx	Complexity	cen	Centralisation	for	Formalisation
agl	Environmental Agility			inf	Infrastructure

information needed for strategic planning, and through links with the seven regional Unit Conservation Offices, facilitates accurate and timely monitoring of activities internal and external to the ACAP. The three aspects of the ACAP's complexity indicate a low level of horizontal differentiation, little vertical differentiation, and a relatively low level of spatial differentiation, the latter requiring adjustment to take into account the difficulties of travel. In relation to centralisation, the primacy effect partially insulates the Trust from the forces which otherwise perpetuate bureaucratic characteristics, however it is still prone to some of the difficulties which beset INGOs in their dealings with the Nepalese administration. The few latent traces of centralisation which KMTNC exhibits may be due to the complexities brought about by the need for close cooperation with other official agencies and, at higher organisational levels, the associated handling of the envy factor. The various styles which have characterised ACAP management have placed different emphases on formalisation, however the current situation is one in which a fairly low level of formalisation is induced by the high proportion of professionals, even though there remains a need to adhere to policies in line with the objectives of the relevant Programme Section and of the Project overall. Environmental agility is facilitated by most Trustees being based in Nepal and by all staff being Nepali, facilitating awareness of the political, legal, and social currents in the country, and maintaining awareness of new ideas and possibilities: regional cooperation, moves by various INGOs to set up an endowment fund for conservation in Nepal, and joint schemes with other INGOs. Insofar as infrastructure is concerned, internal boundaries between organisational units do not appear to interfere with solving problems which overlap areas of responsibilities. Where programmes overlap regions, positive mutual support exists between Unit Conservation Offices and between UCOs and specialist positions in the Directorate Office, indicating that core and support work are integrated in practice.

THE CASE STUDIES
CHAPTER 7

THE PEAK DISTRICT NATIONAL PARK UNITED KINGDOM

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PEAK DISTRICT NATIONAL PARK UNITED KINGDOM

THE NATURAL AND SOCIO-CULTURAL ENVIRONMENTS

Situated in the Northern Midlands of England on the southern tip of the Pennine Range, the Peak District National Park[1] consists of 1438 square kilometres of uplands, surrounded by more fertile lowlands and dense urban development. The Park covers parts of Derbyshire, Staffordshire, Cheshire, Greater Manchester, West Yorkshire, and South Yorkshire, and is surrounded by some of the largest industrial regions in the United Kingdom. Figure 7.1 shows the Peak National Park and its location. The area as a whole ranges in altitude from 104 metres to 636 metres, with average annual rainfall from 900 mm to 1500 mm, such variations counterpointing the heterogeneous character of the Peak District which is naturally split into two distinct zones, known as The Dark Peak and The White Peak. It is perhaps worthwhile clarifying the term "Peak" as it applies here: the derivation is from the old English "peac", meaning knoll or hill, and in 924 A.D. the area was known as "peacland" - there is no etymological connotation of "peak" in the sense of a single, sharp summit - nor is there one in reality.

The Dark Peak is a landscape of contrast, ranging from the moorland plateaux and cliff-like edges of sandstone to the broad flat valleys lying on shale. The Dark Peak is usually equated with the high, largely peat-covered moorlands to the north which lie at an altitude of more than 300 metres, however geographically it also includes the moorland running down the western and eastern extremes of the region. The soil in the Dark Peak is very acid, the predominant peat supporting very few plant species, vegetation being mainly confined to cotton grass, bilberry, heather, and bracken. Combined with the harsh climate, the Dark Peak is inhospitable to farming, although it does support curlews, golden plovers, foxes, and mountain hares in addition to sheep and grouse. Human management of these latter species run counter to woodland regeneration - few areas of ancient oak woodland still survive.

1 This is the formal and legal title. Henceforth this will be shortened to Peak National Park, and similar abbreviation will be made to the title of the managing agency.

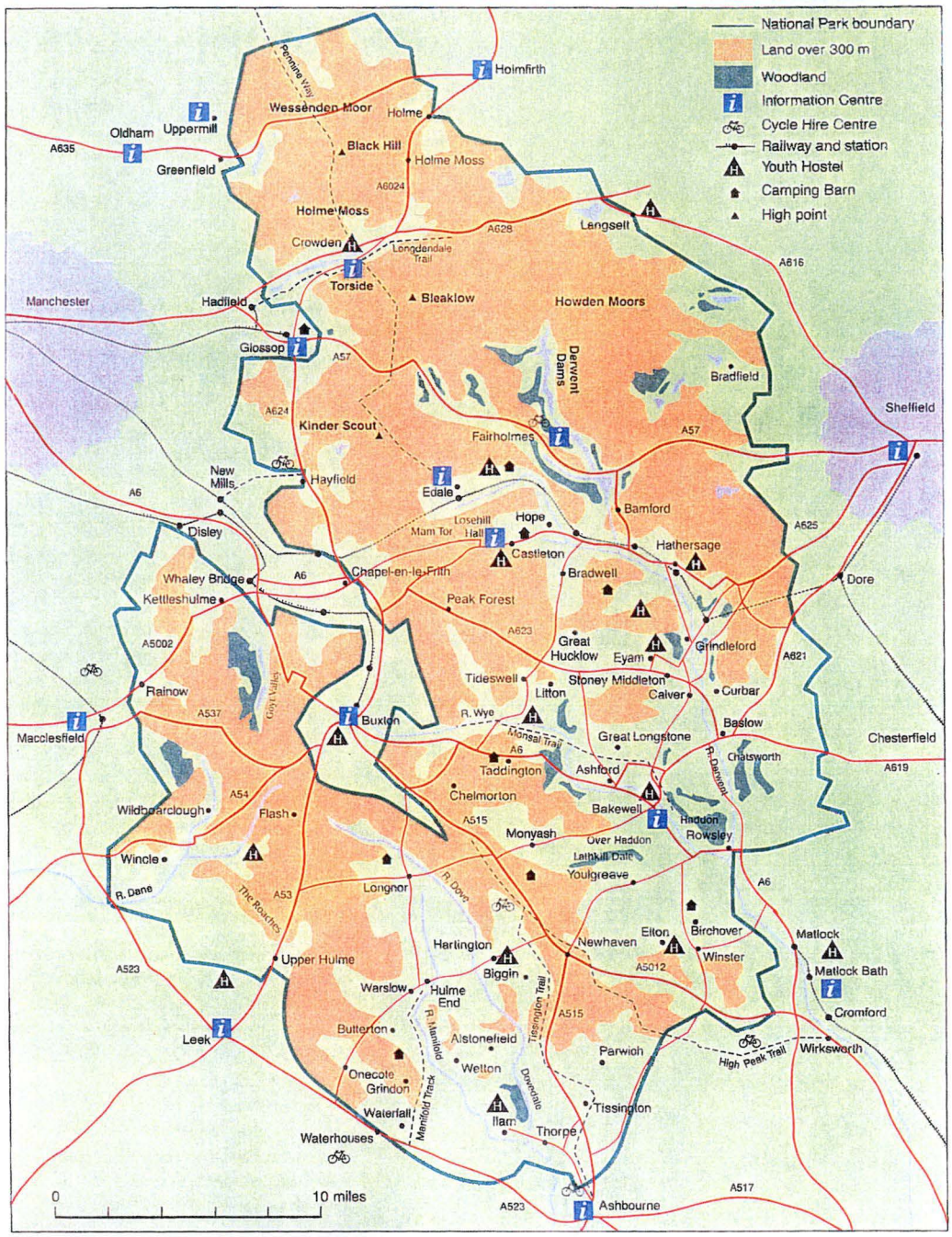


FIGURE 7.1
PEAK NATIONAL PARK
(Source: Smith, 2000)

The White Peak derives its name from the white limestone which dominates this zone, the countryside being softer and more fertile than the Dark Peak. Nevertheless, whilst much of the White Peak is given over to farming, very little is arable land. The flora and fauna of the White Peak show much greater variation than those of the Dark Peak, being much closer in habitat to the more southerly parts of England.

Current land use in the Peak National Park extends over farming, forestry, water supply, and mineral extraction. Of the 2,700 farms in the Park, most are less than 40 hectares, roughly 60 per cent are run on a part-time basis, and some are owned by the National Trust and the Water Companies - *i.e.,* North West Water, Severn Trent Water, and Yorkshire Water. In terms of forestry, the Peak National Park Authority manages 480 hectares of woodland, whilst the Water Companies and Forest Enterprise (the Government timber-growing body), own large areas of coniferous woodland, mostly in water catchment areas. A significant proportion of the water supply for the population centres surrounding the Peak National Park is provided from reservoirs within the Park. There are 55 dammed reservoirs of over two hectares surface which collectively supply 450,000 kilolitres of water per day, although overall, reservoirs in the Park occupy a surface area of over 1,200 hectares. The lead mining which ceased in the late Nineteenth Century left a legacy of archaeological sites and a latter-day industry - the current reworking of the fluorspar which the lead miners discarded as waste. Limestone quarrying is now the major extractive industry, although since early 1998 this has been affected by ongoing disputes largely revolving around planning permission. These disputes have involved judicial review by the High Court, a related test case before the Law Lords, and a public inquiry by a Government Inspector. The Peak National Park Authority has, overall, been vindicated in its efforts to protect the National Park.

English Nature (the United Kingdom Government's advisor on nature conservation) has designated some 30 per cent of the Peak National Park as Sites of Special Scientific Interest (SSSIs) based on the Sites' importance for flora, fauna, geology, or geomorphology. English Nature seeks agreements with landowners for SSSIs to be managed so as to conserve their special interests whilst continuing traditional land uses. Nature conservation was one of the main aims of the Ministry of Agriculture in designating the North Peak and South-West Peak as

"Environmentally Sensitive Areas". Farmers within these regions are encouraged by grants to manage their land for conservation. Outside of the Environmentally Sensitive Areas, the Ministry of Agriculture, Fisheries and Food and the National Park Authority promote the Countryside Stewardship Scheme which encourages farmers and other land owners to conserve ecologically important land.

The villages and hamlets spread throughout the Park house a population of 38,000, the occupational profile of which reflects the face of the Park - farmers, quarry workers, and employees in light industries such as electronics, although the majority are employed in the service industries, particularly tourism. There is also some commuting exchange with areas outside the Park. The key function of preserving the built environment of the Park through, for example, village conservation areas aimed at safeguarding their historical, architectural, and arboreal value is carried out by the Park Authority in conjunction with English Heritage which provides specialist advice to such agencies and advises the U.K. Government on England's built heritage.

EVOLUTION OF THE PRESENT FRAMEWORK

Pressure to protect the British national heritage began in the late nineteenth century, ultimately being channelled through organisations such as the National Trust, the Royal Society for the Protection of Birds, and the Council for the Preservation of Rural England. With few natural, uninhabited areas remaining after clearance, settlement, cultivation, enclosure, and the Industrial Revolution, the British approach to National Parks departed from that adopted in less intensively developed countries.

From the late Nineteenth Century, the movement for national parks became closely linked with the pressures for more public access to mountains, although related Parliamentary bills introduced in 1908, 1924, 1926, and 1927 were withdrawn or foundered - lost in the committee stages or baulked by the congested state of business in the House. On a more positive note, the aftermath of the mass trespass on Kinder Scout in 1932 generated considerable public support for legislative underpinning for the freedom of access concept. Meanwhile,

a number of government reports came and went, all recommending some form of national park, *Planning Acts* of 1925 and 1932 provided the cause of rural preservation with some minor consolation, and by 1935, the general increase in public attitudes toward the need to conserve areas of national importance culminated in the setting up of a Standing Committee on National Parks.

The onset of the Second World War impeded progress somewhat, although in the 1940s, despite hostilities, several government reports highlighted a need for National Parks as recreational bases for urban dwellers. The first of these was the Scott Committee on Land Utilisation in Rural Areas established in 1942, which strongly backed the need to create a network of nature reserves and national parks. Post-War reconstruction saw the Dower Report of 1945 focus on how the park concept might apply in England and Wales, a report which furthered the findings of the Scott Committee and made some farsighted proposals which formed the basis of nearly everything that has followed in Britain.

In the same year as the Dower Report, a new Committee was set up under Sir Arthur Hobhouse to consider the detailed application of the Dower recommendations. Reporting in 1947, the Hobhouse Committee proposed the designation of National Parks in which most land would be in private ownership, where development would be limited by public control, and where recreation would be provided by private and public investment, principles which were enshrined in the *National Parks and Access to the Countryside Act* of 1949. Neither the Dower nor the Hobhouse Reports considered it essential that all, or even a great part, of the land in a park should be taken into public ownership, although acquisition of land might be necessary in some places for reclamation or improvement or for nature reserves. The Hobhouse Report coincided with the introduction of new planning measures contained in the *Town and Country Planning Act* 1947, and both had an influence on the eventual shape of the 1949 Act. This latter statute set up the National Parks Commission as recommended in the Hobhouse Report, but without the powers proposed in that Report - essentially a compromise solution and criticised as such at the time. The Commission's responsibilities were confined to designating national parks and advising on their administration, responsibilities which were continued by the Countryside Commission in 1968 when it assumed the functions of the

National Parks Commission, although the new Commission took on a number of new tasks, including the setting up, in conjunction with local authorities and others, of a network of country parks.

The Peak District was designated as a National Park in 1950 and began operating as the first British National Park in the following year. For several years the Peak District and the Lake District were run by independent authorities, a National Park Authority being established to administer the affairs of each of the National Parks following the passing of the *Environment Act* 1995. This Act introduced the redefined purposes of National Park designation together with a new constitutional basis of administration and consolidation of the powers into a common framework in England and Wales. Subordinate legislation (the *National Parks [England] Order* 1996) set up the new English National Park Authorities with effect from October 1996 for a six month period of preparation for operational responsibility after which the National Park Boards and Committees in England ceased to operate.

As a concluding observation, parks in the United Kingdom generally seem to be very well networked and in many respects share a common, recognisable culture and view of the world. There is also a significant exchange of personnel between Parks administrators. Where there are significant differences, this is usually in responses to local political factors and geographical differences.

PRIMARY DATA ANALYSIS

Prior to analysing the information obtained by questionnaire, the levels of correlation for this primary data were established:

- amongst respondents from within the Peak National Park Authority (PNPA);
- amongst outside observers;
- between PNPA respondents and outside observers.

After validation, the primary data was summarised in the form of key descriptive statistics, before the analysis proceeded to assessments of variables in the PNPA's external environment and in the core dimensions and allied factors of the Authority's organisational structure.

VALIDATION OF SOURCE DATA

As shown in Table 7.1, data from respondents within the PNPA yielded a coefficient of multiple correlation of 0.993 (significant at the 0.001 level), and a coefficient of multiple determination of 0.986, which indicated a very high level of correlation amongst respondents. This was, in fact, the strongest correlation of all amongst respondents within agencies. Correlation between the responses of observers outside PNPA exhibit a coefficient of multiple correlation of 0.992 significant at the 0.001 level, this high correlation being confirmed by the multiple of coefficient of determination of 0.984 (see Table 7.1).

TABLE 7.1 PEAK NATIONAL PARK AUTHORITY DATA CORRELATIONS AMONGST AND BETWEEN AGENCY RESPONDENTS AND OUTSIDE OBSERVERS

Coefficient Type	Correlation amongst Agency Respondents *N= 4*	Correlation amongst Outside Observers *N=3*	Correlation between Agency and Outside Respondents
Coefficients of Multiple Correlation *[R]*	0.993	0.992	0.930
Coefficients of Multiple Determination *[R^2]*	0.986	0.984	0.865

All correlations significant at the 0.001 level *Source: Survey Data*

Again, this represented the strongest correlation amongst outside observers of any agency. The arithmetic means of raw data from respondents within PNPA were compared with the mean responses from the outside observers. From Table 7.1 it can be seen that the Peak National Park exhibited a very high (in fact the highest) coefficient of multiple correlation, 0.930 at a significance level of 0.001, with a coefficient of multiple determination of 0.865.

DESCRIPTIVE STATISTICS

To summarise the Peak National Park data, selected descriptive statistics for responses on both the external environment and the core dimensions and allied factors of organisational structure are set out in Table 7.2. The assessments of the external environment and those of the core dimensions and allied factors of organisational structure demonstrated clear differences, the assessments of the external environment of the PNPA typically exhibiting very high variability, whereas the assessments

of the core dimensions and allied factors of organisational structure exhibited low dispersions. Although all assessments of elements of the external environment showed some dispersion, the lowest relative dispersions were exhibited by a bracket of assessments: *heterogeneity* (the coefficient of variation for which also demonstrated the equal lowest dispersion over all agencies) and *turbulence.* From this pair, there was a considerable leap to the remaining three variables, with *technological complexity, hostility,* and *restrictiveness* all showing dispersion of some three times that of *heterogeneity.*

TABLE 7.2 PEAK NATIONAL PARK
SELECTED DESCRIPTIVE STATISTICS
- EXTERNAL ENVIRONMENT
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

	Arithmetic Mean [1]	*Coefficient of Variation (%)*
External Environment		
Heterogeneity	6.4	8.3
Turbulence	12.1	14.6
Hostility	14.7	21.7
Technological Complexity	5.3	21.1
Restrictiveness	4.9	25.0
Core Dimensions and Allied Factors of Organisational Structure		
Delegation	11.4	25.7
Sophistication of Control and Information System	45.6	17.1
Complexity	20.9	19.7
Centralisation	40.6	9.7
Formalisation	31.0	9.7
Environmental Agility	31.1	14.4
Infrastructure	20.0	5.8

1 Based on a confidence level of 95 per cent.

Source: Survey Data

Assessments within the core dimensions and allied factors of organisational structure manifested a lower level of variability than the external environment. The assessments fell into three rough groups: the lowest dispersions comprising *infrastructure, centralisation,* and *formalisation* (the coefficients of variation of which were all below 10 per cent), the mid-range including *environmental agility, sophistication of control and information systems,* and *complexity,* from whence there was a considerable leap to *delegation* with a relative dispersion more than four times greater than *infrastructure.*

ASSESSMENT OF VARIABLES IN THE EXTERNAL ENVIRONMENT

Substantial portions of this assessment derive from information provided by respondents within the PNPA and outside observers in their additional comments on questionnaire items or in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited. For a proper understanding of the external environment of the Peak National Park Authority, each element needs to be viewed against the framework provided by the chart of the principal external relationships (Figure 7.2). The elements themselves are considered below.

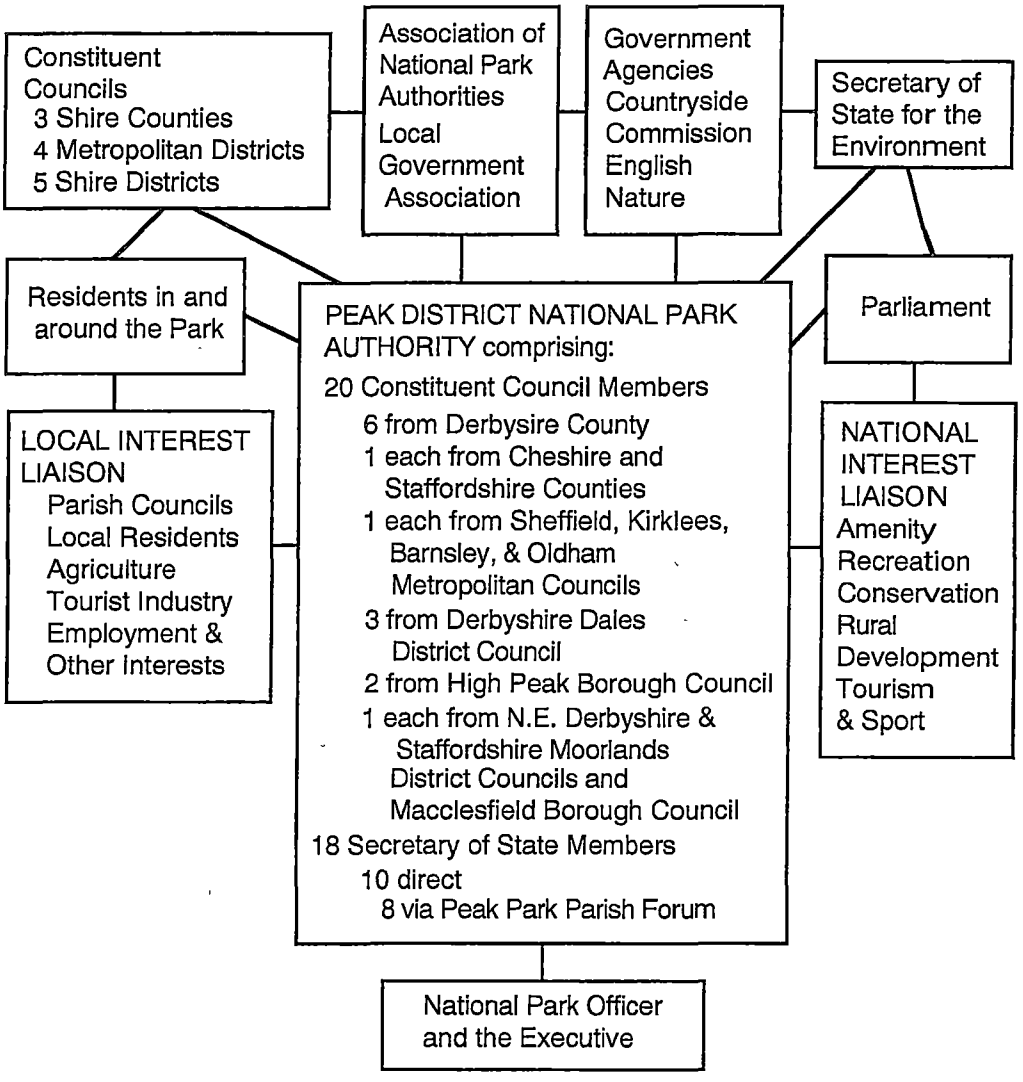
Heterogeneity

As the summary data in Table 7.3 clearly shows, the heterogeneity of the environment of the Peak National Park Authority was rated as very strong in absolute terms, an assessment which was borne out in relative terms, with the environment exhibiting a nett heterogeneity score well above the mean of the agencies examined here. Along with the Pinelands Commission, the PNPA showed the highest heterogeneity rating of all six organisations, a level of heterogeneity which was produced by a combination of factors, prominent amongst which was the varied land use in the Park which, as noted earlier, extends over farming, forestry, water supply, and mineral extraction. Related to these is the fact that the vast majority of the land in the Park is in private ownership, the Park has a resident human population with some 150 villages, and is ringed by large industrial cities which account for much of the Park visitation.

Some sense of the heterogeneity of the Authority's environment may be gauged from the chart of the principal external relationships (Figure 7.2), which includes the most significant of the organisations and other bodies with which the Authority needs to interact. The PNPA's links with these bodies derive from its work in relation to nature conservation management, cultural heritage, land use issues, economic activities (including the various primary industries), socio-economic infrastructure, and recreation and visitor management. Also of importance are the Authority's relations with both the central government of the United

Kingdom and local government, together with key statutory authorities and NGOs.

FIGURE 7.2 PEAK NATIONAL PARK AUTHORITY
CHART OF PRINCIPAL EXTERNAL RELATIONSHIPS



(Source: Peak National Park Authority, 1997)

Turbulence

In absolute terms, the level of turbulence in the environment of the PNPA was quite low, although as summarised in Table 7.4, turbulence exhibited a moderate relative score. Some of the more prominent elements in the Authority's environment which contribute to turbulence include the character of land-use conflicts, the strongest of which is with mineral extraction. There is a degree of recognition on the part of the

TABLE 7.3 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HETEROGENEITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	5.8	13.6
Ngorongoro Conservation Area Authority	5.9	18.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	5.9	11.8
Peak National Park Authority	**6.4**	**8.3**
Pinelands Commission	6.4	8.2
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	6.0	16.7
Over All Six Organisations	6.1	13.1

Source: Survey Data

PNPA of the wider public interest in the area's purer limestone along with rarer minerals not elsewhere available, but proposed extractions to simply meet the demand for aggregate material are usually actively resisted. Changes in agricultural policy stemming from the European Community have produced shifts in emphasis from incentives for increased production to the concept of a joint goal of environmental conservation and production. Within integrated rural development schemes, experiments focus on the mutual support between social, economic, and environmental aspects and the manner in which landowner and resident support is achievable. With the substantial surrounding population, recreation pressures remain a major challenge and these have stimulated a number of innovative approaches.

TABLE 7.4 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TURBULENCE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.2	10.8
Ngorongoro Conservation Area Authority	12.6	12.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	11.4	9.9
Peak National Park Authority	**12.1**	**14.6**
Pinelands Commission	11.2	19.8
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	11.1	19.1
Over All Six Organisations	11.7	15.4

Source: Survey Data

Hostility

In the quantitative terms of Table 7.5, the environment of the PNPA rated the highest of the six organisations on hostility. Even though in absolute terms this was below the third quartile, it seems probable that the ratings - at least from respondents within the Authority - may well have been coloured by two of the more heated disputes over mineral extraction, including the notorious Moss Rake West Quarry controversy - which were current at the time the questionnaires were completed. As noted earlier, the Peak National Park is the classic type of protected landscape in a developed country with sophisticated planning systems. Much of the success of its management is the product of many years of fostering a sense of partnership by enhancing communication and relationships with landowners and residents of the Park and with Park users. The diverse nature of the Park nevertheless inevitably generates periodic but usually highly specific hostilities, amongst the most prominent being that emanating from various quarry and mine operators, whether relating to the re-opening of dormant sites, expansion of permitted minerals, or enlargement of extraction areas. Other instabilities in the PNPA's environment which have at times created hostility include significant increases in tourism which have not consistently been supported by appropriate infrastructure, and these, coupled with overcrowding in summer, have imposed heavy strains on facilities and consequent antagonism. As the planning function does almost universally, the PNPA Planning Committee inevitably attracts a fair measure of hostility from both potential developers and objectors, most of this hostility arising from perceived injustice and/or frustration. Through a range of very diverse programmes, the PNPA endeavours to allay hostility by publicly demonstrating its commitment to protecting landscape, providing for visitors, and serving the well-being of local residents.

Technological Complexity

Information technology in the Authority is sophisticated and covers all aspects of the management of the Park, including research, program delivery, information support, communications, and corporate and library

TABLE 7.5 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HOSTILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.6	20.2
Ngorongoro Conservation Area Authority	13.6	19.9
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	12.1	14.6
Peak National Park Authority	**14.7**	**21.7**
Pinelands Commission	12.0	20.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	13.5	23.8
Over All Six Organisations	13.0	20.8

Source: Survey Data

services. From the scores on technological complexity shown in Table 7.6, the environment of the PNPA falls significantly above the mean of the agencies examined in this work, and is in fact the highest rating of all the organisations. Management decisions in the Authority make optimum use of both technically sophisticated information and technology. The Authority's information technology services team is responsible for providing the computer networks, for advice and support for the use of new technology throughout the Authority, for the provision of all electronic communication facilities, and for crucial liaison with the Ordnance Survey. The PNPA's dedication to technology extends to the provision of public 24-hour electronic information facilities.

TABLE 7.6 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TECHNOLOGICAL COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.8	19.1
Ngorongoro Conservation Area Authority	4.9	22.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	4.0	20.4
Peak National Park Authority	**5.3**	**21.1**
Pinelands Commission	4.7	21.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.6	26.0
Over All Six Organisations	4.7	21.3

Source: Survey Data

Restrictiveness

Substantiating the general impression garnered from other sources, the average rating on restrictiveness here was above the overall mean, and as highlighted in Table 7.7, was in fact the highest of all the organisations examined. Given the concept of restrictiveness adopted in this project, this rating suggests that the operation of the PNPA may well be subject to significant environmental constraints by way of one or more factors of a legal, political or economic character. Based on observations by respondents and other information, it would seem highly probable that these are derived from three main sources: *firstly,* the rather complex interactions between the Authority and its constituent councils, *secondly,* the relationships between the Authority and the central government, and *thirdly,* the dialogues and dealings which are essential with various government agencies and NGOs. A further issue which may have some bearing on restrictiveness is the way in which, despite the PNPA's endeavours to balance its diverse responsibilities, some of its conservation goals may have been accomplished by subordinating development goals through restrictions on quarrying and mining. One outside observer maintained that such restrictions on goal achievement are inescapable in the face of the competing demands which face organisations like the PNPA.

TABLE 7.7 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - RESTRICTIVENESS

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.2	29.3
Ngorongoro Conservation Area Authority	4.6	27.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	3.7	45.9
Peak National Park Authority	**4.9**	**25.0**
Pinelands Commission	4.1	35.3
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.7	32.9
Over All Six Organisations	4.4	31.8

Source: Survey Data

ASSESSMENT OF VARIABLES IN THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

As with the assessment of environmental variables, appreciable portions of the assessment here derive from information provided by respondents within the PNPA and outside observers, in their additional comments on questionnaire items, and in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited. These core dimensions and allied factors need to be understood in the setting of the main structural components of the Peak National Park Authority. Figure 7.3 offers a model of the organisational structure to facilitate discussion of the individual dimensions and factors.

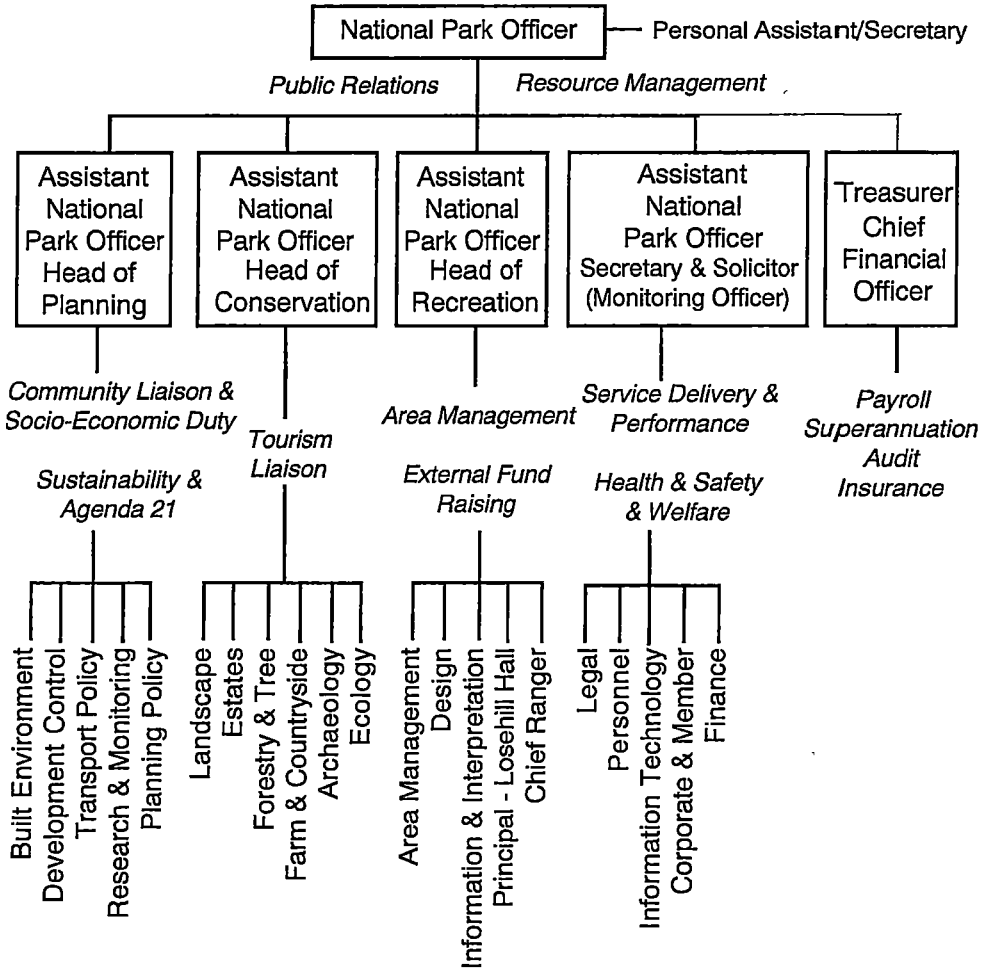
Delegation

As Table 7.8 indicates, in exhibiting a nett score on delegation which fell significantly below the mean of the six organisations, the PNPA showed virtually the same set of scores as the lowest overall - the Ngorongoro Conservation Area Authority. The Members of the Peak District National Park Authority officially constitute "the Authority", and it is this body which is formally responsible for corporate decision making - setting and approving policy, decisions in committee, public relations with the general public, the media, and the Authority's partners, review of operations through committees and individual inquiries, and supervision of delegation to the officers of the Authority. The Authority acts as the local planning authority and produces a Structure Plan and National Park Plan setting out its management policies. The PNPA's administrative structure is the most direct of the protected areas in the United Kingdom in being independent of the structure of local authorities and in having its own staff headed by the National Park Officer, to whom delegation flows in his capacity as the chief executive officer of the PNPA. In turn, the National Park Officer delegates to the four Assistant National Park Officers and the Treasurer as Chief Financial Officer in line with the responsibilities of their individual departments. These officers, in turn, delegate to a level consistent with the responsibilities of particular subordinate officers. Some key decision areas are retained by the Authority itself, including variations in pay and conditions together with discipline and dismissal of senior management. Reserved to the

National Parks Officer are other key decisions such as those involving discipline and dismissal of staff other than senior managers.

FIGURE 7.3 ORGANISATION CHART OF THE PEAK NATIONAL PARK AUTHORITY

(as at May 2000)



italics indicate cross-functional responsibilities

Source: Peak National Park Authority (2001)

Sophistication of Control and Information System

Members of the Authority appeared to be generally satisfied with the control and information system, with few reservations on the quality of the output in terms of what is required at the level of corporate decision. On the whole, respondents on the PNPA staff indicated that the control and information system assists in reducing uncertainty in decision making, an outlook which supports the quantitative assessment that the level of sophistication of the control and information system lies marginally above the mean of the six organisations (see Table 7.9). Outside observers go

TABLE 7.8 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DELEGATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	13.5	30.1
Ngorongoro Conservation Area Authority	11.2	23.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	15.4	24.2
Peak National Park Authority	**11.4**	**25.7**
Pinelands Commission	17.8	31.0
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	15.7	37.8
Over All Six Organisations	14.4	34.0

Source: Survey Data

beyond this in indicating that the Authority's control and information system has a degree of sophistication entirely consistent with the current *and* projected needs of the Authority. An organisational structure of low complexity, formalisation, and centralisation which might be theoretically expected from the PNPA's system's level of sophistication is in fact justified on the basis of the actual ratings on the first two of these variables, although the contribution of centralisation is rather equivocal. It is accordingly reasonable to conclude that the control and information system is appropriate to both external and internal environments.

TABLE 7.9 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - SOPHISTICATION OF CONTROL AND INFORMATION SYSTEM

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	44.8	14.9
Ngorongoro Conservation Area Authority	45.9	17.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	44.7	13.9
Peak National Park Authority	**45.6**	**17.1**
Pinelands Commission	47.1	8.9
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	47.1	10.9
Over All Six Organisations	45.9	13.3

Source: Survey Data

Complexity

Some idea of the level of complexity of the work of the PNPA can be gained from the functional organisational structure as shown in the organisation chart (Figure 7.3). The functions delineate the main areas of the Authority's work in the Peak National Park, and articulate within the complex network depicted in the chart of the Authority's principal external relationships (Figure 7.2). This network includes the most significant of the organisations and other bodies with which the Authority needs to interact. The PNPA's links with these bodies derive from its work in relation to nature conservation management, cultural heritage, land use issues, economic activities (including the various primary industries), socio-economic infrastructure, and recreation and visitor management. Also of importance are the Authority's relations with both the central government of the United Kingdom and local government, together with key statutory authorities and NGOs.

Overall, the complexity of the Authority is considered to be high, with ratings of the PNPA's complexity substantially above the mean of the six organisations under examination. The three aspects of complexity in

TABLE 7.10 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	19.4	19.0
Ngorongoro Conservation Area Authority	20.4	17.6
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.4	14.0
Peak National Park Authority	**20.9**	**19.7**
Pinelands Commission	19.8	17.1
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	20.2	14.7
Over All Six Organisations	19.8	16.7

Source: Survey Data

the Authority's structure are reflected in part in the organisation chart depicted in Figure 7.3: specialisation and departmentation appear

consistent with the size of the organisation, and at a reasonably substantial level - denoting a high level of horizontal differentiation, the number of hierarchical levels indicates vertical differentiation in the mid-range, and there is a low level of spatial differentiation as evident in the spatial spread of the Authority's substantial number of field staff.

Centralisation

Reflecting the amount of discretion that first-line supervisors have over the critical elements of their jobs as well as the degree of influence that top management has over key parts of the decision making process, the degree of centralisation in the PNPA falls in the mid-range when considered from an absolute standpoint, even though quantitative ratings are significantly above the mean of the six organisations examined. Decision-making authority passes from the Authority as a body to the National Park Officer who delegates consistently with the responsibilities of each department, and who can, on occasion, exert a high degree of influence over decisions. However subordinate managerial staff retain discretion over critical aspects of their jobs in line with their level and functional specialisation in the organisation. The combination of factors which affect the PNPA generates a situation in which the expected inverse relationship between delegation and centralisation *is* in evidence, however the strength of this relationship is not particularly high.

TABLE 7.11 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - CENTRALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	36.6	15.2
Ngorongoro Conservation Area Authority	40.1	11.1
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	36.0	15.9
Peak National Park Authority	**40.6**	**9.7**
Pinelands Commission	35.1	14.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	36.2	13.4
Over All Six Organisations	37.2	14.0

Source: Survey Data

Formalisation

In the case of the PNPA, the quality of the written job descriptions and the fact that they extend to all employees of the Authority - including the National Park Officer as chief executive officer - indicates that job content and job context are comprehensively specified and suggests a high level of formalisation. However other elements of formalisation - the standardisation and control of work, the level of supervision, the amount of freedom given to operatives and managers, and the extent to which regulations exist and are enforced - vary quite significantly across the PNPA departments. As might be expected, the Treasurer's Department which, as the principal financial unit, is highly regulated and evinces a necessarily close supervisory style, as do aspects of other departments including those concerned with planning and legal matters in which policies and procedures must necessarily be followed in decision making. On the other hand, the conservation and recreation functions are staffed by a significant component of professionals with tertiary qualifications, including roughly a quarter with university higher degrees. The relevant departments showed much less formalisation, the professional staff having considerable freedom, even though administrative staff need to observe defined procedures and rules, and follow overall policies in the making of day-to-day decisions. The quantitative data is rather more elevated than this mix of formalisation levels suggests, but given that evidence from different sources supports the finding of a low degree of formalisation, this overall picture of the PNPA was accepted.

TABLE 7.12 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - FORMALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	30.6	7.7
Ngorongoro Conservation Area Authority	30.9	9.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	30.9	7.1
Peak National Park Authority	31.0	9.7
Pinelands Commission	29.8	10.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.2	10.7
Over All Six Organisations	30.5	8.9

Source: Survey Data

Environmental Agility

Given the complex network of bodies as set out in the chart of the PNPA's principal external relationships (Figure 7.2) with which the Authority relates and from which it has the potential to draw information, a higher level of environmental agility might have been expected in the quantitative scores. Respondents within the Authority and outside observers were in general agreement that the PNPA maintains a very high level of awareness of those aspects of its task and general environments which are depicted on the periphery of Figure 7.2. Nevertheless amongst internal and external respondents, opinion diverged on the extent to which the PNPA responds appropriately to both aspects of its environment. This was particularly the case on the question of whether the Authority is characteristically *reactive* or *proactive.* Outside observers typically considered that the Authority's capacity to anticipate changes in either aspect of its environment was of a significantly lesser order than considered by respondents within the Authority, other evidence affording some credence to the view taken by the external respondents. On the other hand, respondents were unanimous that the Authority actively attempts to change threatening demands from the environment. On balance, it would appear that the PNPA is generally well-equipped to accommodate externally induced change, but its existing policies and structure generally demonstrate insufficient flexibility to allow it to act rather than simply react.

TABLE 7.13 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - ENVIRONMENTAL AGILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	32.9	9.9
Ngorongoro Conservation Area Authority	33.4	9.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	31.3	11.0
Peak National Park Authority	**31.1**	**14.4**
Pinelands Commission	29.8	17.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.8	14.6
Over All Six Organisations	31.5	13.0

Source: Survey Data

Infrastructure

Based on the views presented by both internal and external respondents, the boundaries between PNPA departments do not seem to present particular obstacles to solving problems which overlap functional areas of responsibility. The functional structure of the PNPA divides work so that individual departments are responsible for their particular specialities, whereas overall tasks generally cross departmental lines. Meetings between relevant departments are used to resolve the conflicts which are inevitably encountered between functional specialities, including those which arise in relation to the provision of appropriate support for core activities where core and support work are not integrated within the same department. Although it is clear that core and support work *do* take place within some individual departments, there is some difference of opinion amongst respondents (internal and external) on the extent to which these instances represent true integration. Based upon the responses of internal and external respondents, together with information from other reliable sources, the infrastructure of the PNPA seems appropriate to its needs, as judged by the Authority's capacity to pursue a variety of activities in a coordinated fashion.

TABLE 7.14 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - INFRASTRUCTURE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	20.4	12.5
Ngorongoro Conservation Area Authority	20.9	12.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.6	10.2
Peak National Park Authority	**20.0**	**5.8**
Pinelands Commission	18.0	14.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	19.5	16.9
Over All Six Organisations	19.5	13.3

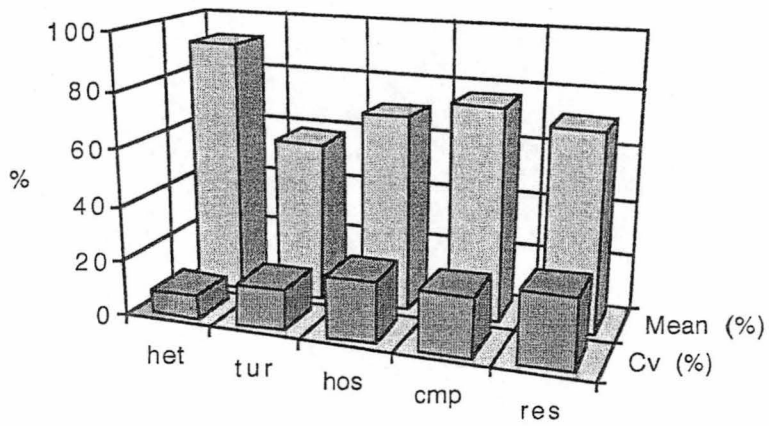
Source: Survey Data

SUMMARY

EXTERNAL ENVIRONMENT

Providing an overview of the environment of the PNPA, the statistical measures for the five aspects of the Authority's environment are summarised graphically in Figure 7.4. The relative potency of each environmental variable may be judged from the means expressed in percentage form.

FIGURE 7.4 PEAK NATIONAL PARK AUTHORITY
EXTERNAL ENVIRONMENT - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

het	Heterogeneity	tur	Turbulence	hos	Hostility
cmp	Technological Complexity			res	Restrictiveness

The environment of the PNPA showed the equal highest heterogeneity rating, produced by a combination of factors: varied land use, the majority of the land vesting in private ownership, a resident human population, and its periphery of large industrial cities. Turbulence in the environment of the PNPA arises primarily from conflicts over land-use for mineral extraction and agriculture - catalysed by the shifting emphasis in European Community agricultural policy and the recent outbreak of foot-and-mouth disease, together with integrated rural development schemes which focus on the mutual support between social, economic, and environmental aspects. Hostility is a consequence of the manifold rôles played by the Authority - particularly the planning function which inevitably attracts hostility from potential developers and objectors. As an incidental issue, hostility may also have skewed the ratings of the PNPA

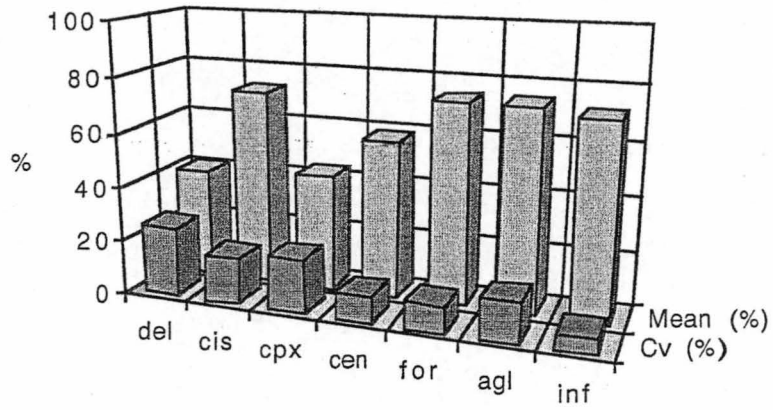
environment through disputes over mineral extraction which were current at the time the questionnaires were completed. The Authority endeavours to counteract hostility by fostering a sense of partnership through enhancing communication and relationships with landowners and residents and with Park users through diverse education programmes. PNPA's very high score on technological complexity reflects the high standard of information technology required in dealing with the Authority's environment, management decisions making optimum use of both technically sophisticated information and technology. The PNPA's environment is typically high in restrictiveness, significant legal, political and economic constraints stemming from the complex interactions between the Authority and its constituent councils, relationships between the Authority and the central government, and the essential dialogues and dealings with various government agencies and NGOs. There are also restrictions on goal achievement which are inescapable in the face of competing demands, particularly where conservation goals have been accomplished by subordinating development goals and conversely.

CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

The relevant statistical measures with the means expressed as percentages are summarised in graphical format in Figure 7.5. This creates an overview of the core dimensions of the Trust's organisation together with ancillary structural factors.

In relation to delegation, the Authority is formally responsible for corporate decisions and policy making, retaining some other key decision areas itself, whilst reserving others to the National Parks Officer. The control and information system assists in reducing uncertainty in decision making, and has a degree of sophistication entirely consistent with the current *and* projected needs of the Authority, and is appropriate to both the external and internal environments. The three aspects of complexity in the PNPA manifest as a high level of horizontal differentiation, vertical differentiation in the mid-range, and a low level of spatial differentiation. Insofar as centralisation is concerned, decision-making authority passes from the Authority as a body to the National Park

FIGURE 7.5 PEAK NATIONAL PARK AUTHORITY
CORE DIMENSIONS AND ALLIED FACTORS
OF ORGANISATIONAL STRUCTURE - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

del	Delegation	cis	Sophistication of Control & Information System		
cpx	Complexity	cen	Centralisation	for	Formalisation
agl	Environmental Agility			inf	Infrastructure

Officer who is in a position to exert a high degree of influence over decisions. Subordinate managerial staff retain discretion over critical aspects of their jobs in line with their level and functional specialisation in the organisation. The quality of the written job descriptions and the fact that they extend to all employees of the Authority indicates that job content and job context are comprehensively specified and suggests a high level of formalisation. However other elements of formalisation vary quite significantly across the PNPA departments, some being highly regulated and evincing a close supervisory style, whereas other functions, staffed by a significant component of professionals, showed much less formalisation. On environmental agility, the PNPA maintains a very high level of awareness of its task and general environments, although opinion diverged on the extent to which the Authority responds appropriately to both aspects of its environment. On balance, it would appear that the PNPA is generally well-equipped to accommodate externally induced change, but its existing policies and structure generally demonstrate insufficient flexibility to allow proactivity. The infrastructure of the PNPA shows boundaries between departments which do not seem to present obstacles to solving problems overlapping functional areas. Meetings are used to resolve other conflicts, including support for core activities where core and support work are not integrated.

THE CASE STUDIES
CHAPTER 8

THE NEW JERSEY PINELANDS

USA

THE CASE STUDIES
CHAPTER 8

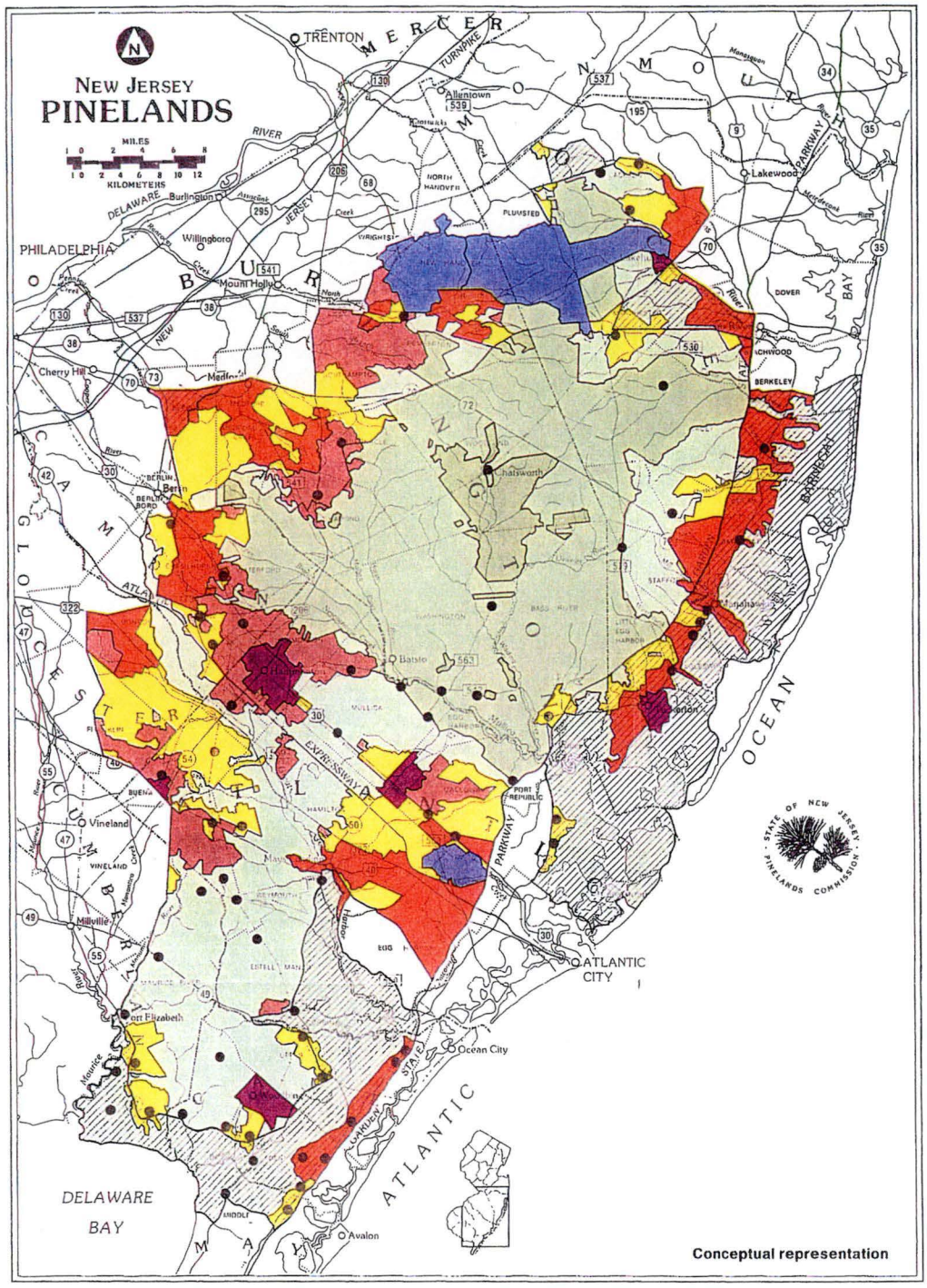
THE NEW JERSEY PINELANDS USA

THE NATURAL AND SOCIO-CULTURAL ENVIRONMENTS

The New Jersey Pine Barrens form a portion of the Outer Coastal Plain in the heavily urbanised northeastern United States. Situated in the south-east of New Jersey, the Pine Barrens occupy almost 30 per cent of the State, and comprise the largest body of open space between Richmond, Virginia and Boston, Massachusetts, on the American mid-Atlantic Coast.

As an ecosystem, the New Jersey Pine Barrens comprise over 5828 square kilometres, within which the Pinelands National Reserve consists of 4452 square kilometres. The terms "the Pinelands" or "New Jersey Pinelands" generally refer to this Reserve, that is, to that part of the Pine Barrens landscape which is protected by Federal legislation - specifically, by Section 502 of the *National Parks and Recreation Act, 1978*. The Federally-defined boundaries of the Pinelands National Reserve and the Pinelands Area, as set by State legislation (the *Pinelands Protection Act, 1979),* differ somewhat: the Reserve includes land east of the Garden State Parkway and to the south bordering Delaware Bay which is omitted from the Pinelands Area. As an example of the world's major ecosystem types, the Pinelands was designated a Biosphere Reserve under the UNESCO Man and the Biosphere Programme in 1983. Figure 8.1 shows the location of the Pinelands.

The Pinelands is $^1/_3$ publicly and $^2/_3$ privately owned. Federal lands include three military installations together with a wildlife refuge, whilst various parks and forests constitute the bulk of State public lands, although there are also historic villages which fall under the purview of New Jersey public administration. There are numerous local government parks within the Pinelands together with conservation lands owned by non-profit organisations.



Preservation Area District

"The heart of the Pines"

Uses here include cranberry and blueberry agriculture, forestry, recreation, and fish and wildlife management

Forest Areas

Environmentally sensitive lands that display many qualities similar to the Preservation Area

Uses include low density residential and commercial development, agriculture, forestry, recreation, and resource extraction

Agricultural Production Areas

Larger concentrations of conventional agricultural lands

Uses are primarily restricted to agriculture and related commercial and residential activities. Municipalities may nominate additional areas

Special Agricultural Production Areas

Lands devoted to cranberry and blueberry agriculture

Uses are largely limited to cranberry and blueberry farming or native horticulture

Rural Development Areas

Already semi-developed

Uses include new residential development at 200 units per square mile and other uses compatible with the Pinelands environment. Municipalities may designate a "municipal reserve" to accommodate future growth pressures in such areas

Regional Growth Areas

Adjacent to already developed portions of the Pinelands

Uses may be determined by municipalities to achieve an assigned average growth density

Pinelands Towns

Traditional communities primarily outside of regional growth areas

Municipalities may determine future land uses which are compatible with the existing character of the town

Military and Federal Installation Areas

Federally owned lands

Uses are consistent with national defense and federal requirements as determined by memoranda of agreement with the Commission

Pinelands Villages

Settlements with cultural and historical ties to the Pinelands

Municipalities may designate land uses which are compatible with the existing character of the village

Within Pinelands National Reserve but outside state designated Pinelands Area

FIGURE 8.1 THE NEW JERSEY PINELANDS

(Source: Pinelands Commission, 1985)

The total population of the Pinelands communities exceeds 700,000, with population densities ranging from marginally less than 4 persons per square kilometre in the remote interior to in excess of 1500 persons per square kilometre in more developed communities at the periphery.

The Atlantic Outer Coastal Plain which is the setting for the Pinelands is a geological formation characterised by gently rolling terrain and sandy soils which render the region very sensitive to pollution. The altitude of the Pinelands ranges from sea level to 60 metres, whilst rainfall averages between 107 cm and 117 cm. Underlying much of the Pinelands is an shallow aquifer estimated to carry some 64 billion kilolitres. Bogs, marshes, and swamps are created where these waters lie at or near the surface, accounting for roughly 20 per cent of the Pinelands' mosaic of wetlands, uplands, and aquatic environments. The aquifer also feeds the Pinelands' streams with characteristically acidic and nutrient-poor water.

These surface and ground water resources form the bedrock for the nature conservation values intrinsic to the Pinelands. These values reside in the:

- *fauna* - with 59 species of amphibians and reptiles, 91 fish species, 34 species of mammals, and 299 bird species;
- *flora* - with over 800 species of vascular plants, of which five are endemic, 580 native, 270 introduced, and 71 endangered, threatened, or undetermined;
- *habitats* - which include sphagnum swamp, white cedar swamp, cranberry bogs, upland pine-oak, pygmy pine plains, hardwood swamp, and salt marsh.

The Pinelands economy relies heavily on land- and water-based agricultural activities, although recreation, resource-related businesses, shell fishing, and construction (at the area's margins) are also important industries.

The Pinelands can logically be divided into areas of different land-use capability. The delineation of these areas, and the allocation among them of mandatory and optional land uses subject to environmental standards, became a central feature of the Commission's

Comprehensive Management Plan. This Plan is an ecosystems approach to land management that classifies areas of the Pinelands based upon the interrelationships of its resources. It determines the type and intensity of development that is permitted in a manner that sustains the ecosystem while providing economic growth in appropriate locations.

The core of the Pinelands is designated as the Preservation Area where development is strictly limited. In general, only new land uses which are compatible with the ecology of this area are permitted, such as the cultivation of berries and native plants, forestry, and the operation of recreational facilities designed for minimal impact on the landscape. Conventional residential, commercial, and industrial development is largely prohibited. Some parts necessarily have to be treated separately, such as existing villages and military bases.

Surrounding the core is the Protection Area where development types and intensities are determined, based on their location in a series of six management areas. Depending on the resource values of the management area, permitted developments range from very low-density uses in more pristine sections to areas to which future growth is being directed. All development is subject to a wide range of environmental and cultural resource standards to protect water quality, wetlands, rare and endangered plant and animal species, prehistoric resources, and scenic values.

EVOLUTION OF THE PRESENT FRAMEWORK

Originally inhabited by Amerindians, the Pinelands has been intensively used since the early days of colonisation. In the post-World War II era, residential development threatened the region in the form of large retirement communities and spreading suburbanisation emanating from nearby Philadelphia. As the full weight of postwar urban sprawl came to bear on other parts of New Jersey, the path of Pinelands history forked: Would the Pinelands become the locale of grandiose development projects such as a jetport and a city of a quarter million, both of which had been formally proposed in 1965 by a regional planning board supported by local, state, and federal funding (Collins, 1988), or would the region's value come to be based on its open spaces, natural features, and

traditional lifestyles, which uncontrolled development would damage or obliterate? (Pinelands Commission, 1997). The advent of casino gambling in Atlantic City, to the east of the Pinelands, created more pressure for development in the coastal and adjacent areas. It appeared in the mid-1970s that the region would go the way of most of the rest of the urbanised northeastern United States (Moore, 1997).

As urbanisation began to encroach upon New Jersey's last vestige of wilderness, local citizens joined with state and national environmental organisations to demand action to save the fragile Pinelands. These efforts marked the beginning of a succession of state and federal studies and planning commissions, the U.S. Department of the Interior also expressing an interest in the region as a location to test a new concept in land management where various levels of government would use their land use authorities, combined with limited acquisition of the most critical places, to protect areas of national concern. In 1978, Congress designated the Pinelands as America's first National Reserve and invited the State of New Jersey to devise a comprehensive management plan for the region which, if approved by the Secretary of the Interior, would entitle the state to federal funding for land acquisition (Moore, 1997). Whereas the reserve involves sizeable land acquisition, the concept differs from a more traditional park concept in that it seeks to direct, regulate, and mitigate the effects of an increasing population on a regional ecosystem basis rather than affording absolute protection in a designated park area with no controls outside park boundaries.

Responding to the federal invitation, in February 1979 the Governor, by executive order, established the Pinelands Commission and instituted a moratorium on development while a plan for the Pinelands was being prepared. In June 1979, the New Jersey Legislature supplemented the Federal law by enacting the *Pinelands Protection Act,* a statute which is perhaps the strongest land use legislation in the U.S.A. The *Pinelands Protection Act* authorised the Commission to devise a Comprehensive Management Plan for the Pinelands National Reserve. In late 1980, the Commission adopted the Plan after extensive deliberation and the involvement of local government officials, organisations, and interested citizens. The Plan was subsequently approved by the Governor of New Jersey, and in early 1981, by the Secretary of the Interior. All counties and municipalities within the Pinelands are required to revise master

plans and zoning ordinances so they will conform with the Comprehensive Management Plan, this process allowing local governments to adapt Plan standards and management areas to local conditions (Pinelands Commission, 1985). Development sponsored by governmental agencies is also subject to the Commission's approval. In this cooperative intergovernmental scheme, all participants are to "preserve, protect, and enhance the resources of the Pinelands" and permit only development that is consistent with that purpose (Moore, 1997).

The Comprehensive Management Plan was adopted in two phases. The Preservation Area Plan took effect in September 1980, whilst the Protection Area Plan became effective in January 1981 (Pinelands Commission, 1997). The basic strategy of the Comprehensive Management Plan is to create various categories of land use based on existing natural and cultural features, existing land use, and projected needs. Several categories or "land capability" types emerged: Forest, Agricultural Production, Rural Development, Regional Growth, Pinelands Towns, Villages, and Military and Federal Installations, land capability types which are distributed between the Preservation Area and the Protection Area. The goals for the Preservation Area emphasise the preservation of an extensive contiguous land area in its natural state with the promotion of compatible agricultural and recreational uses and prohibition of incompatible development. Development is highly regulated in the Preservation Area which encompasses the largest tracts of relatively unbroken forest and most of the economically vital berry industry. The larger surrounding Protection Area contains a mix of valuable environmental features, farmland, hamlets, subdivisions, and towns, making the Commission's task there more complex. The Protection Area also seeks to preserve and maintain the essential character of the Pinelands environment and to encourage appropriate patterns of development in or adjacent to areas already used for such purposes (Good and Good, 1984).

Administration is by a three level partnership involving federal, state, and local governments coordinated by a 15 member Pinelands Commission as an independent state agency. The Commission's structure set in the Federal legislation includes one member appointed by the Federal Secretary of the Interior, one member from each of the seven counties in

the Reserve appointed by the respective counties and another seven members appointed by the Governor of New Jersey. The Federal law also provides for the Commission to include residents of the Reserve who represent economic activities in the area (such as agriculture) and residents of New Jersey who represent conservation interests. These provisions are reinforced in the New Jersey State legislation which also established a Pinelands Municipal Council representative of each municipality in the Pinelands area to act in an advisory capacity (Lucas, 1992).

PRIMARY DATA ANALYSIS

Prior to analysing the information obtained by questionnaire, the levels of correlation for this primary data were established:

- amongst respondents from within the Commission;
- amongst outside observers;
- between internal respondents and outside observers.

After validation, the primary data was summarised in the form of key descriptive statistics, before the analysis proceeded to assessments of variables in the Commission's external environment and in the core dimensions and allied factors of its organisational structure.

VALIDATION OF SOURCE DATA

The data from respondents within the New Jersey Pinelands Commission yielded a coefficient of multiple correlation of 0.932 (significant at the 0.001 level) as set out in Table 8.1 and this, along with

TABLE 8.1 NEW JERSEY PINELANDS COMMISSION DATA CORRELATIONS AMONGST AND BETWEEN AGENCY RESPONDENTS AND OUTSIDE OBSERVERS

Coefficient Type	Correlation amongst Agency Respondents *N= 5*	Correlation amongst Outside Observers *N=4*	Correlation between Agency and Outside Respondents
Coefficients of Multiple Correlation [R]	0.932	0.991	0.904
Coefficients of Multiple Determination [R^2]	0.869	0.982	0.817

All correlations significant at the 0.001 level *Source: Survey Data*

the coefficient of multiple determination of 0.869, indicated a reasonable level of correlation amongst these respondents. Insofar as correlations between the responses of observers outside Pinelands are concerned, Table 8.1 reveals a coefficient of multiple correlation of 0.991 significant at the 0.001 level, this very high correlation (the second highest for this category) being confirmed by the coefficient of multiple determination of 0.982. The arithmetic means of raw data from respondents within the Pinelands Commission were compared with the mean responses from the outside observers. From Table 8.1 it can be seen that the New Jersey Pinelands exhibited a high coefficient of multiple correlation, 0.904 at a significance level of 0.001, with a coefficient of multiple determination of 0.817.

DESCRIPTIVE STATISTICS

The Pinelands data summary in Table 8.2 comprises selected descriptive statistics for responses on both the external environment and the core dimensions and allied factors of organisational structure.

TABLE 8.2 NEW JERSEY PINELANDS
SELECTED DESCRIPTIVE STATISTICS
- EXTERNAL ENVIRONMENT
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

	Arithmetic Mean [1]	*Coefficient of Variation (%)*
External Environment		
Heterogeneity	6.4	8.2
Turbulence	11.2	19.8
Hostility	12.0	20.4
Technological Complexity	4.7	21.4
Restrictiveness	4.1	35.3
Core Dimensions and Allied Factors of Organisational Structure		
Delegation	17.8	31.0
Sophistication of Control and Information System	47.1	8.9
Complexity	19.8	17.1
Centralisation	35.1	14.6
Formalisation	29.8	10.6
Environmental Agility	29.8	17.6
Infrastructure	18.0	14.4

1 Based on a confidence level of 95 per cent. *Source: Survey Data*

The assessments of *heterogeneity* in the Commission's environment, with a coefficient of variation of 8.2 per cent, were relatively more uniform

than the other variables. At the other end of the variability spectrum, *restrictiveness* presented the most disparate series of assessments, varying by an average of 35.3 per cent about the mean of the data set - the highest coefficient of variation. In general, a lower level of variability characterised the Pinelands data amongst the core dimensions and allied factors of organisational structure, with the most dispersed - *delegation* - exhibiting a coefficient of variation of 31.0 per cent, and the variable displaying the least dispersion *(sophistication of control and information systems)* a coefficient of 8.9 per cent.

ASSESSMENT OF VARIABLES IN THE EXTERNAL ENVIRONMENT

Substantial portions of this assessment derive from information provided by respondents within the Pinelands Commission and outside observers in their additional comments on questionnaire items or in the course of other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited. The following inventory of the key parts of the external environment of the Pinelands Commission provides an indication of the multi-faceted nature of the environmental milieu in which the Commission operates. Each of the five elements with which this work is concerned needs to be viewed against this background.

Federal Agencies

US Department of Defence
(in relation to the three military installations in the Pinelands)
US Department of the Interior
- National Parks Service
- National Biological service
- Fish and Wildlife Service

US Geological Survey
US Man and the Biosphere Programme
(which brings the Pinelands Commission into direct and indirect contact with eleven additional Federal agencies)

State of New Jersey

NJ Department of Environmental Protection
- Division of Fish, Game and Wildlife
- Division of Parks and Forests

NJ Division of Travel and Tourism
NJ Geological Survey
NJ Office of State Planning

Pinelands Municipal Council

Interest Groups and Associations

Atlantic White-Cedar Initiative
Forked River Mountain Coalition
Great Egg Harbor Watershed Association
Nature Study in Cumberland County, New Jersey
New Jersey Natural Heritage Programme
Outer Coastal Plain - Pinelands Research Symposium
Pinelands Preservation Alliance
Rutgers University Biodiversity Center
Sierra Club - West Jersey Group
Stonebubble - Art from the Aquifer
Various wildlife refuges
Whitesbog Preservation Trust

Heterogeneity

The environment of the Pinelands Commission was rated as very strongly heterogeneous in absolute terms, an assessment which was borne out in relative terms, with the environment exhibiting a nett heterogeneity score well above the mean of the agencies examined here, as demonstrated in Table 8.3. With the Peak National Park Authority, the Commission showed the highest heterogeneity rating of all six organisations, a level of heterogeneity which was produced by a set of factors which included the heavy reliance which the economy places on land- and water-based agricultural activities, the additional industrial importance of recreation, shell fishing, and construction, together with an approach to land management which seeks to balance ecosystem sustainability with economic development. The most significant of the organisations and other bodies with which the Commission needs to interact are given in the inventory of the key parts of the Commission's external environment. This provides some impression of the heterogeneity of its environment, the Pinelands Commission's links with these bodies deriving from its work in relation to land use, conservation management, cultural heritage, economic activities, and recreation management. Also of importance are the Commission's relations with both the central government of the United States, the State Government of New Jersey, local government, and other institutions such as Rutgers University.

TABLE 8.3 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HETEROGENEITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	5.8	13.6
Ngorongoro Conservation Area Authority	5.9	18.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	5.9	11.8
Peak National Park Authority	6.4	8.3
Pinelands Commission	**6.4**	**8.2**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	6.0	16.7
Over All Six Organisations	6.1	13.1

Source: Survey Data

Turbulence

In absolute terms, the environment of the Pinelands Commission demonstrated a low level of turbulence and, as shown in Table 8.4, also exhibited a very low relative score on this variable. Other sources confirm a very low level of unpredictable change in the environment of the Commission, the overall picture being one of a generally stable setting, allied with which flexibility has played a key role in the implementation of the CMP. Each section of the Plan is preceded by "flexibility language", which allows management area limits to be moved if municipalities can convince the Commission that this is appropriate, while a provision for "letters of interpretation" means that anyone can ask the Commission how the Plan applies to an unusual circumstance or to a use not anticipated by the Plan (Lucas, 1992). This allows the Commission to define its intent and apply the Plan to unique situations rather than being tied to the precise language of regulatory sections. An added factor here is that the Pinelands Municipal Council (PMC) has become a vehicle for an ongoing dialogue between municipalities and the Commission, and in particular for reviewing changes to the CMP. The preparedness of the Commission to adapt the CMP in line with changes in the environment - such as changes in technology in cellular and personal communications, where the tower requirements of both industries were accommodated within the framework of the CMP -

demonstrates a flexible approach to unanticipated events which alleviates most of the residual effects of the low level of unpredictability in the Commission's environment.

TABLE 8.4 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TURBULENCE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.2	10.8
Ngorongoro Conservation Area Authority	12.6	12.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	11.4	9.9
Peak National Park Authority	12.1	14.6
Pinelands Commission	**11.2**	**19.8**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	11.1	19.1
Over All Six Organisations	11.7	15.4

Source: Survey Data

Hostility

As with turbulence, the environment of the Pinelands Commission displays a low index of hostility in both absolute and relative terms - the lowest of all the six organisations, as Table 8.5 indicates. This appears to be the product of a number of interacting factors. Socio-economic factors include the fact that unemployment in the Pinelands has consistently remained below other areas, average effective tax rates in the Pinelands have shown a trend lower than all other regions in New Jersey, and population growth in Pinelands towns outpaces the remainder of the State. In addition, Pinelands counties account for nearly half of New Jersey agricultural sales, a high value relative to their thirty-five per cent share of total State agricultural land. The management style evinced by the Commission is an important factor in minimising hostility, perhaps best exemplified by the Local Review Officer (LRO) programme which streamlines the Commission's building application process, with the LRO - whose role is essentially that of a facilitator - being the first and often only point of contact with the Commission for private landowners. A sound scientific basis, a flexible approach, and the partnership between federal, state, and local units

have proved fundamental to the Pinelands success (Lucas, 1992). These factors, together with excellent public communication have meant that decisions encounter little opposition and are increasingly gaining broader acceptance.

TABLE 8.5 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HOSTILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.6	20.2
Ngorongoro Conservation Area Authority	13.6	19.9
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	12.1	14.6
Peak National Park Authority	14.7	21.7
Pinelands Commission	**12.0**	**20.4**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	13.5	23.8
Over All Six Organisations	13.0	20.8

Source: Survey Data

Technological Complexity

The Commission's management decisions make optimum use of technically sophisticated information and advanced technology. In pursuing its preservation function within the framework of the CMP, the Commission has complex information needs and accordingly utilises reasonably sophisticated supporting technology. This applies, for example, in its scientific monitoring of land-use change, water resources, and wetland communities, and to the operation of the regional transfer-of-development-rights programme that permits transfers from conservation areas to growth areas using Pinelands Development Credits (PDCs). For *not* developing their land, owners in the Preservation, Agricultural, and Special Agricultural Production Areas are allocated PDCs which may be purchased by developers of land in Regional Growth Areas and used to increase the densities at which they can build (Pinelands Commission, 1999a). As observed earlier, all development in the Pinelands is subject to wide ranging environmental and cultural resource standards to protect water quality, wetlands, rare and endangered plant and animal species, prehistoric resources, and

scenic values. In ensuring these standards, the Commission employs a variety of computer-based technologies which have made it feasible to develop Geographic Information Systems (GIS) capabilities, arboreal succession models, and watershed-based studies of the long-term ecological sustainability of wetlands systems, all of which have a decision support role vital to the Commission's research and planning. The technological complexity of the Commission's environment also has a prospective aspect insofar as providing the technology which will help to ensure the future preservation of the ecosystem through education and research - as, for example, by way of Internet access to Pinelands resources. These qualitative assessments are confirmed by the quantitative data shown in Table 8.6, the rating of the environment of the Pinelands Commission matching the mean of the six organisations.

TABLE 8.6 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TECHNOLOGICAL COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.8	19.1
Ngorongoro Conservation Area Authority	4.9	22.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	4.0	20.4
Peak National Park Authority	5.3	21.1
Pinelands Commission	**4.7**	**21.4**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.6	26.0
Over All Six Organisations	4.7	21.3

Source: Survey Data

Restrictiveness

As noted under turbulence, the partnership between U.S. Federal, State of New Jersey, and local units has proved fundamental to the Pinelands success, and this is at least partly due to the level of political and administrative cooperation which the partnership generates, and which in turn confers some measure of political insulation on the Commission's operations. The low quantitative rating shown in Table 8.7 - well under the mean of the six organisations under study - intimates that although the Commission faces some constraints, these do not dominate. Whilst

TABLE 8.7 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - RESTRICTIVENESS

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.2	29.3
Ngorongoro Conservation Area Authority	4.6	27.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	3.7	45.9
Peak National Park Authority	4.9	25.0
Pinelands Commission	**4.1**	**35.3**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	4.7	32.9
Over All Six Organisations	4.4	31.8

Source: Survey Data

respondents generally considered that political and social curbs are of little significance, legal constraints *were* cited as important by most respondents (notwithstanding the high coefficient of variation) despite the insulation which often exempts the Pinelands when the objectives of new statutes are inconsistent with the CMP or when policies in the Pinelands are more stringent than elsewhere in the State. The most significant of the legal constraints are those presented by the Pinelands international status as a Biosphere Reserve (Moore, 1997). From an economic standpoint, analysis of the CMP's impact on the region has shown that *neither* the economic vitality of the Pinelands *nor* the fiscal integrity of its municipalities has been hindered, while development has been channelled into less environmentally sensitive areas.

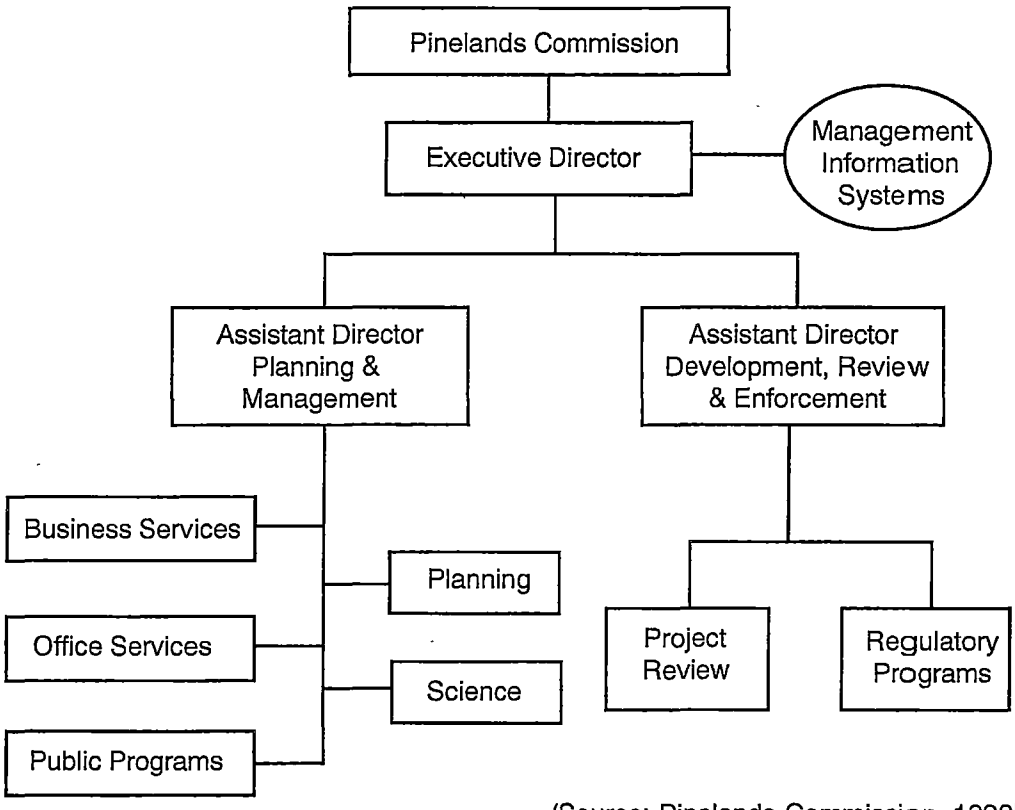
ASSESSMENT OF VARIABLES IN THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

As with the assessment of environmental variables, appreciable portions of the assessment here derive from information provided by respondents within the Pinelands Commission and outside observers in their additional comments on questionnaire items and in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources

have, of course, been cited. The background against which to view each of the core dimensions and allied structural factors of the Commission is provided by Figure 8.2, which is an organisation chart depicting the principal elements of its structure.

FIGURE 8.2 ORGANISATION CHART OF THE PINELANDS COMMISSION

(as at September 2000)



(Source: Pinelands Commission, 1999b)

Delegation

The ultimate authority here resides with the U.S. Secretary of the Interior by virtue of the U.S. Federal *National Parks and Recreation Act* of 1978 (§471i), from whom delegation flows to the Governor of New Jersey. In enacting the *Pinelands Protection Act* of 1979, the New Jersey Legislature established the Pinelands Commission as:

> ... a political subdivision of the State established as an instrumentality exercising public and essential governmental

> functions, and the exercise by the Commission of the powers and duties conferred by this Act and by the Federal Act shall be deemed and held to be an essential governmental function of the State. For the purpose(s) ... of the New Jersey Constitution, the Commission is hereby allocated within the Department of Environmental Protection, but, notwithstanding said allocation, the Commission shall be independent of any supervision or control by such Department or by the Commissioner or any officer or employee thereof.
>
> *Pinelands Protection Act*, 1979, §13:18A-4(a)

The authority for designating the Chairman of the Commission vests in the Governor, whilst the Commission itself is authorised to appoint the Executive Director as its chief administrative officer. As the policy-determining body, the Commission delegates decision-making authority to the Executive Director, who in turn delegates to a level consistent with the responsibilities of particular officers. The chief classes of decision which the Executive Director has delegated to the two Assistant Directors and through them as necessary to the relevant functional staff include:

- marketing and public relations tactics for new services together with changes in these tactics for existing services; *(without qualification)*
- negotiating with staff or their unions about pay and conditions; *(with minor constraints)*
- development of new initiatives or services; *(within specified limits)*
- the selection and dismissal of senior personnel. *(restricted to Assistant Directors)*

As shown in Table 8.8, the Commission's rating on delegation was well above the mean for the six organisations under review, and by far the highest in absolute terms. There was considerable variation in the way in which delegation is perceived within the Commission and by outside observers, and although the differences did not seem to be linked with respondents' internal or external status, and responses were not polarised, there was nevertheless a high coefficient of variation (31 per cent).

TABLE 8.8 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DELEGATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	13.5	30.1
Ngorongoro Conservation Area Authority	11.2	23.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	15.4	24.2
Peak National Park Authority	11.4	25.7
Pinelands Commission	**17.8**	**31.0**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	15.7	37.8
Over All Six Organisations	14.4	34.0

Source: Survey Data

Sophistication of Control and Information System

There was a very high order of agreement amongst respondents, irrespective of whether they were internal or external to the Commission, ratified by the very low coefficient of variation of 8.9 per cent. Responses from within the Commission indicated that the control and information system is very well matched to the decision making needs of the organisation, whether at the strategic, tactical, or operational levels, a view which is substantiated by virtually all the responses from outside observers, the only exceptions concerning ineffectual quality and cost controls. These positive outlooks support the quantitative assessment summarised in Table 8.9 that the level of sophistication of the control and information system is high and lies significantly above the mean of the six organisations. The high level of sophistication achieved in the Commission's control and information system predicates an organisational structure of low complexity, formalisation, and centralisation. These structural characteristics are in fact attained, even though the level of formalisation would have been expected to be somewhat lower. It may therefore be concluded that the control and information system matches the Commission's needs.

TABLE 8.9 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - SOPHISTICATION OF CONTROL AND INFORMATION SYSTEM

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	44.8	14.9
Ngorongoro Conservation Area Authority	45.9	17.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	44.7	13.9
Peak National Park Authority	45.6	17.1
Pinelands Commission	**47.1**	**8.9**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	47.1	10.9
Over All Six Organisations	45.9	13.3

Source: Survey Data

Complexity

The low level of complexity implicit in the organisation chart in Figure 8.2 is confirmed by the quantitative data, the version of functional structure adopted in the Commission showing the following three separate aspects of complexity:

Differentiation:	Evidence:
• a moderate level of horizontal differentiation	minimal specialisation and departmentation (but see below)
• little vertical differentiation	very few levels in the hierarchy
• a relatively low level of spatial differentiation	outlying offices dispersed geographically from 50 to 100 kilometres

The only inconsistency here was in relation to horizontal differentiation, where there was a higher than expected proportion of employees holding university higher degrees. In all other respects, the Commission presented the classic features of low complexity and, as noted above, this is substantiated by the average scores shown in Table 8.10, which equate to the mean of all the organisations examined here.

TABLE 8.10 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	19.4	19.0
Ngorongoro Conservation Area Authority	20.4	17.6
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.4	14.0
Peak National Park Authority	20.9	19.7
Pinelands Commission	**19.8**	**17.1**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	20.2	14.7
Over All Six Organisations	19.8	16.7

Source: Survey Data

Centralisation

As Table 8.11 shows, the degree of centralisation in the Commission is low in absolute terms, as well as displaying a quantitative rating which is significantly below the mean of the six organisations under study, indicating that first-line supervisors have considerable discretion over the critical elements of their jobs, and that top management has only a limited influence over key parts of the decision making process.

TABLE 8.11 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - CENTRALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	36.6	15.2
Ngorongoro Conservation Area Authority	40.1	11.1
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	36.0	15.9
Peak National Park Authority	40.6	9.7
Pinelands Commission	**35.1**	**14.6**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	36.2	13.4
Over All Six Organisations	37.2	14.0

Source: Survey Data

The political and administrative insulation noted under *Restrictiveness* may account, at least in part, for the degree of decentralisation which is shown by the structure of the Commission's operations and which is atypical of government agencies in the United States. The inverse relationship between delegation and centralisation which would be theoretically expected is in fact demonstrated quite strongly in the case of the Pinelands Commission.

Formalisation

Atypically of the organisations examined in this study, measures of the elements of formalisation vary only slightly across the Commission. Level of supervision, standardisation and control of work, degree of freedom enjoyed by staff, existence and enforcement of regulations, and quality and coverage of written job descriptions display considerable consistency. It seems likely that this lack of variation is due to the high proportion of professionals in the Commission's employ (the staff comprise roughly $^2/_3$ professionals, $^1/_3$ support), allied with an organisational culture which does not discriminate on status. The only element which indicated a high level of formalisation was the quality of the written job descriptions and their application, although this was considerably outweighed by the other elements, culminating in a level of formalisation falling between moderate and low, as Table 8.12 indicates.

TABLE 8.12 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - FORMALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	30.6	7.7
Ngorongoro Conservation Area Authority	30.9	9.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	30.9	7.1
Peak National Park Authority	31.0	9.7
Pinelands Commission	**29.8**	**10.6**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.2	10.7
Over All Six Organisations	30.5	8.9

Source: Survey Data

Environmental Agility

The Commission was generally considered by internal and external respondents to maintain a prudent awareness of what is happening in its environment, and in particular, roughly half of the respondents in both categories considered that the Commission is not only reasonably well aware of the activities of related organisations but also of technological developments by which it may be affected. There was unanimity amongst outside observers as well as respondents within the Commission that the Commission maintains a high level of sensitivity to any political, legal, and social developments in its environment which may have an impact on its operations. In a somewhat similar vein, all internal respondents considered that the Commission endeavours to change any demands made by elements in its environment if it is considered that those demands are potentially detrimental to the Commission and/or its operations. This view was shared by two of the outside observers. On balance, it would appear that the Commission is clearly capable of accommodating externally induced change, and in addition, key internal and external respondents considered that the Commission *is* proactive (although it fell below the mean of the six organisations on this factor, the ratings differed considerably, as the coefficient of variation in Table 8.13 shows).

TABLE 8.13 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - ENVIRONMENTAL AGILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	32.9	9.9
Ngorongoro Conservation Area Authority	33.4	9.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	31.3	11.0
Peak National Park Authority	31.1	14.4
Pinelands Commission	**29.8**	**17.6**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	30.8	14.6
Over All Six Organisations	31.5	13.0

Source: Survey Data

Infrastructure

In solving problems which overlap functional areas of responsibility, the boundaries between Commission departments constitute a hindrance, according to the view shared by a majority of internal respondents and all but one of the outside observers. Although the way in which the Commission's structure distributes work so that individual departments are responsible for particular functions is not, in itself, unusual, there was some degree of consensus amongst respondents that the organisational culture (or, in the opinion of one external respondent, the management style) tends to unnecessarily segregate departments from each other. As a consequence, in instances such as those in which core and support work are not integrated within the same department, and the provision of appropriate support for core activities becomes an issue, it is necessary to resort to formal meetings to resolve the conflicts which are inevitably encountered between specialities. Notwithstanding this assessment of the Commission's infrastructure (which the quantitative data corroborated, the Commission showing the lowest rating of all six organisations as indicated in Table 8.14), its undoubted capacity to pursue a variety of activities in a coordinated fashion indicates that the infrastructure of the Commission seems appropriate to its needs.

TABLE 8.14 COMPARISON OF DESCRIPTIVE STATISTICS
• CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - INFRASTRUCTURE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	20.4	12.5
Ngorongoro Conservation Area Authority	20.9	12.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.6	10.2
Peak National Park Authority	20.0	5.8
Pinelands Commission	**18.0**	**14.4**
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	19.5	16.9
Over All Six Organisations	19.5	13.3

Source: Survey Data

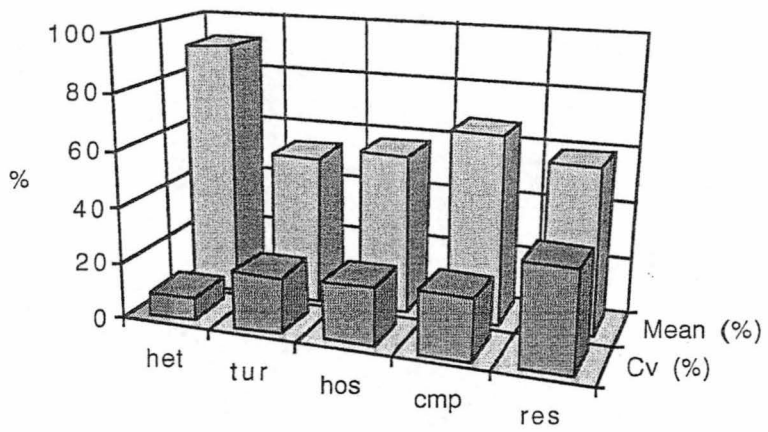
SUMMARY

EXTERNAL ENVIRONMENT

An overview of the environment of the Pinelands Commission is afforded by the statistical measures for the five aspects of the Commission's environment as summarised graphically in Figure 8.3. The relative strength of each variable may be judged from the means expressed in percentage form.

The environment of the Pinelands Commission displayed the equal highest heterogeneity, produced by a set of factors which included the heavy reliance which the economy places on agricultural activities, the additional industrial importance of recreation, shell fishing, and construction, together with an approach to land management which

FIGURE 8.3 PINELANDS COMMISSION
EXTERNAL ENVIRONMENT - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

het	Heterogeneity	tur	Turbulence	hos	Hostility
cmp	Technological Complexity			res	Restrictiveness

seeks to balance ecosystem sustainability with economic development. On the other hand, this environment shoes a very low turbulence, there being a very low level of unpredictable change in the environment. The generally stable setting is allied with a flexibility which allows the Commission to define its intent and apply the Plan to unique situations as well as adapting the CMP to changes in the environment. The Pinelands Municipal Council increases environmental stability through facilitating dialogue between municipalities and the Commission, and in particular

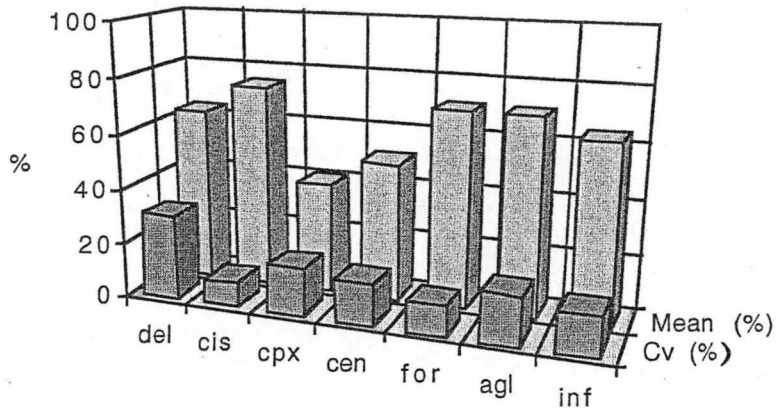
for reviewing changes to the CMP. Similarly, the Commission's environment shows the lowest hostility, the product of a number of interacting factors, including socio-economic factors - low unemployment, low trends in tax rates, high population growth, high agricultural sales - a management style which minimises hostility, and demonstrable success grounded in a sound scientific basis, a flexible approach, and the partnership between federal, state, and local units. On technological complexity, the Commission's management decisions relating to environmental factors make optimum use of technically sophisticated information and advanced technology. Scientific monitoring of the natural environment, operation of the regional transfer-of-development-rights programme, and ensuring wide ranging environmental and cultural resource standards, all involve complex information needs and utilise reasonably sophisticated supporting technology. The low level of restrictiveness affecting the Commission is the product of such forces as the political and administrative cooperation which the partnership generates, as this confers some measure of political insulation on the Commission's operations. The CMP's impact on the region has hindered *neither* the economic vitality of the Pinelands *nor* the fiscal integrity of its municipalities, while development has been channelled into less environmentally sensitive areas.

CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

The relevant statistical measures with the means expressed as percentages are summarised in graphical format in Figure 8.4. This creates an overview of the core dimensions of the Trust's organisation together with ancillary structural factors.

The Pinelands Commission presented most of the classic features of low complexity. The Commission, as the policy-determining body, delegates decision-making authority to the Executive Director, who in turn delegates to a level consistent with the responsibilities of particular officers. Delegations to functional staff include some without qualification, some with minor constraints, others within specified limits, although some are restricted to top management. The control and information system is very well matched to the decision making needs of the organisation, whether at the strategic, tactical, or operational levels,

FIGURE 8.4 PINELANDS COMMISSION
CORE DIMENSIONS AND ALLIED FACTORS
OF ORGANISATIONAL STRUCTURE - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

del	Delegation	cis	Sophistication of Control & Information System		
cpx	Complexity	cen	Centralisation	for	Formalisation
agl	Environmental Agility			inf	Infrastructure

whilst a medium level of horizontal differentiation, little vertical differentiation, and a relatively low level of spatial differentiation result in complexity overall being quite low. Centralisation is the lowest of all the organisations, the political and administrative insulation noted under *Restrictiveness* possibly accounting for the degree of decentralisation which is shown by the structure of the Commission's operations and which is atypical of government agencies in the United States. Formalisation varies only slightly across the Commission, this lack of variation being due to the high proportion of professional employees and an organisational culture which does not discriminate on status. The high formalisation indicated by the quality of the written job descriptions and their application was outweighed by the other elements. Despite its low relative score on environmental agility, the Commission is reasonably well aware of the activities of related organisations and of technological developments by which it may be affected, and maintains a high level of sensitivity to developments which may affect its operations. Endeavouring to change any potentially detrimental environmental demands, the Commission has also demonstrated a capability of accommodating externally induced change, and with flexible policies and a relatively adaptable structure is able to foster *pro*activity beyond the simple *re*activity which characterises many organisations.

The low score on infrastructure arises from the hindrance caused by boundaries between Commission departments, the organisational culture and/or the management style which tend to unnecessarily segregate departments from each other, and the consequential implications for resolution meetings.

As a Biosphere Reserve, involving issues related to both public and private land holdings, intergovernmental and public/private partnerships, and ecological sustainability and growth management, the Pinelands remains a testing ground for new approaches to land management.

THE CASE STUDIES
CHAPTER 9

THE CENTRAL PLATEAU CONSERVATION AREA

TASMANIA

THE CASE STUDIES
CHAPTER 9

CENTRAL PLATEAU CONSERVATION AREA TASMANIA

THE NATURAL AND SOCIO-CULTURAL ENVIRONMENTS

The Central Plateau Conservation Area (CPCA) forms part of the land mass of the Central Plateau which is a dominant feature of Tasmania's landscape. The main feature of the Central Plateau as a physiographic feature is a relatively undissected, dolerite-capped plateau sloping generally south-eastward from an average level of 1070 metres in the north to 600 metres in the south, and naturally drained by the Derwent River system. The Plateau as a whole covers 7.4 per cent of the area of the State, its boundary being well defined by a sharp rim on the west, the continuation of which on the north and east forming the Great Western Tiers - named somewhat paradoxically as they lie in the central north of the island. To the south, the Plateau boundary is arbitrarily taken as the 600 metre contour since the surface descends in a series of steps to the south (Davies, 1959). Again, as an entity, the Central Plateau contributes about 78 per cent of Tasmania's high mountain environments, and represents some 43 per cent of the alpine and subalpine areas in Australia (Costin, 1973).

With over 4,000 lakes, the Plateau is aptly known as the "Lake Country" of Tasmania. There are few comparable places in the world: Finland and the New Jersey Pine Barrens bear some similarity, but at much lower elevations, whilst parts of the Tibetan Plateau are also lake-bestrewn, but at a much higher altitude (Banks, 1973). The unique geological and geomorphological features of the Central Plateau provide a substrate supporting unusual plant communities. In turn, many animal species, some of which are themselves rare or endemic to the Plateau, depend directly or indirectly on these plant communities. As a consequence of fires, stock grazing, and rabbits, the Plateau has been significantly affected by sheet erosion, with some parts being some of the most severely eroded alpine and subalpine ecosystems in Australia. A new fungal disease *Phytophthora sp.* has affected numerous alpine plant

species in the Pine Lake area in the north-eastern part of the CPCA, and has caused the death of many species including ancient native pines.

The Central Plateau Conservation Area was originally proclaimed in 1982, with most of that area subsumed in 1990 within the Walls of Jerusalem National Park, and the CPCA being re-proclaimed over much of the earlier Central Plateau Protected Area. In 1999, the residue of this Protected Area was revoked as part of the Regional Forest Agreement and added to the CPCA, bringing the total area to 1,219 square kilometres - roughly 24 per cent of the physical Plateau [1]. The bounds and orientation of the present CPCA are shown in Figure 9.1, whilst the Area's zoning is shown in Figure 9.2. Together with the Walls of Jerusalem National Park with which the CPCA shares the Plateau's north-west, this area is extremely sensitive, and equates with the zone which requires the greatest protection as posited by Shepherd, Winkler, and Jones (1975). The Area's conservation values derive largely from the altitude - the highest point is 1420 metres - the associated high rainfall, and the lacustrine setting. The vegetation of the CPCA includes extensive areas of *Poa* grassland, with heath and shrub species predominating on ridges, and sedge and bog communities on poorly drained sites. At the highest elevations, the surface is usually covered by boulders interspersed with creeping and mat shrubbery. A few areas of true climax vegetation remain in the far north and west of the CPCA. Among the alpine plant communities are the woodlands of the endemic pencil pine (*Athrotaxis cupressoides* Don) which are the most extensive anywhere.

The CPCA forms part of the wider Tasmanian Wilderness World Heritage Area (TWHA), and although it comprises only just over six per cent of the TWHA, it contributes significantly to its conservation values. The CPCA encompasses diverse habitats, the "alpine plateau and mountain peaks, turbulent rivers, sheltered lakes ... and moorland" referred to in the formal WHA Description supporting flora and fauna that include many primitive groups of Gondwanan origins.

1

Original proclamation	*Tasmania, Statutory Rules* 1982 #13
Subsumption and re-proclamation	*Tasmania, Statutory Rules* 1990 #84
Revocation and Supplementation	*Tasmania, Regional Forest Agreement (Land Classification) Act* 1998 § 17(4)

FIGURE 9.1 THE CENTRAL PLATEAU CONSERVATION AREA : ORIENTATION
(Source: *Tasmanian Wilderness WHA Management Plan,* 1999)

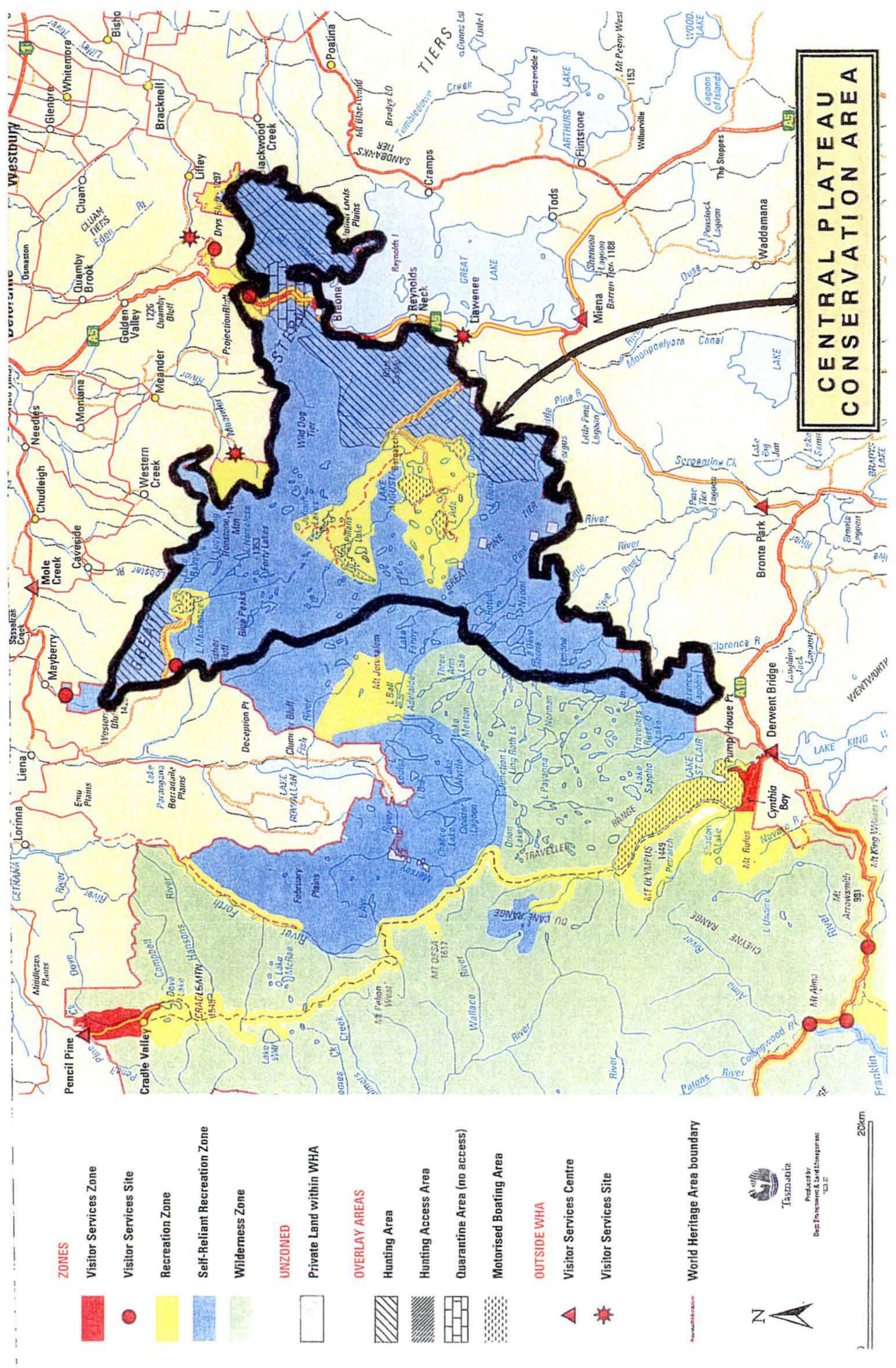


FIGURE 9.2 THE CENTRAL PLATEAU CONSERVATION AREA : ZONING

(Source: *Tasmanian Wilderness WHA Management Plan*, 1999)

Demographically and economically, the CPCA presents an unusual picture. There is no permanent residential population of the CPCA, the main human impacts coming from various forms of recreation, prominent amongst which are bushwalking (including guided tours), fishing, and hunting (in the Eastern and Northern parts of the CPCA). The CPCA nevertheless plays a significant economic role, particularly in that it includes the significant parts of the catchments of three hydro-electric schemes with a total of twenty power stations, the levels of Plateau Lakes McKenzie and Augusta having been artificially raised to increase generating capacity. Collectively, these schemes provide nearly 60 per cent of the long-term average power output of the State. Although guided walking tours may operate (subject to licence conditions and conformity with the Walking Track Management Strategy), commercial huts are explicitly excluded from the CPCA.

EVOLUTION OF THE PRESENT FRAMEWORK

In 1863, land in Tasmania was first set aside as "reserves for scenic purposes", and by 1899 Tasmania had twelve reserves, although National Park status had to await the comprehensive *Scenery Preservation Act* of 1915, and with this the establishment of the Scenery Preservation Board, which was the *first* authority in Australia to be set up for the creation and management of parks and reserves. Ironically, Tasmania was the *last* of the Australian States to establish a National Park.

The Board was responsible only for the protection of flora and the preservation of scenery and had no responsibility for the protection of fauna. From the 1850s to the 1920s, numerous Protection Acts were in force, intended mainly to control the trade in native animal skins. The *Animals and Birds Protection Act* 1928 introduced a hierarchical protection classification, a representative board to assume responsibility for the administration of the Act, and the capacity to reserve sanctuaries - innovations which underpin later legislation.

The late 1960s and early 1970s saw increasing concern over proposals to develop dams for power generation in the South-West Wilderness. While there was increasing support for the reservation of South-West Tasmania, the conservation-versus-development debate flared with the

proposal to flood Lake Pedder, and the world's first politically-based Green party - the United Tasmania Group - was formed in an attempt to prevent the inundation. A Legislative Council Select Committee was ultimately unable to save Lake Pedder but revealed that Tasmania lacked expertise in park management and wildlife conservation. It recommended a new system of managing the natural environment and particularly the establishment of a professional park service.

These recommendations were essentially embraced in the *National Parks and Wildlife Act* 1970 which repealed the *Scenery Preservation Act* 1915 and the *Animals and Birds Protection Act* 1928, and placed the management and control of parks, reserves, fauna and flora in the hands of a single authority, the National Parks and Wildlife Service. This authority commenced operations in 1971, with wide-ranging powers covering the management of parks, protection of fauna and flora, regulation of hunting, protection of Aboriginal relics, conduct of research, dissemination of information about conservation, and enforcement of regulations under the *National Parks and Wildlife Act* and, from 1975, the *Aboriginal Relics Act.* It is responsible for the planning and management of State Reserves (including national parks, nature reserves, Aboriginal sites, and historic sites), game reserves, and conservation areas.

In May 1987, the National Parks and Wildlife Service was amalgamated with the Department of Lands to form the Department of Lands, Parks and Wildlife, this agency being divided in 1989 to create the Department of Environment and Planning and Department of Parks, Wildlife and Heritage, the responsibilities of this latter agency including but going beyond lands reserved under the *National Parks and Wildlife Act.*

In 1989, significant additions were made to the Tasmanian Wilderness World Heritage Area (originally inscribed in 1982), the inclusion of the Central Plateau Conservation Area providing the Government with significant problems, as this was not a conventional "wilderness", but an area in which commercial grazing, hunting, and snaring, as well as recreational fishing, hunting, horse riding, and bushwalking were well-entrenched. As Hay (1994) suggested, there were potentially explosive conflicting values and use-claims which required delicate management. Such conflicts appear to derive from two kinds of difficulties: those stemming from spillover effects of particular activities and those

stemming from alleged discrimination in the distribution of social and/or economic benefits derived from development and use. Both spillovers and alleged benefit deficiencies raise two public interest issues which suggest the general boundaries of the administrative frame-of-reference required. The *first* concerns the level of efficiency achieved in developing and using the Plateau resources; the *second* relates to equity among those who benefit from environmental actions on the Plateau.

Inefficiencies in resource use or inequities in benefit distribution appear to be exacerbated by any significant fragmentation of governmental authority controlling resources and development. Whilst the Parks and Wildlife Service bore primary responsibility for the CPCA, some specialised aspects of the management of the Area fell to other State Government agencies - for example, the Hydro-Electric Commission and the Inland Fisheries Commission - as well as local government authorities. Each agency was its own master, and accordingly their management policies differed in detail depending on the interests of the particular agency. This detracted from the unity of purpose and available methods of public intervention, and thus was less than perfect in responding to the administrative requirements imposed by multiple use. There was a lack of congruence in the jurisdictions of government agencies and the areas in which environmental problems were located, thus inhibiting efforts to integrate management in a regional sense. This situation remains virtually unaltered today (the Hydro-Electric Commission is, however, now a Corporation). Total additions in 1989 brought the World Heritage Area to its current size of 13,800 square kilometres, or approximately 20 per cent of Tasmania. February 1993 saw yet a further amalgamation of agencies, this time the Department of Parks, Wildlife and Heritage linking with the Department of Environment and Land Management.

Following the appointment of a new Director of National Parks and Wildlife in early 1996, the Service underwent a major restructuring which resulted in the rationalisation of the four previous management areas and 23 districts into two divisions and seven districts. In the aftermath of the election of a Labor Government in September 1998, the Department of Environment and Land Management (of which the Parks and Wildlife Service was a division) further amalgamated to become the Department of Primary Industries, Water and Environment (DPIWE). After the resignation of the Director and the appointment of a successor as

General Manager from elsewhere within DPIWE, the opportunity was taken to hive-off the resource management and conservation functions from the Parks and Wildlife Service into stand-alone divisional status within DPIWE. This left the remnants of the Service in the form represented in Figure 9.5 as a division with that Department.

This forms the present context of the Parks and Wildlife Service.

Under the terms of the *National Parks and Wildlife Act* 1970, the term "Conservation Area" is applied to an area of land predominantly in a natural state, but mining and in some cases, hunting, may be permitted. The management objectives guiding the Parks and Wildlife Service as the management agency of the CPCA are as follows:

- to conserve natural biological and geological diversity and cultural significance;
- to provide for the controlled use of natural resources, including the:
  - preservation of water quality and protection of catchments;
  - exploration and controlled utilisation of mineral resources;
  - ecologically sustainable game hunting/fishing;
- to educate based on the purposes of reservation and/or the natural or cultural values of the area;
- to foster relevant research;
- to protect against and rehabilitate after adverse impacts of fire, introduced species, diseases, and soil erosion;
- to encourage tourism and recreational use consistent with the conservation of the area's natural and cultural values;
- to encourage cooperative management programmes with Aboriginal people in relevant areas consistent with management objectives.

(Parks and Wildlife Service, 1999a)

Neither the Act nor its supporting Regulations, however, provide explicitly for the possibility of incompatibility among the uses to which such a conservation area might be put, although *prima facie* zoning would allow for competing uses of resources. This parallels the zoning philosophy used by the Great Barrier Reef Marine Park Authority (Chapter 4).

There are two particular factors which should be considered here, as both have the potential to influence the management of the CPCA and the supporting organisational structures: *firstly,* the CPCA's status as an integral part of the Tasmanian Wilderness World Heritage Area (TWHA) allied with the fact that the Parks and Wildlife Service is the agency largely responsible for administering the TWHA (under the *aegis* of the

TWHA Consultative Committee[1] and the TWHA Ministerial Council[2]), and *secondly,* the community involvement ethos of the Parks and Wildlife Service as the managing agency of the CPCA itself.

The CPCA as a Component of the World Heritage Area

The CPCA is, of course, subject to the legal underpinning for the conservation of the TWHA which is provided under both Australian Federal legislation, namely the *World Heritage Properties Conservation Act* 1983 and *Conservation Amendment Act* 1988, and Tasmanian State legislation, notably the *National Parks and Wildlife Act* 1970, *Aboriginal Relics Act* 1975, *Crown Land Act* 1976, and *Forestry Act* 1920 (WCMC, 1997). Within this legal context, the initial policy framework and management prescriptions to guide management of the TWHA was provided by a management plan drafted under the provisions of the *National Parks and Wildlife Act* 1970. Once the draft had been modified to take account of public input (which, despite some criticisms, had been produced by an exhaustive process of public involvement started in 1989), together with the views of the TWHA Consultative Committee and the National Parks and Wildlife Advisory Council, it was approved by the TWHA Ministerial Council under the joint management arrangement between the Tasmanian and Commonwealth Governments, and came into force in September 1992. This initial plan took as its overall management objective the protection, conservation, presentation, and rehabilitation of the natural and cultural heritage, and pursued this through a set of zones and sub-zones intended to maintain and enhance wilderness and environmental quality and provide for a range of appropriate recreation and scientific activities.

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1 The TWHA Consultative Committee includes representatives of the following:

- Conservation interests
- Primary Industry
- Archaeology
- Bushwalkers
- Local Government
- Tourist Operators
- Botany
- Commonwealth interests
- Aboriginal Community
- TRLUF
- Freshwater Anglers
- Forest Industries
- Parks and Wildlife Service
- Environment Australia

(Tasmanian Wilderness WHA Consultative Committee, 1998)

N.B. TRLUF: an acronym for Traditional Recreational Land Users Federation - an amalgam of organisations such as the High Country Trail Riders, Mountain Huts Preservation Society, Mountain Cattlemen Association, various West Coast organisations from whence it sprung, game groups, and 4WD clubs.

2 The TWHA Ministerial Council comprises two representatives each from the Commonwealth and Tasmanian Governments.

Pursuing the intention of reviewing the plan within five years, the process of review commenced in early 1995, and included stakeholder and public consultation over a two-and-a-half year period, before publishing a draft plan in late 1997 for public comment and review. The final version of the 1999 management plan (which took effect in March 1999) is intended to span the subsequent ten years, this second management plan for the TWHA retaining much of the general thrust of the 1992 plan, however as a result of the extensive feedback, this plan also:

- incorporates greater community involvement in management;
- more closely integrates recreation and tourism interests;
- provides greater linkage to the World Heritage Convention; and
- adds a system of monitoring and evaluation for assessing achievement of the plan's objectives.

Whilst the plan has general application to the CPCA, there are also some specialised aspects of the plan which have an impact on the CPCA; these include continuing work on threats to the values of the area such as the *Phytophthora* outbreak, allowing traditional practices to continue where there is no negative impact on the values of the area, expanding fuel stove only areas to cover sites in the CPCA, allowing bait fishing in specified lakes, retaining existing hunting areas, and forming a partnership between the Service and members of the public to jointly manage publicly available huts (Parks and Wildlife Service, 1999b).

The Community Involvement Ethos of the Parks and Wildlife Service

The Parks and Wildlife Service's rationale for involving people outside the Service is best articulated in the concept of community partnerships which are conceived as mutually supportive and beneficial relationships between the Service and the community (Parks and Wildlife Service, 1997). Partners may have differing motivations and derive different benefits, but the essential element of such a partnership is a *shared goal,* the partnership proper emerging in the overlap between Service and community goals, as depicted in Figure 9.3.

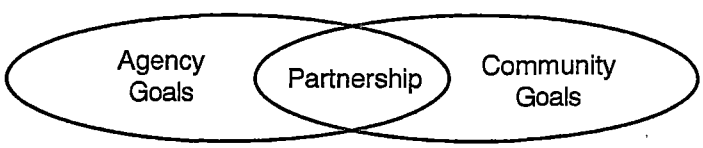


FIGURE 9.3 THE CONCEPT OF COMMUNITY PARTNERSHIPS
(Source: Parks & Wildlife Service, 1997)

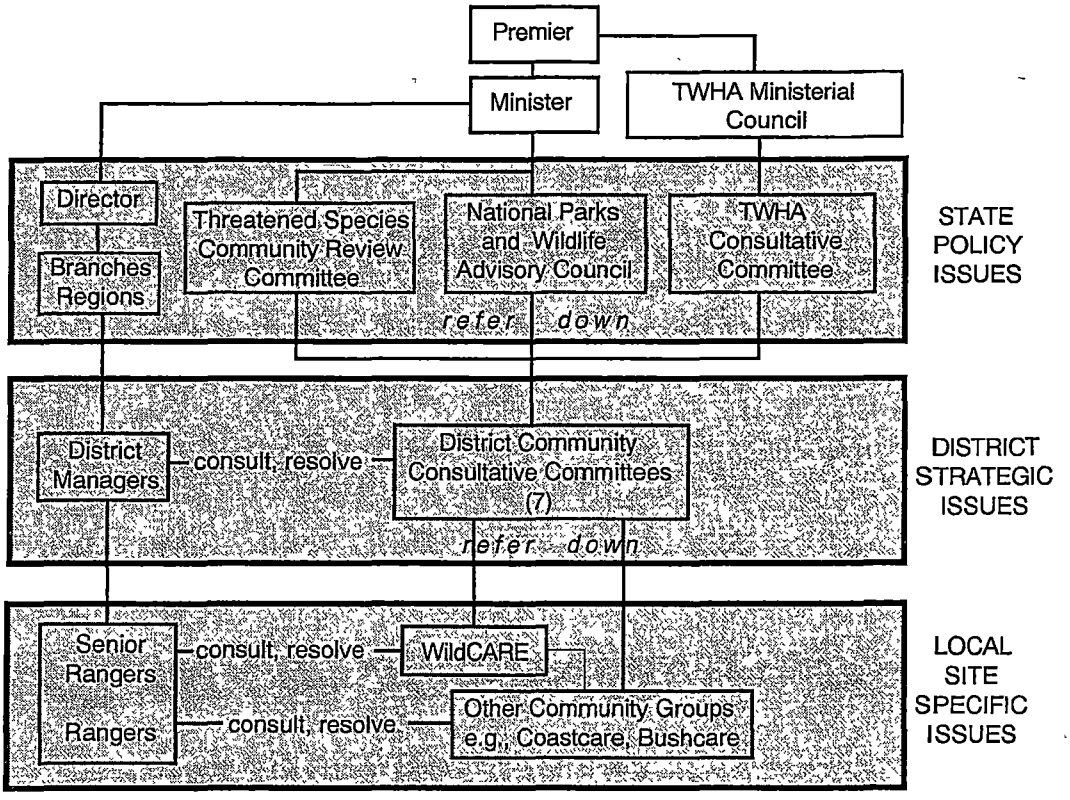
Without adequate monitoring and controls, such partnerships may "breed" covertly and exponentially, as evidenced by the Report prepared by the Chair of the National Parks and Wildlife Advisory Council in July 1997 which recommended a rationalisation of advisory committees from more than thirty - representing statutory, intergovernmental, geographical expertise, business, and external interest groups - to seven District-based committees. The Report indicated that many protected area systems include advisory committees as part of their institutional arrangements, primarily to receive expert and/or representative comment on programmes and proposals, but also to resolve difficulties, establish linkages with the broader community and gauge clientele satisfaction or dissatisfaction .

The remarks made by the Chair are intriguing:

> At the outset of the current review it became clear that virtually nobody within or outside the Parks Service had a clear knowledge of the existing pattern of advisory groups established to deal with issues and practice in national parks and protected areas management in Tasmania. Following an urgent query to Parks personnel and identifiable advisory groups, a list of PWS Advisory groups was assembled in late 1996. Nobody knew then whether this data was complete or entirely correct, but what did emerge was a somewhat disturbing picture. Clearly, numerous and somewhat disparate advisory groups had been established on an *ad hoc* basis over many years, without any adequate guidelines as to purpose, objectives, effectiveness, or accountability. Views were expressed indicating some groups were performing well, while others were dormant or perhaps no longer needed, given the most recent restructuring of the Service, the advent of special programmes such as Landcare and Coastcare, and improved means of public consultation on a variety of nature conservation matters.
>
> (National Parks and Wildlife Advisory Council, 1997)

Each of the seven Parks and Wildlife management districts (see Figure 9.1) has a District Community Consultative Committee (DCCC), the DCCC network serving the primary method for community input to Parks and Wildlife Service operations at a District level, and complements the older Parks and Wildlife Service community engagement programmes at the local level (*e.g.,* WildCARE) and at State policy level (*e.g.,* National Parks and Wildlife Advisory Council). WildCARE is made up of four branches - Nature Care, Community Action in Reserves (CARes), Heritage Care, and WildCARE Office - each linked to appropriate

FIGURE 9.4 INTEGRATED COMMUNITY CONSULTATION NETWORK
(Source: Parks & Wildlife Service, 1997)



branches of the Parks and Wildlife Service. The Bushcare programme provides funding to community groups to conserve remnant bushland and revegetate areas for the purposes of nature conservation and sustainable agriculture. Like Bushcare, Coastcare is a Federally initiated and funded programme, based on the Landcare model, and enjoys considerable success in involving the community, and in changing attitudes and behaviour. The framework of these principal institutions is illustrated in Figure 9.4.

PRIMARY DATA ANALYSIS

Prior to analysing the information obtained by interview and questionnaire, the levels of correlation for this primary data were established:

- amongst respondents from within the Parks and Wildlife Service;
- amongst outside observers;
- between Parks and Wildlife Service respondents and outside observers.

After validation, the primary data was summarised in the form of key descriptive statistics, before the analysis proceeded to assessments of CPCA-associated variables in the Service's external environment and in the core dimensions and allied factors of its organisational structure.

VALIDATION OF SOURCE DATA

As shown in Table 9.1, data from respondents within the Parks and Wildlife Service as the managing agency for the Central Plateau Conservation Area yielded a coefficient of multiple correlation of 0.928 significant at the 0.01 level, and this, together with a coefficient of multiple determination of 0.861, indicates a reasonable level of correlation amongst respondents. Insofar as correlations between the responses of observers outside the Parks and Wildlife Service are concerned, Table 9.1 reveals a coefficient of multiple correlation of 0.967 significant at the 0.01 level, this second lowest correlation being confirmed by the

TABLE 9.1 CENTRAL PLATEAU CONSERVATION AREA DATA CORRELATIONS AMONGST AND BETWEEN AGENCY RESPONDENTS AND OUTSIDE OBSERVERS

Coefficient Type	Correlation amongst Agency Respondents *N= 6*	Correlation amongst Outside Observers *N=5*	Correlation between Agency and Outside Respondents
Coefficients of Multiple Correlation *[R]*	0.928	0.967	0.866
Coefficients of Multiple Determination *[R^2]*	0.861	0.935	0.750

All correlations significant at the 0.01 level *Source: Survey Data*

coefficient of multiple determination of 0.935. Nevertheless there were some significant discrepancies on *Environmental Agility,* on which the responses from outside observers on the Central Plateau Conservation Area revealed a correlation coefficient of 0.213. The arithmetic means of raw data from respondents within the Service were compared with the mean responses from the outside observers. From Table 9.1 it can be seen that the managing agency for the Central Plateau Conservation Area exhibited the lowest coefficient of multiple correlation, 0.866 at a significance level of 0.01, with a coefficient of multiple determination of 0.750.

DESCRIPTIVE STATISTICS

As a synopsis of the data, selected descriptive statistics for responses on both the external environment and the core dimensions and allied factors of organisational structure are summarised in Table 9.2.

Of the environmental variables, the assessments of *heterogeneity* and *turbulence* were relatively more uniform than any of the other variables with, at the other end of the variability spectrum, *restrictiveness* presenting the most disparate series of assessments, varying by an average of 32.9 per cent about the mean of the data set. With a coefficient of variation of 37.8 per cent, the assessments of the level of *delegation* display the largest dispersion amongst the core dimensions and allied factors of organisational structure, although this was atypical of the data. *Sophistication of control and information systems* and *formalisation* presented the lowest relative dispersions, although these were not far removed from the remaining variables.

TABLE 9.2 CENTRAL PLATEAU CONSERVATION AREA SELECTED DESCRIPTIVE STATISTICS

- EXTERNAL ENVIRONMENT
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

	Arithmetic Mean [1]	*Coefficient of Variation (%)*
External Environment		
Heterogeneity	6.0	16.7
Turbulence	11.1	19.1
Hostility	13.5	23.8
Technological Complexity	4.6	26.0
Restrictiveness	4.7	32.9
Core Dimensions and Allied Factors of Organisational Structure		
Delegation	15.7	37.8
Sophistication of Control and Information System	47.1	10.9
Complexity	20.2	14.7
Centralisation	36.2	13.4
Formalisation	30.2	10.7
Environmental Agility	30.8	14.6
Infrastructure	19.5	16.9

1 Based on a confidence level of 95 per cent. *Source: Survey Data*

ASSESSMENT OF VARIABLES IN THE EXTERNAL ENVIRONMENT

Substantial portions of this assessment derive from information provided by respondents within the Parks and Wildlife Service and outside observers during interviews, in their additional comments on questionnaire items, or in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited.

Heterogeneity

Insofar as the Parks and Wildlife Service's management of the CPCA is concerned, the heterogeneity of the environment of the Service may be gauged from the diversity of the stakeholders who have direct interests in the CPCA, together with those which have some sort of custodial role over the Area. Outside observers generally presented comprehensive inventories of the stakeholders in the CPCA, although these were readily categorised into the following groups: recreational fishermen, bushwalkers, horseriders, field naturalists, as well as hydro-electric power generation and mining interests. Apart from these stakeholder interests, the Parks and Wildlife Service has an extensive set of interactions with numerous government bodies and NGOs, such as those included in the integrated community consultation network (Figure 9.4). Prominent in this latter group are those bodies which have an interest in the CPCA by virtue of it forming part of the Tasmanian Wilderness World Heritage Area (TWHA) - the Tasmanian Wilderness World Heritage Area Ministerial Council and the TWHA Consultative Committee. Other institutional elements of the Service's environment include the National Parks and Wildlife Advisory Council and the Threatened Species Community Review Committee which, functioning at a Statewide level, have an intrinsic interest in the CPCA. All but one quite minute area falls within the Service's Central North District and accordingly comes within the purview of that District's Community Consultative Committee, whilst at the local site level, the bodies which have at least a periodic interest in the CPCA are legion. In terms of its management of the CPCA, the environment of the Parks and Wildlife Service achieved a moderate rating on heterogeneity in absolute terms, an assessment which was borne out in relative terms (see Table 9.3), with the environment exhibiting an average heterogeneity score almost precisely on the mean

of the six organisations examined here, and a low variation amongst respondents as shown by the coefficient of variation of 16.7 per cent.

TABLE 9.3 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HETEROGENEITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	5.8	13.6
Ngorongoro Conservation Area Authority	5.9	18.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	5.9	11.8
Peak National Park Authority	6.4	8.3
Pinelands Commission	6.4	8.2
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**6.0**	**16.7**
Over All Six Organisations	6.1	13.1

Source: Survey Data

Turbulence

Considered from the standpoint of environmental dynamism, the opinion of outside observers was uniformly consistent in holding that the environment in which the Parks and Wildlife Service carries out its management of the CPCA had seen little change in recent years, although some observers noted that there was evidence of limited change in cultural dimensions, and that eco-tourism is beginning to make an impact on that environment. Outside observers generally maintained that, despite the stability of the environment of the Service, there were infrequent fluctuations in the environment which were largely unpredictable, adding that this was exacerbated by certain politicians who from time to time emphasise their own agendas, *e.g.,* concerning access to and management of fishing waters. As shown in Table 9.4, over all respondents, the environment of the Parks and Wildlife Service with respect to the CPCA rated below the mean, and ranked with the New Jersey Pinelands as the least turbulent of the six organisations. The coefficient of variation at 19.1 per cent indicated that variation between respondents was slightly higher than with heterogeneity, but still within acceptable limits.

TABLE 9.4 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - TURBULENCE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.2	10.8
Ngorongoro Conservation Area Authority	12.6	12.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	11.4	9.9
Peak National Park Authority	12.1	14.6
Pinelands Commission	11.2	19.8
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**11.1**	**19.1**
Over All Six Organisations	11.7	15.4

Source: Survey Data

Hostility

In the quantitative terms as summarised in Table 9.5, this environment ranked third in the level of hostility, although it should be noted that the coefficient of variation of almost 24 per cent indicated quite a high degree of variation in some aspects of responses. Nevertheless, in terms of environmental risk, there was unanimity amongst outside observers that the Parks and Wildlife Service is the best equipped organisation to manage the CPCA, and that the Service has all the necessary expertise to manage the area, although additional funding and labour would always be desirable to facilitate the fulfilment of the objectives for the CPCA within the wider Tasmanian Wilderness World Heritage Area. There were, nevertheless, some suggestions that, if governments wish to be consistent with the trends in other fields, they may increasingly allow private enterprise and special interest groups to take over management of certain functions, *e.g.,* private businesses might assume some responsibility for the control of tourist operations, and fishing organisations may be allowed to manage certain waters. Respondents considered that many environmental opportunities exist but that there are severe limitations in terms of funding and labour to exploit these opportunities. From the standpoint of environmental dominance, respondents generally considered that the Parks and Wildlife Service has to struggle to ensure the management of the long term objectives for

the area are kept on track and achieved, principally because the objectives of business and of politicians are generally short term and related to self interest.

TABLE 9.5 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - HOSTILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	12.6	20.2
Ngorongoro Conservation Area Authority	13.6	19.9
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	12.1	14.6
Peak National Park Authority	14.7	21.7
Pinelands Commission	12.0	20.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**13.5**	**23.8**
Over All Six Organisations	13.0	20.8

Source: Survey Data

Technological Complexity

From the average scores on technological complexity highlighted in Table 9.6, the environment of the Parks and Wildlife Service in its management of the CPCA falls below the mean of the agencies examined in this work, and is in fact the second lowest rating of all the organisations. There was, however, significant variability in the ratings, as demonstrated by the coefficient of variation of 26 per cent, some respondents considering that the advanced technology used by the Service in its research activities indicated a generally high level of complexity, others citing the marginally lower level of technology which typifies program delivery and intra-departmental communications as symptomatic of a low level of complexity overall, whilst still others saw the Service's Internet site as, variously, an instance of advanced technology in the provision of public information services and as a poorly maintained example of over-concern with the Service's public image. It is conceivable that some of the variability may have resulted from some respondents considering the Service as a whole rather than only in relation to its role vis-à-vis the CPCA.

TABLE 9.6 COMPARISON OF DESCRIPTIVE STATISTICS
- EXTERNAL ENVIRONMENT - TECHNOLOGICAL COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.8	19.1
Ngorongoro Conservation Area Authority	4.9	22.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	4.0	20.4
Peak National Park Authority	5.3	21.1
Pinelands Commission	4.7	21.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**4.6**	**26.0**
Over All Six Organisations	4.7	21.3

Source: Survey Data

Restrictiveness

Respondents from within the Service as well as outside observers consistently reported that constraints are a fact of life for the Service, some respondents weighting economic factors as most constraining - particularly in managing the CPCA - and attaching lesser significance to social and political factors. In this vein, a matter raised by several outside observers was that at times, the Parks and Wildlife Service's salary budget has been of such magnitude that few funds have been left for existing and future operations and infrastructure. It was opined that the jurisdiction of the Service has gradually been expanding, but that this has not been matched with resource growth. As noted later under *Environmental Agility,* awareness of political, legal, and social developments is considered to be adequate, although it was considered that at times there is a lack of political will-power to support some developments. In sum, and as summarised in Table 9.7, the Service showed the second highest level of restrictiveness of all six organisations, and although responses varied considerably, this was not as much as the coefficient of variation of almost 33 per cent might suggest.

TABLE 9.7 COMPARISON OF DESCRIPTIVE STATISTICS
• EXTERNAL ENVIRONMENT - RESTRICTIVENESS

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	4.2	29.3
Ngorongoro Conservation Area Authority	4.6	27.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	3.7	45.9
Peak National Park Authority	4.9	25.0
Pinelands Commission	4.1	35.3
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**4.7**	**32.9**
Over All Six Organisations	4.4	31.8

Source: Survey Data

ASSESSMENT OF VARIABLES IN THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

As with the assessment of environmental variables, appreciable portions of the assessment here derive from information provided by respondents within the Parks and Wildlife Service and outside observers during interviews, in their additional comments on questionnaire items, or in other communications. In accordance with the assurances of anonymity given to all respondents, no attributions have been made. Secondary sources have, of course, been cited. The organisational structure of the Parks and Wildlife Service forms the context of the core dimensions and allied factors of the structure of the Service. A chart of the main structural elements of the Service is accordingly provided as Figure 9.5 to furnish a background against which to project the discussion of each dimension and factor.

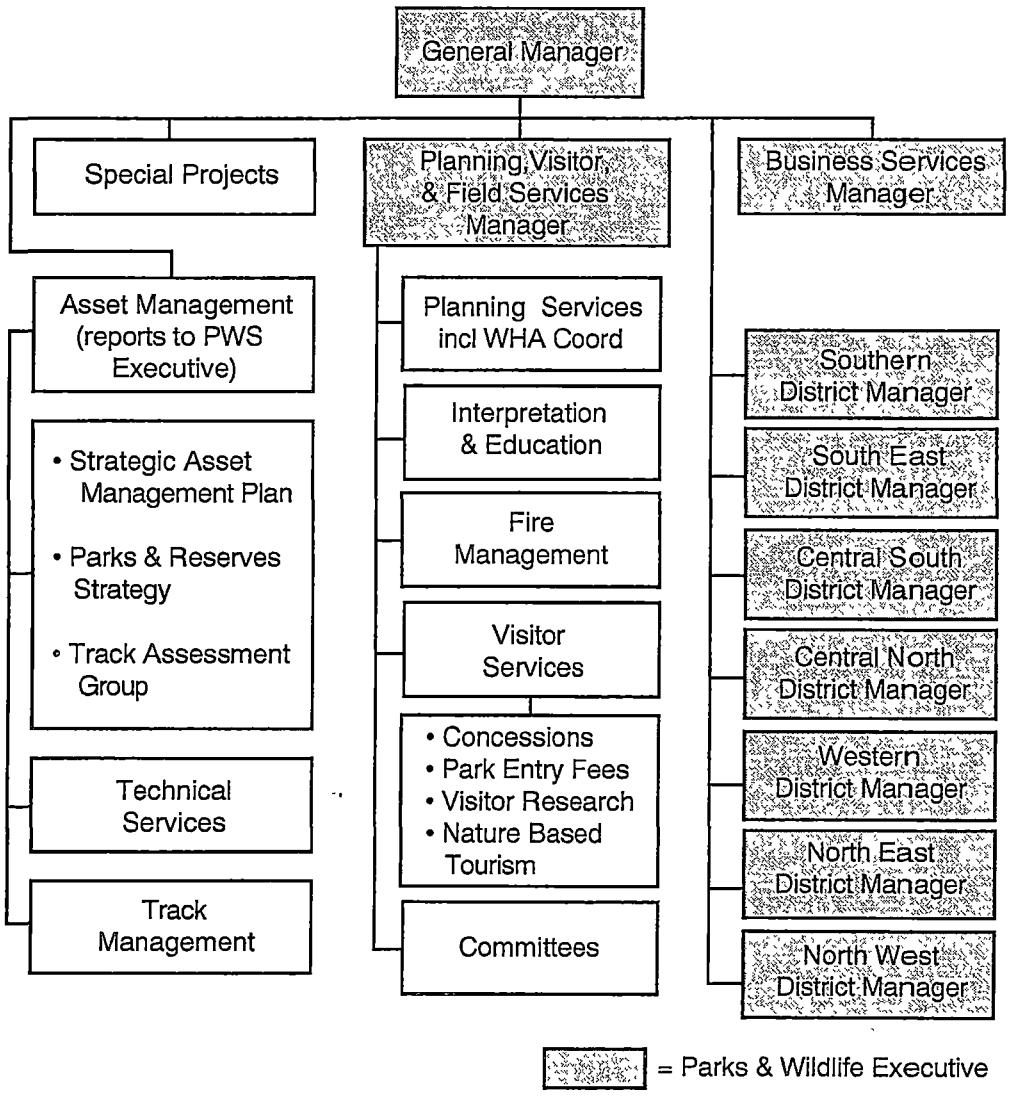
The Service underwent some restructuring in the latter part of 2000, and although all questionnaires were completed prior to this restructuring, it was considered inappropriate to seek consequential quantitative data from respondents. Comments were, nevertheless, solicited from two agency respondents and two outside observers in relation to the effects of the structural changes on the Service. Their responses are noted under the appropriate headings.

Delegation

One of the prime bases on which the TWHA Management Plan (which covers the CPCA) is constructed is the objective of decentralising management functions and delegating management decisions and responsibility to field bases in order to increase efficiency and effectiveness. The pursuit of this objective is influenced by the way in which two potentially incompatible forces interact - on the one hand, the professionalism inherent in the Parks and Wildlife Service favours a high degree of delegation, whilst on the other, the overlying bureaucratic outlook induced by the public service culture (but paradoxically not

FIGURE 9.5 ORGANISATION CHART OF THE TASMANIAN PARKS AND WILDLIFE SERVICE

(as at November 2001)



Source: Parks and Wildlife Service, 2001

fostered by the new General Manager of the Service, a career public servant) does not reconcile easily with delegation (see also *formalisation*). These forces may well account for the high coefficient of variation which, at almost 38 per cent, indicated considerable variation in the ratings of delegation in the Parks and Wildlife Service, making the Service's score on delegation (the second highest) somewhat suspect (see Table 9.8). Delegation throughout the Parks and Wildlife Service is generally consistent with the level of responsibility concerned, although there have in the past been instances in which District boundaries were incompatible with the delegation involved, creating difficulties in managing some aspects of the CPCA. The Service as a whole is subject to the general constraints which apply to the Tasmanian State Service, including the retention by the General Manager as Head of Agency of some key decision areas, such as the selection and dismissal of senior personnel. There is some degree of delegation in negotiating pay and conditions of work, but the *Tasmanian State Service Act* 1984 designates specific authority to both Heads of Agencies and the Commissioner for Public Employment which circumscribe the extent to which delegation is possible in these matters. By way of contrast, there is a high degree of delegation of decisions which involve the development of new initiatives or services, or at a tactical level, marketing decisions relating to new or existing services. Following the restructuring which occurred in late 2000, all four respondents from whom comments were solicited agreed that the restructure would, *prima facie,* increase the level of delegation in the Service, although there was no implication that delegation had previously been low.

TABLE 9.8 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DELEGATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	13.5	30.1
Ngorongoro Conservation Area Authority	11.2	23.3
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	15.4	24.2
Peak National Park Authority	11.4	25.7
Pinelands Commission	17.8	31.0
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**15.7**	**37.8**
Over All Six Organisations	14.4	34.0

Source: Survey Data

Sophistication of Control and Information System

The quantitative assessments shown in Table 9.9 reveal that the level of sophistication of the control and information system is high, and marginally above the mean of the six organisations. Irrespective of whether they were internal or external to the Parks and Wildlife Service, respondents generally agreed on almost all aspects of this variable, confirmed by the low coefficient of variation of 10.9 per cent. Internal respondents indicated that the control and information system conforms with the Service's decision making needs with respect to the CPCA at all levels, a view shared by outside observers with only minor disagreements. Amongst these observers, quality controls were commonly held to be less than adequate, although there was significant variation in their opinions on the standard of cost control in the Service. The organisational structure of low complexity, formalisation, and centralisation which should theoretically follow from the high level of sophistication achieved in the Service's control and information system is borne out in reality. The sole anomaly here is that the level of formalisation might have reasonably been expected to be somewhat higher, given the influence of the culture and regulation of the Tasmanian Public Service. The conclusion may therefore be drawn that the control and information system substantially matches the Service's needs.

TABLE 9.9 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - SOPHISTICATION OF CONTROL AND INFORMATION SYSTEM

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	44.8	14.9
Ngorongoro Conservation Area Authority	45.9	17.8
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	44.7	13.9
Peak National Park Authority	45.6	17.1
Pinelands Commission	47.1	8.9
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**47.1**	**10.9**
Over All Six Organisations	45.9	13.3

Source: Survey Data

None of the respondents interviewed after the last restructuring felt that there was anything to suggest that the organisational changes would occasion any significant change in the level of sophistication in the control and information system.

Complexity

With a coefficient of variation at 14.7 per cent indicating a low variability, the ratings of the Service's complexity shown in Table 9.10 are marginally above the mean of the six organisations under study, although only a modest level of complexity exists in absolute terms.

TABLE 9.10 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - COMPLEXITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	19.4	19.0
Ngorongoro Conservation Area Authority	20.4	17.6
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.4	14.0
Peak National Park Authority	20.9	19.7
Pinelands Commission	19.8	17.1
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**20.2**	**14.7**
Over All Six Organisations	19.8	16.7

Source: Survey Data

This is lent support by the basic form of the organisation structure, Figure 9.5 highlighting each aspect of the Service's complexity. There is a medial level of horizontal differentiation - denoted by the moderate levels of specialisation and departmentation, low *vertical* differentiation as indicated by the number of levels in the hierarchy, together with the relatively low level of spatial differentiation connoted by the small spread of the Service's field offices insofar as management of the CPCA is concerned. Comments by those respondents whose opinions were sought on the restructuring in 2000 were conclusive that the restructure *would* change the complexity of the Service, at least insofar as the number of hierarchical levels was concerned. One of the internal respondents considered that other elements might also be affected by the changes, but declined to expand upon this.

Centralisation

The low degree of centralisation indicated by the quantitative data in Table 9.11 (appreciably below the mean for the six organisations) was also consistently reported by respondents from within and outside the Service, this low variability being confirmed by the coefficient of variation at 13.4 per cent. As observed under delegation, the Service is subject to

TABLE 9.11 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - CENTRALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	36.6	15.2
Ngorongoro Conservation Area Authority	40.1	11.1
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	36.0	15.9
Peak National Park Authority	40.6	9.7
Pinelands Commission	35.1	14.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**36.2**	**13.4**
Over All Six Organisations	37.2	14.0

Source: Survey Data

the general constraints which apply under the *Tasmanian State Service Act* 1984. The influence of this legislation may be gauged from the nature of the primary matters on which the Service demonstrates clear centralist tendencies, *i.e.,* in restricting the discretion of first-line supervisors over establishing their budgets and over staff rewards such as salary increases and promotions. These constitute the only significant evidence in the Service of the centralist tendencies of other Tasmanian Government agencies, and on balance, the emphasis in the Service's structure now appears to be on decentralisation, a clear example of which is afforded by its management of the Central Plateau Conservation Area. The respondents who commented upon the restructure in 2000 were unanimous in holding that the restructure would have some impact on centralisation, but there was an unwillingness to predict the type *or* level of change. In relation to its management of the CPCA at least, the Service may be seen as bearing out the theoretical relationship between delegation and centralisation.

Formalisation

The quantitative data in Table 9.12 reveals formalisation in the Service to be only marginally above the lowest level as manifest by the Pinelands Commission, and still below the mean of the six organisations under study, the low coefficient of variation (10.7 per cent) indicating a high degree of agreement amongst respondents. A low level of formalisation such as this implies that there is considerable latitude and freedom to exercise discretion, an insignificant level of programmed behaviour, and few standardised guidelines. With the exception of the last, these factors

TABLE 9.12 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - FORMALISATION

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	30.6	7.7
Ngorongoro Conservation Area Authority	30.9	9.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	30.9	7.1
Peak National Park Authority	31.0	9.7
Pinelands Commission	29.8	10.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**30.2**	**10.7**
Over All Six Organisations	30.5	8.9

Source: Survey Data

are consistently reflected in evidence from other sources on the Parks and Wildlife Service, it being a moot point as to whether the Service over-utilises such guidelines. Insofar as the restructuring in 2000 was concerned, one outside observer was ambivalent on whether formalisation would be affected by the restructuring, whilst the remaining three respondents considered that the concomitant changes would have no effect on this factor, whether in relation to the CPCA or in a wider ambit. Given its high degree of professionalism, it is probable that the Service would have been accorded an even lower rating on formalisation had it not been for an overlying bureaucratic outlook spawned by the public service culture. As in some of the other organisations studied, these two potentially incompatible forces interact, but in the case of the Parks and Wildlife Service, professionalism appears to prevail, resulting in the low level of formalisation.

Environmental Agility

In terms of environmental awareness, the Parks and Wildlife Service was considered to maintain a reasonable level of consciousness of the various parties which have an interest in the CPCA, together with an adequate awareness of political, legal, and social developments which may have an impact on the Service's operations. Nevertheless, this awareness is frustrated somewhat by the lack of political will-power and support to proceed with particular developments. The Parks and Wildlife Service is regarded as sufficiently aware of technological developments, but shortcomings in funding and staffing tend to hinder capitalising on that awareness. In dealing with environmental change, respondents inside and outside the Parks and Wildlife Service were in general agreement that the Service is usually slow to respond to changes, often with good reason, as the majority of changes mooted are usually short-term and politically driven.

Adaptation to environmental changes is satisfactory, with a management plan prepared for the Area and updated about every five years. Both the Parks and Wildlife Service and stakeholders have input to the plan, so in theory, there should be few changes for the Service to deal with during the course of the plan. The quantitative data in Table 9.13 offers a succinct summary of the Service's agility vis-à-vis the environment: in absolute terms, the Service rates as the second lowest, well below the mean of the six organisations under review here. None of the respondents who commented on the restructuring of 2000 felt that there was anything to suggest that those changes would occasion any significant change in environmental agility.

Infrastructure

Before the structure which the Authority introduced in 2000 came into effect, there was a broad consensus amongst respondents that inter-unit meetings effectively resolved any friction between core and support functions within a District, between specialisations at the Service's Head Office, or between Districts where jurisdictional difficulties occasionally arose because of inappropriate District boundaries, *e.g.,* in the case of

TABLE 9.13 COMPARISON OF DESCRIPTIVE STATISTICS
- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - ENVIRONMENTAL AGILITY

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	32.9	9.9
Ngorongoro Conservation Area Authority	33.4	9.0
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	31.3	11.0
Peak National Park Authority	31.1	14.4
Pinelands Commission	29.8	17.6
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**30.8**	**14.6**
Over All Six Organisations	31.5	13.0

Source: Survey Data

the CPCA, management conflicts over the extreme north-western section of the Plateau which fell within the bounds of the then Northern District but which needed to be managed and monitored with the bulk of the CPCA by the Central North District. There was one matter on which there was a clear-cut difference between the perceptions of internal respondents and those of outside observers. On the one hand, respondents within the Service considered that internal boundaries caused minimal interference with achieving solution to problems common to more than a single organisational unit, whilst on the other, outside observers were of the opinion that such boundaries frequently interfered with solving joint problems.

Quantitatively the Service showed a rating equating with the mean of the six organisations, and in absolute terms, the data suggested an infrastructure in the mid-range of the possible scores (see Table 9.14). The coefficient of variation at 16.9 per cent indicated a slightly elevated variability amongst respondents, although this was deemed to be acceptable on the grounds that the remaining differences between respondents seemed to be largely matters of degree.

TABLE 9.14 COMPARISON OF DESCRIPTIVE STATISTICS

- CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - INFRASTRUCTURE

	Arithmetic Mean	*Coefficient of Variation (%)*
Great Barrier Reef Marine Park Authority	20.4	12.5
Ngorongoro Conservation Area Authority	20.9	12.2
King Mahendra Trust for Nature Conservation as manager of the Annapurna Conservation Area Project	18.6	10.2
Peak National Park Authority	20.0	5.8
Pinelands Commission	18.0	14.4
Tasmanian Parks and Wildlife Service as manager of the Central Plateau Conservation Area	**19.5**	**16.9**
Over All Six Organisations	19.5	13.3

Source: Survey Data

Respondents commenting on the organisational changes in late 2000 were unanimous in holding that the restructure would, in principle, change overall infrastructure, with consequential effects on the Service's management of the CPCA. Although there was some variation in the potential changes which they suggested, each of these respondents identified the likelihood that the restructure would improve the division of work by further integrating task performance, rather than the disjointing of tasks amongst different units. There was some support for a possible (but to paraphrase one respondent 'highly improbable') reduction in both the level of influence of internal boundaries and the frequency and duration of meetings.

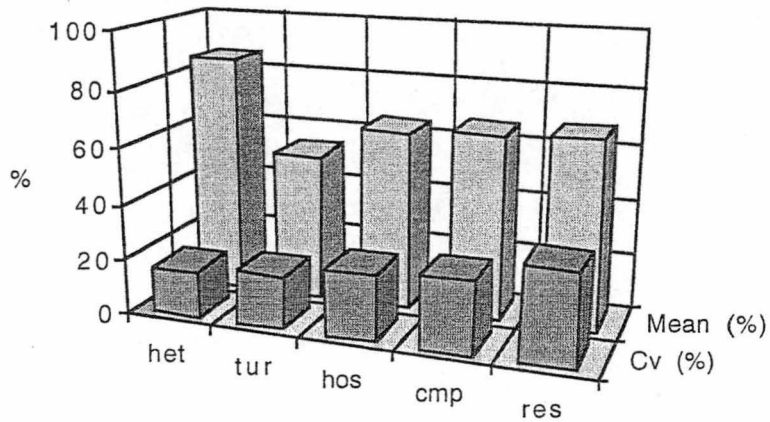
What seems clear from the available material is that there is a strengthening of the rôle of the seven Districts. For example, under the new arrangements, regional planning staff report directly to the Head of Planning Services in Hobart, but remain outposted and work closely with the District Managers in carrying out their work programme. Much the same approach applies to regionally-based Interpretation staff and Wildlife Rangers. It is anticipated that a mooted review of District Managers' position descriptions will, *inter alia,* improve the balance of authority, responsibility, and accountability which vests in these positions, and place greater reliance upon their work in pursuing the goals of the Service.

SUMMARY

EXTERNAL ENVIRONMENT

The relative potency of each environmental variable may be judged from the means expressed in percentage form in Figure 9.6, in which the statistical measures for the five aspects of the Service's environment are summarised graphically, providing an overview of the environment of the Tasmanian Parks and Wildlife Service.

FIGURE 9.6 TASMANIAN PARKS & WILDLIFE SERVICE AS MANAGER OF THE CENTRAL PLATEAU CONSERVATION AREA
EXTERNAL ENVIRONMENT - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

het	Heterogeneity	tur	Turbulence	hos	Hostility
cmp	Technological Complexity			res	Restrictiveness

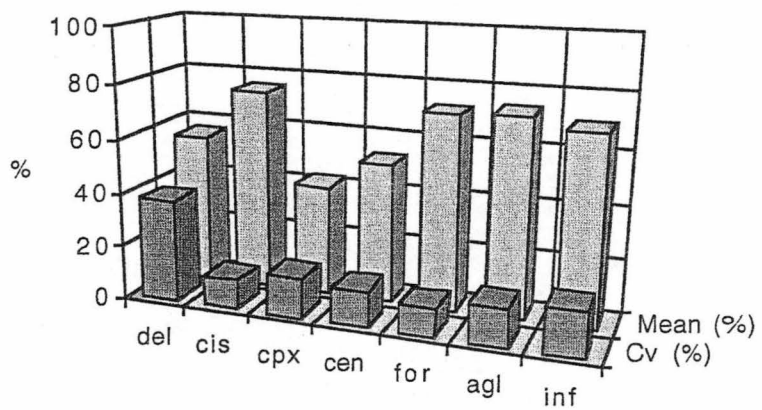
Insofar as heterogeneity is concerned, there is considerable diversity amongst the stakeholders who have direct interests in the CPCA, together with those which have some sort of custodial role over the Area, including fishermen, bushwalkers, horseriders, field naturalists, hydro-electric power generation, mining interests, government bodies and NGOs, prominent amongst which are those bodies which have an interest in the CPCA as part of the Tasmanian Wilderness World Heritage Area. Turbulence is low in the environment in which the Parks and Wildlife Service carries out its management of the CPCA, and may be viewed as relatively stable, although eco-tourism is beginning to have an influence. There are occasional, largely unpredictable fluctuations, exacerbated by some politicians in emphasising their own agendas.

Many environmental opportunities exist but there are severe limitations in terms of funding and labour to exploit these opportunities. There is some hostility in that the Service has to struggle to ensure the management of the long term objectives for the area are kept on track and achieved, the objectives of business and of politicians being generally short term and motivated by self interest. The advanced technology used by the Service in its research activities indicated a generally high level of technological complexity, with marginally lower levels of technology typifying program delivery and intra-departmental communications, symptoms of a low level of complexity overall. Economic factors probably account for most of the restrictiveness, with social and political factors of lesser significance. The Service's salary budget has been of such magnitude that few funds have been left for existing and future operations and infrastructure.

CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE

The relevant statistical measures with the means expressed as percentages are summarised in graphical format in Figure 9.7. This creates an overview of the core dimensions of the Trust's organisation together with ancillary structural factors.

FIGURE 9.7 TASMANIAN PARKS & WILDLIFE SERVICE AS MANAGER OF THE CENTRAL PLATEAU CONSERVATION AREA
CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE - DESCRIPTIVE STATISTICS



Key to Abbreviations: *Source: Survey Data*

del	Delegation	cis	Sophistication of Control & Information System		
cpx	Complexity	cen	Centralisation	for	Formalisation
agl	Environmental Agility			inf	Infrastructure

The CPCA is covered by the TWHA Management Plan, to which delegation is central. In order to increase efficiency and effectiveness, the central objective is to decentralise management functions and delegate management decisions and responsibility to field bases. The level of delegation is generally consistent with the level of responsibility concerned, aside from instances in which District boundaries were incompatible with the delegation involved, creating difficulties in some aspects of the CPCA management. The Service as a whole is subject to the general constraints of the *Tasmanian State Service Act* which, *inter alia,* designates specific authority to both Heads of Agencies and the Commissioner for Public Employment which circumscribe the extent to which delegation is possible. The control and information system substantially matches the Service's needs. Quality controls were commonly held to be less than adequate, and the standard of cost control in the Service was considered to be questionable.

The modest level of complexity which exists may be seen reflected in each aspect of the Service's complexity: a moderate level of horizontal differentiation, shallow vertical differentiation, and a relatively low level of spatial differentiation insofar as management of the CPCA is concerned. Centralisation in the Service is a key issue: constrained by the influence of the culture and regulation of the Tasmanian Public Service, the discretion of some of the staff of the Service is restricted, however the current emphasis in the Service (including its management of the Central Plateau Conservation Area) appears to be decentralisation, and centralisation is accordingly low. The tendency toward a low level of formalisation in the Service implies that there is considerable latitude and freedom to exercise discretion, an insignificant level of programmed behaviour, and few standardised guidelines. Two potentially incompatible forces interact - a high degree of professionalism and an bureaucratic outlook as an overlay - with professionalism appearing to prevail. The Service maintains a reasonable level of environmental agility, with sufficient awareness of technological developments, but capitalising on that awareness is hindered by shortcomings in funding and staffing. Adaptation to environmental changes is satisfactory, although the Service is usually slow to respond to changes. There is a strengthening of the rôle of the seven Districts in relation to infrastructure, and inter-unit meetings have been used in resolving friction in most areas of the Service. The rôle of internal boundaries in achieving solution to problems across organisational units is perceived differently

by respondents within the Service and by outside observers, on the one hand viewed as causing minimal interference, whilst on the other, seen as frequently interfering.

A common thread in the comments from outside observers was that there are two cultures within the Parks and Wildlife Service, a legacy of defensive, conservation orientated individuals contrasting with those who recognise contextual factors and political realities, but are geared to innovation and broader community concerns. There was consensus that the elimination of the bunker mentality is difficult, but equally there was agreement that this *is* gradually occurring. The main area of contention in some of the views put forward by outside observers is that the Parks and Wildlife Service is managing the CPCA for the long term (for decades and centuries ahead), whereas politicians and interest groups tend to have much shorter time horizons, usually only the next five to ten years.

PART 3

CROSS-CASE ANALYSES

PART 3

CROSS-CASE ANALYSES

Whilst there is only one chapter in Part 3, this Preface serves the essential purpose of providing much of the crucial backing for Chapter 10. The focus here is on analyses spanning the six case studies of the protected areas, Chapter 10 focusing on the development of a prototype profile of the relationship between environment and structure.

VALIDATION OF SOURCE DATA

As indicated in the preamble to Part 2, one aspect of the validation of data involved establishing the correlation of the data amongst agency respondents, amongst outside observers, and between agency respondents and outside observers. Table P3.1 summarises the coefficients of multiple correlation and coefficients of multiple determination as presented in the chapters dealing with each agency.

DATA CORRELATIONS AMONGST AGENCY RESPONDENTS

As shown in Table P3.1, data from respondents within agencies yielded coefficients of multiple correlation ranging from a low of 0.882 (significant at the 0.01 level) from respondents within the Great Barrier Reef Marine Park Authority, to a high of 0.993 (significant at the 0.001 level) from respondents within the Peak District National Park Authority which, together with respondents within the Ngorongoro Conservation Area Authority and the Annapurna Conservation Area Project, demonstrated coefficients of multiple determination exceeding the overall value of 0.900.

DATA CORRELATIONS AMONGST OUTSIDE OBSERVERS

Table P3.1 reveals that correlations between the responses on individual agencies from outside observers were, *overall,* quite high, ranging from a multiple correlation coefficient of 0.958 significant at the 0.01 level (Ngorongoro Conservation Area) to 0.992 at a significance level of 0.001 level (Peak District National Park). All coefficients of multiple

determination exceeded 0.900, and overall showed a value of 0.960. Nevertheless in the two Australian cases there were some significant discrepancies on *Environmental Agility,* on which the responses from outside observers on the Great Barrier Reef Marine Park showed a correlation of only 0.128, whilst those on the Central Plateau Conservation Area revealed a coefficient of 0.213. By contrast, the responses of the outside observers of each of the other agencies demonstrated more substantial correlations on *Environmental Agility* which ranged from 0.878 to 0.888, all at significance levels of 0.01. It was considered that on the basis of the correlations overall, there was sufficient consistency to use the responses from outside observers in validating the agency data.

TABLE P3.1 DATA CORRELATIONS AMONGST AND BETWEEN AGENCY RESPONDENTS AND OUTSIDE OBSERVERS

COEFFICIENTS OF MULTIPLE CORRELATION *[R]* AND COEFFICIENTS OF MULTIPLE DETERMINATION *[R^2]*

Protected Area	Correlation amongst Agency Respondents	Correlation amongst Outside Observers	Correlation between Agency and Outside Respondents
Great Barrier Reef Marine Park	0.882[a] (0.778)	0.981 (0.962)	0.929[a] (0.863)
Ngorongoro Conservation Area	0.963 (0.927)	0.958[a] (0.918)	0.910[a] (0.828)
Annapurna Conservation Area	0.958[a] (0.918)	0.988 (0.976)	0.884[a] (0.781)
Peak District National Park	0.993 (0.986)	0.992 (0.984)	0.930 (0.865)
New Jersey Pinelands	0.932 (0.869)	0.991 (0.982)	0.904 (0.817)
Central Plateau Conservation Area	0.928[a] (0.861)	0.967[a] (0.935)	0.866[a] (0.750)

All correlations significant at the 0.001 level except
[a] Correlation significant at the 0.01 level

Coefficients of Multiple Correlation *[R]* are shown in plain text
Coefficients of Multiple Determination *[R^2]* are shown in brackets

CORRELATIONS BETWEEN DATA FROM AGENCY RESPONDENTS AND DATA FROM OUTSIDE OBSERVERS

The arithmetic means of raw data from respondents in an agency were compared with the mean responses from the outside observers for that agency. The results are summarised in Table P3.1, the lowest

coefficients of multiple correlation occurring in the cases of the Central Plateau Conservation Area (0.866 at a significance level of 0.01) and the Annapurna Conservation Area (0.884 at a significance level of 0.01). The highest correlations were in the cases of the Peak National Park (0.930 at a significance level of 0.001), and the Great Barrier Reef Marine Park (0.929 at a significance level of 0.01). The coefficients of multiple determination exhibited a range from 0.750 (Central Plateau Conservation Area) to 0.865 (Peak District National Park), with an overall upper limit of validity in these data indicated at 82 per cent.

CHAPTER 10

ENVIRONMENT AND STRUCTURE: A PROTOTYPE PROFILE

CHAPTER 10

ENVIRONMENT AND STRUCTURE: A PROTOTYPE PROFILE

In working toward a synthesis, this Chapter follows the research design and utilises the synergistic effect between conventional comparative study and the heuristic study of cases for the three-fold purpose of weaving a fabric of distinctions and relationships, revealing patterns of similarities and differences amongst the contingency factors, and displaying the intricate causal textures of the environments underlying the six cases.

Against the background of the data validation set out in the Preface to Part 3, the Chapter proceeds by exploiting the interaction of four complementary perspectives:

- a profile analysis of the core dimensions and allied factors of organisational structure provides a necessary frame of reference within which to develop a profile of environmental factors: in the context of this study, the profiles of the external environments of agencies are inextricably entwined with the profiles of these structural factors;
- a preliminary analysis across the six organisations of the relationships between the external environmental variables and the core dimensions and allied structural factors, using Pearson product-moment correlations;
- a typological analysis of the external environments of the six organisations; and
- multiple regression and correlation analysis of the relationships between the external environmental variables and the core dimensions and allied structural factors.

All four complementary perspectives served as indicative sources, none being taken as providing definitive information in isolation. As noted in the research design, the expected instability in the multiple regression due to the limited size of the data set was considered to be offset by the value of the information. Toward explaining the relationship between environment and structure, information gleaned from these four analyses was compared with information from secondary sources and supplemented, where possible, by follow-up contacts with agency respondents, outside observers, and other informants.

PROFILE ANALYSIS OF STRUCTURAL FACTORS

This typological analysis was achieved by classifying the components of each of the core dimensions and allied variables of organisational structure into generic, common, and unique elements. Generic elements were regarded as those which contribute to a particular structural variable of all six organisations, *common* elements those which occur in the structure of more than a single organisation although not in all, and *unique* elements those which occur only in the structure of a single organisation. Comparison of the relative strengths of the variables in each of the six organisations was facilitated by merging this classification with the means expressed as percentages of the possible scores, with dispersion being established by coefficients of variation. Also included are the final outcomes of multiple regression analysis, details of which will be outlined later in this chapter.

DELEGATION

FIGURE 10.1 CLASSIFICATION OF ELEMENTS AND COMPARISON OF MEASURES - DELEGATION

Generic	*Common*	*Unique*
Delegations by CEO: public relations and development and marketing of new initiatives and services and comparable changes in existing activities.	Delegations by CEO: selection and dismissal of senior personnel and negotiating with staff and/or unions on pays & conditions. Statutory authority status expands freedom to delegate. Delegation to field bases of management decisions and operational responsibilities.	Delegation of routine management to a separate entity (GBRMPA to Queensland Parks & Wildlife Service).

Agency	*Means (%)*	*Coefficients of Variation (%)*	*Multiple Regression*	
			Environmental Variable	*beta Coefficients*
GBRMPA	48.2	30.1	Heterogeneity	0.758
NCAA	40.0	23.3	Turbulence	0.207
ACAP	55.0	24.2	Hostility	–0.016
PNPA	40.7	25.7	Tech Complexity	(excluded)
PINE	63.6	31.0	Restrictiveness	–0.130
CPCA	56.1	37.8		

Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
NCAA	Ngorongoro Conservation Area Authority
ACAP	Annapurna Conservation Area Project (managed by King Mahendra Trust for Nature Conservation)
PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

Shaded cells indicate elements which have direct associations with environmental factors.

Delegation was highest in the Pinelands Commission, as noted in Figure 10.1, the high variability in this and other cases here being within acceptable tolerances. Delegation by the chief executive officers included several critical classes of decision authority, some as constituent elements in all six organisations, whilst others formed elements which contributed to delegation in the environments of several of the organisations. Other elements common to some of the organisations comprised delegation to field bases of management decisions together with responsibility for operational matters, and the greater freedom in delegation afforded by statutory authority status as manifest in the GBRMPA, the KMTNC in relation to the ACAP, and the PNPA. Even beyond the significant levels of autonomy possessed by these organisations, the Pinelands Commission enjoys the rare standing of being totally independent of any supervision or control by its nominal parent department of the New Jersey Government.

SOPHISTICATION OF CONTROL AND INFORMATION SYSTEMS

FIGURE 10.2 CLASSIFICATION OF ELEMENTS AND COMPARISON OF MEASURES - SOPHISTICATION OF CONTROL AND INFORMATION SYSTEMS

Generic	*Common*	*Unique*
Demonstration of theoretical expectation of an inverse link between sophistication and complexity, formalisation, and centralisation.	Systems facilitated internal and external monitoring and were frequently linked to strategic planning and reports to government.	Systems *capable* of reducing decision uncertainty, but *actual* reduction equivocal due to questionable participation in planning (NCAA).

Agency	*Means (%)*	*Coefficients of Variation (%)*	*Multiple Regression*	
			Environmental Variable	*beta Coefficients*
GBRMPA	44.8	14.9	Heterogeneity	0.452
NCAA	45.9	17.8	Turbulence	0.341
ACAP	44.7	13.9	Hostility	0.108
PNPA	45.6	17.1	Tech Complexity	(excluded)
PINE	47.1	8.9	Restrictiveness	0.096
CPCA	47.1	10.9		

Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
NCAA	Ngorongoro Conservation Area Authority
ACAP	Annapurna Conservation Area Project (managed by King Mahendra Trust for Nature Conservation)
PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

Shaded cell indicates an element which has a direct association with environmental factors.

The sophistication of the control and information systems in all six organisations showed a single generic element - the subsistence in practice of the theoretical expectation of an inverse relationship between sophistication and complexity, formalisation, and centralisation such that where sophistication of the control and information systems is high, then complexity, formalisation, and centralisation will all be low and *vice versa.* The pattern was not considered to be affected by isolated instances in which the levels of one or other factor were equivocal. Control and Information Systems were most sophisticated in both the Pinelands Commission and the Tasmanian Parks and Wildlife Service in its management of the Central Plateau Conservation Area, shown clearly in Figure 10.2, which also demonstrates that the ratings of this sophistication in both these organisations showed the lowest dispersions. Paradoxically, quality controls on control and information systems in the Pinelands Commission and the Tasmanian Parks and Wildlife Service were considered to be less than satisfactory by most respondents. There was one common element: control and information systems generally facilitated internal and external monitoring and were frequently linked to strategic planning *and* reports to government, and control and information systems. The Ngorongoro Conservation Area Authority presented the single unique element, namely that whilst the control and information systems are *capable* of reducing decision making uncertainty, the *actual* reduction is somewhat equivocal due to questionable participation in planning.

COMPLEXITY

As Figure 10.3 highlights, the Peak National Park Authority demonstrates the highest level of complexity generated by a combination of generic and common elements. The generic elements which affected complexity in all six organisations were, firstly, low levels of *vertical* and *spatial differentiation*, to each of which types there was a single, borderline exception - the Peak National Park Authority in the case of vertical differentiation, and the Ngorongoro Conservation Area Authority in the instance of spatial differentiation. Both cases were deemed to be sufficiently marginal to justify the application of the generic classification. The same situation appertained in *horizontal differentiation*, where all but

FIGURE 10.3 CLASSIFICATION OF ELEMENTS AND COMPARISON OF MEASURES - COMPLEXITY

Generic				
Low levels - vertical and spatial differentiation; High to moderate horizontal differentiation;		*(the single exceptions in each type of differentiation were marginal)*		
Agency	*Means (%)*	*Coefficients of Variation (%)*	*Multiple Regression*	
			Environmental Variable	*beta Coefficients*
GBRMPA	39.6	19.0	Heterogeneity	0.339
NCAA	41.6	17.6	Turbulence	0.556
ACAP	37.6	14.0	Hostility	0.074
PNPA	42.7	19.7	Tech Complexity	(excluded)
PINE	40.4	17.1	Restrictiveness	0.120
CPCA	41.2	14.7		

Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
NCAA	Ngorongoro Conservation Area Authority
ACAP	Annapurna Conservation Area Project (managed by King Mahendra Trust for Nature Conservation)
PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

Shaded cells indicate elements which have direct associations with environmental factors.

one organisation - the Annapurna Conservation Area Project - fell into the higher ranges, the exception again being so marginal as to allow this type of differentiation to be treated as generic. There were no unique elements which affected complexity in only one organisation. Overall, the picture of complexity in the six organisation is one of low differentiation.

CENTRALISATION

The highest degree of centralisation was effectively shared by the Peak National Park Authority and the Ngorongoro Conservation Area Authority, shown in Figure 10.4, which also demonstrates that the ratings of heterogeneity in both these organisations showed the lowest dispersions. Although the means for the organisations differ marginally, they have been equated on the grounds that the ratings on both are patently well above those of the other organisations. There was a single generic element which influenced centralisation, namely the subsistence in practice of the theoretical expectation of an inverse relationship between centralisation and delegation such that where centralisation is

FIGURE 10.4 CLASSIFICATION OF ELEMENTS AND COMPARISON OF MEASURES - CENTRALISATION

Generic	*Common*
Subsistence in practice of the theoretical expectation of an inverse relationship between centralisation and delegation.	Incipient centralisation prompted by the need for cooperation with government agencies - despite shelter of statutory authority status. *De*centralisation of management functions *cf.* bureaucratic tendencies of government. Divisionalisation provided more detailed input into decisions (functional), but retarded responses to new information (dysfunctional). Divisionalisation accelerated responses to new information and increased input into decisions.

Agency	*Means (%)*	*Coefficients of Variation (%)*	*Multiple Regression*	
			Environmental Variable	*beta Coefficients*
GBRMPA	52.3	15.2	Heterogeneity	0.551
NCAA	57.3	11.1	Turbulence	0.189
ACAP	51.4	15.9	Hostility	0.141
PNPA	58.0	9.7	Tech Complexity	(excluded)
PINE	50.1	14.6	Restrictiveness	0.118
CPCA	51.7	13.4		

Source: Survey Data

Key to Abbreviations:

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PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

Shaded cells indicate elements which have direct associations with environmental factors.

high, then delegation will be low, and where centralisation is low, then delegation will be high. The strength of the relationship did, however, vary significantly, ranging from weak in the case of the Great Barrier Reef Marine Park Authority and the Ngorongoro Conservation Area Authority through to strong in the case of the Pinelands Commission. There were several elements common to a number of the organisations, some of which exhibited incipient centralisation prompted by the need for cooperation with government agencies - despite being sequestered by their status as statutory authorities. There were also distinct accents on *de*centralisation of management functions which contrasted sharply with the bureaucratic tendencies of government agencies. There were instances amongst the organisations in which divisionalisation was functional in providing more detailed input into decisions, and dysfunctional in retarding responses to new information - as with the Great Barrier Reef Marine Park Authority's use of "critical issues" divisionalisation, although the more common picture was one where

divisionalisation facilitated rapid responses to new information and provided more detailed input into decisions, such as in the Annapurna Conservation Area Project's use of geographic divisionalisation. There were no unique elements which influenced centralisation.

FORMALISATION

FIGURE 10.5 CLASSIFICATION OF ELEMENTS AND COMPARISON OF MEASURES - FORMALISATION

Generic	*Common*	*Unique*
Proportion of subsystems' professionals influenced formalisation of particular organisational subsytems.	Changes in CEOs (GBRMPA and Tasmanian Parks and Wildlife Service) affected formalisation.	Within overall policy bounds, volunteers share considerable freedom with salaried colleagues (GBRMPA).

Agency	*Means (%)*	*Coefficients of Variation (%)*	*Multiple Regression*	
			Environmental Variable	*beta Coefficients*
GBRMPA	72.9	7.7	Heterogeneity	0.516
NCAA	73.6	9.2	Turbulence	0.328
ACAP	73.6	7.1	Hostility	0.093
PNPA	73.8	9.7	Tech Complexity	(excluded)
PINE	71.0	10.6	Restrictiveness	0.066
CPCA	71.9	10.7		

Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
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PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

None of the elements have direct associations with environmental factors.

The highest formalisation was shared by the Peak National Park Authority, the Ngorongoro Conservation Area Authority, and the Annapurna Conservation Area Project. Figure 10.5 shows that, whilst the means for the NCAA and the ACAP are identical, they are very slightly below that for the PNPA, but all three have been treated as effectively coequal. The generic element here is the differential levels of formalisation which characterised particular organisational subsytems and which hinged on the proportion of professionals working within those subsystems. Two distinct scenarios exist: *firstly,* low formalisation characterised those organisational subsystems in which there was a high proportion of professionals who had considerable freedom to operate within overall policy bounds, and *secondly,* high formalisation demarcated those subsystems where procedures and standards were

typically essential - as with administration and finance. The New Jersey Pinelands Commission is included within this element, although it properly constituted a *tertium quid* - formalisation measures in the Commission were consistent across the organisation, due to the combined effects of a high proportion of professionals (more than two-thirds of the staff are professionals) and an organisational culture which does not discriminate on status. The sole common element here was the ways in which formalisation has been affected by changes in the chief executive officers in the Great Barrier Reef Marine Park Authority and the Tasmanian Parks and Wildlife Service, changes which have each brought with them, *inter alia,* slightly different attitudes to the ways in which procedures are specified and rules enforced. In these bodies, the advents of the new Chair and Chief Executive Officer and new General Manager respectively appear to have increased the recognition accorded the professionals in their organisations through significant increases in delegation and decentralisation, contrasting with the bureaucratic tendencies of related government agencies. The two potentially incompatible forces of professionalism and bureaucratisation interact, but in the cases of these two organisations, professionalism appears to prevail, resulting in low levels of formalisation. There have also been relatively recent changes in the chief executive officers of the Pinelands Commission and the Annapurna Conservation Area Project, however there is no evidence to indicate that these changes have brought about any modification in formalisation (the Pinelands already evinced the lowest level of formalisation of all the organisations). The Great Barrier Reef Marine Park Authority provided the only unique element under formalisation - within overall policy bounds, volunteers working within the Authority (generally in the Aquarium) share considerable freedom with salaried colleagues.

ENVIRONMENTAL AGILITY

The greatest environmental agility was effectively shared by the Ngorongoro Conservation Area Authority and the Great Barrier Reef Marine Park Authority. Figure 10.6 shows that, whilst the means for the NCAA and the GBRMPA differ somewhat, they have been regarded as effectively equivalent on the grounds that there is a substantial gap

FIGURE 10.6 CLASSIFICATION OF ELEMENTS AND COMPARISON OF MEASURES - ENVIRONMENTAL AGILITY

Generic	*Common*	*Unique*
Agility limited by existing policies, programmes, and structure, and by funding and/or staffing shortfalls.	Agility limited by problems in utilising the volume and quality of information available on the environment.	Agility limited by interactions between the following factors: • a preoccupation with organisational reviews, • a tendency toward crisis management, and • an inward looking orientation (GBRMPA).
Diverse advisory structures give effective intelligence on environmental developments.	Reactions to environmental demands conditioned by priorities set by strategic plan.	
Periodic updating of plans of management helps agility.	Distracted by short-term, politically-driven changes.	

Agency	*Means (%)*	*Coefficients of Variation (%)*	*Multiple Regression*	
			Environmental Variable	*beta Coefficients*
GBRMPA	78.3	9.9	Heterogeneity	0.401
NCAA	79.5	9.0	Turbulence	0.352
ACAP	74.5	11.0	Hostility	0.045
PNPA	74.0	14.4	Tech Complexity	0.099
PINE	71.0	17.6	Restrictiveness	0.102
CPCA	73.3	14.6		

Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
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PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

Shaded cells indicate elements which have direct associations with environmental factors.

between these two and the remaining organisations. There were three generic elements affecting environmental agility: limitations on agility brought about by existing policies, programmes, and structure (flexibility in outlook notwithstanding - policies and structure themselves also need to be flexible), and by funding and/or staffing shortfalls. On a reactive-proactive continuum (between "being able simply to re-act" and "being able to act positively"), *collectively* these limitations have a tendency to place an organisation more toward the reactive pole rather than the proactive pole. In addition, the diverse advisory structure/network of bodies available to some organisations provided effective intelligence on relevant political/legal/social developments, and periodic updating of relevant management plans helps agility. Common elements affecting environmental agility comprised limitations on agility brought about by difficulties in knowing how to effectively utilise a high level of awareness of environmental developments stemming from the high quantity of incoming quality information, and by the tendency to be diverted by short-term, politically-driven changes - reactions to environmental demands

being conditioned by the priorities set by the strategic plan. The only unique element here was the limitation on agility brought about by the complex interactions of a preoccupation with organisational reviews, a tendency toward crisis management ("fire-fighting"), and being too inward looking. On a reactive-proactive continuum this limitation has a tendency to place the Great Barrier Reef Marine Park Authority more toward the reactive pole rather than the proactive pole.

INFRASTRUCTURE

FIGURE 10.7 CLASSIFICATION OF ELEMENTS AND COMPARISON OF MEASURES - INFRASTRUCTURE

Common
Division of work within the organisations so that subunits were responsible for entire tasks.
Integration of core work and support work.
Joint problem solving frequently obstructed by internal boundaries
Infrequent meetings between units.

Agency	*Means (%)*	*Coefficients of Variation (%)*	*Multiple Regression*	
			Environmental Variable	*beta Coefficients*
GBRMPA	72.9	12.5	Heterogeneity	0.365
NCAA	74.6	12.2	Turbulence	0.474
ACAP	66.4	10.2	Hostility	0.008
PNPA	71.4	5.8	Tech Complexity	(excluded)
PINE	64.3	14.4	Restrictiveness	0.154
CPCA	69.6	16.9		

Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
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Shaded cells indicate elements which have direct associations with environmental factors.

There were neither generic elements nor unique elements identified in relation to infrastructure, this variable being strongest in the Ngorongoro Conservation Area Authority, highlighted graphically in Figure 10.7. The common elements which were identified as contributing to the infrastructure of the organisations varied somewhat in the degree to which they applied to particular organisations. In the summary below, only the organisations showing the strongest application are noted. *Firstly,* work was divided within organisations so that subunits were responsible for entire tasks, an element which characterised the Great Barrier Reef Marine Park Authority, the Ngorongoro Conservation Area Authority, the Annapurna Conservation Area Project, and the New Jersey

Pinelands Commission. *Secondly,* core and support work were integrated - strongly typical of the Annapurna Conservation Area Project and the Peak National Park Authority. *Thirdly,* internal boundaries frequently interfered with joint problem solving in the Pinelands Commission and the Tasmanian Parks and Wildlife Service, and *lastly,* meetings between units seldom occurred in the Annapurna Conservation Area Project and the Ngorongoro Conservation Area Authority.

PRELIMINARY ANALYSIS OF RELATIONSHIPS BETWEEN ENVIRONMENTAL AND STRUCTURAL VARIABLES

Continuing to follow the linkage between the profiles of the external environments of agencies and those of the structural variables, an analysis was made of the relationships between pairs of environmental and structural variables *via* Pearson product-moment correlations and coefficients of determination. Both sets of coefficients shown in the correlation matrix (Table 10.1) confirm the basic intercorrelation between the two sets of variables, and justify the development of a regression model (Coakes and Steed, 1996). The twelve statistically significant correlations identified in Table 10.1 coincide with the twelve highest coefficients of determination, this third of all comparisons providing an indication of the variables which might feasibly be linked to structure.

TABLE 10.1 RELATIONSHIPS BETWEEN ENVIRONMENTAL AND STRUCTURAL VARIABLES

COEFFICIENTS OF CORRELATION *[r]* AND DETERMINATION *[r^2]*

	Hetero-geneity	Turbulence	Hostility	Technological Complexity	Restrictive-ness
Delegation	−0.138 (0.019)	−0.267[b] (0.071)	−0.274[b] (0.075)	−0.313[a] (0.098)	−0.134 (0.018)
Sophistication of Control and Information System	0.017 (0.000)	0.030 (0.001)	0.004 (0.000)	−0.018 (0.000)	0.024 (0.001)
Complexity	−0.026 (0.001)	0.229[b] (0.052)	0.005 (0.000)	0.010 (0.000)	−0.013 (0.000)
Centralisation	0.169[b] (0.029)	0.037 (0.001)	0.080 (0.006)	0.288[a] (0.083)	0.097 (0.009)
Formalisation	0.311[a] (0.097)	0.214[b] (0.046)	0.075 (0.006)	−0.053 (0.003)	0.139 (0.019)
Environmental Agility	0.093 (0.009)	0.122 (0.015)	0.057 (0.003)	0.064 (0.004)	0.151[b] (0.023)
Infrastructure	0.156[b] (0.024)	0.284[a] (0.081)	0.042 (0.002)	0.095 (0.009)	0.225[b] (0.051)

[a] Correlation significant at the 0.01 level (non-directional [two-tailed] test)
[b] Correlation significant at the 0.05 level (non-directional [two-tailed] test)

Correlation coefficients *[r]* are shown in plain text
Coefficients of determination *[r^2]* are shown in brackets

On the basis of the statistically significant correlations, turbulence, hostility, and technological complexity would be inversely related to delegation, so that delegation decreases as, for example, hostility increases. Apart from their lack of statistical significance, the correlations between each of the five external environmental factors and the sophistication in control and information systems were very low, and the respective coefficients of determination were negligible. In its direct relationship with complexity, turbulence was the only one of the external environmental factors which displayed a statistically significant relationship, increases in this variable being related to increases in complexity. Direct, statistically significant relationships were also established between both heterogeneity and technological complexity and centralisation, on this evidence, increases in these variables being related to increases in centralisation. Heterogeneity and turbulence demonstrated an acceptable degree of correlation with formalisation, both being directly related to this dependent variable. Restrictiveness was the only external environmental variable to demonstrate a statistically significant link with environmental agility, this direct relationship indicating that increased restrictiveness was accompanied by increased environmental agility. The external environmental variables of heterogeneity, turbulence, and restrictiveness all showed statistical significance in their direct relationships with infrastructure.

Although these Pearson correlations provide some suggestion of the possible relationships between the dependent and independent variables, it should be noted that, as observed by various authors such as Lindeman, Merenda, and Gold (1980), such bivariate correlations are sometimes poor indicators of the contribution an independent variable might make in a regression equation. As these authors point out, there are cases in which a variable having a relatively large bivariate correlation with the dependent variable actually contributes very little to predictive accuracy, given that other independent variables are already present in the equation, and there are also instances in which a potential independent variable has nearly a zero bivariate correlation with the dependent variable, but which suppresses irrelevant information in other independent variables, thus contributing significantly when added to the regression equation.

TYPOLOGICAL AND MULTIPLE REGRESSION ANALYSIS

The typological analysis was achieved by breaking up each of the compound environmental variables into its salient elements, which were then classified as generic, common, or unique, paralleling the treatment of the core dimensions and allied structural factors. *Generic* elements here were regarded as those which contributed to a particular variable in the environment of all six organisations, *common* elements those which occurred in the environments of more than a single organisation although not in all, and *unique* elements those which occurred only in the environment of a single organisation. The classified elements are summarised in Figure 10.8, and are examined in more detail later in this Chapter. Comparison of the relative strengths of the variables in each of the six organisations was facilitated by merging this three-way classification with charts of the means expressed as percentages of the possible scores, juxtaposed with coefficients of variation to reflect the degree of variability. As an extension of this, it was possible to gauge the relative influence of the various elements on each variable, the organisation(s) with the highest ratings and those with the lowest ratings being compared with the classified elements. Although it was considered that elucidation of extreme ratings would most likely be found amongst the common and unique elements, generic elements were nevertheless examined as it was possible that these might serve as catalysts in conjunction with the other types of elements. Bearing in mind the exploratory character of this research, and the essentially supportive role in which the statistics were cast, the statistical detail has been kept to manageable proportions. To ensure excessive detail does not obfuscate the main message of regression analysis, this work follows the counsel of Ahlgren and Walberg (1975) in adopting a minimalist but critical set of measures, as well as in reserving the key distinguishing equations and tests to Appendix 3 (although the final outcomes of the multiple regression analysis are also incorporated within each of Figures 10.1 - 10.7 for the sake of completeness). These procedures have not only facilitated maintaining a tight focus on the substantive issues involved, but also enabled the overall space limitations of the Thesis to be met.

As organisations adapt to their external environment primarily through the efforts of their management - a human agency which may misperceive the environment, distort reality, or react emotionally - it is

FIGURE 10.8 CLASSIFICATION OF ELEMENTS IN THE EXTERNAL ENVIRONMENTS OF THE SIX ORGANISATIONS

Heterogeneity		
Generic	*Common*	*Unique*
Competition for use of the natural resources of a protected area.	Increasing organisation-set pressures deriving from a protected area's status.	Influence of long-term goals (ACAP's orientation of ultimate self-sufficiency).
Magnitude of organisation-sets (stakeholders).	Resident human population.	Statutory authority of ACAP - a *primus inter pares* situation.
Interactions with various levels of government.	Some private ownership of land.	Operations not confined to one protected area (Tasmanian Parks and Wildlife Service).
Relations with NGOs and INGOs.	Geographic differentiation in programme priorities.	
Turbulence		
Generic	*Common*	*Unique*
Changing character of natural resource use - occasioned by shifts in demographic patterns and the way in which the viability of some uses oscillates.	Instabilities induced by *eg,* significant disease in flora or fauna within a protected area (as in the GBRMP & the NCA) or affecting a protected area indirectly (*eg,* PNPA with respect to recent outbreak of foot-&-mouth disease in UK).	Flexibility in planning generated an unusual capacity to deal with unique situations (Pinelands) & application of a plan to unique situations (Pinelands & ACAP).
	Shortcomings in infrastructure *eg,* with respect to tourism.	Planning process divisive and dysfunctional (NCAA).
	Advances in natural resource utilisation fostered by NGOs and INGOs.	Large-scale climatic, political, and economic cycles (GBRMPA).
Hostility		
Generic	*Common*	*Unique*
Increased pressures combined with reductions in resources, culminate in increased competition for scarce resources.	Size and diversity of organisation-set bring an inherent risk.	Primacy afforded KMT by virtue of statutory authority in ACAP spawned hostility in the guise of an envy factor.
	Perceived injustices and/or frustration amongst potential developers or objectors.	Dissatisfaction with lack of genuine participation in planning (NCAA).
	Increases in resource use place additional strain on facilities.	Disagreements on means of implementing World Heritage on spatial scale of GBRMPA.
Technological Complexity		
Common		
Sophisticated information technology required in dealing with environments.		
Medium-level technology in the information management of some organisations.		
In environments which are non-complex technologically, and which therefore do not require technologically sophisticated information for making strategic decisions, deficiencies in technological sophistication are not significant.		
Restrictiveness		
Generic	*Common*	*Unique*
A set of many restraining influences - legal, political, and social - although the degree of restraint varied considerably.	Economic support not commensurate with responsibilities.	Absence of economic restrictiveness, even when development channelled into environmentally less sensitive areas (Pinelands).
Complexity of interactions with governmental bodies.	Subordination of development goals to conservation goals.	
	Political and administrative insulation conferred by cooperative relations with various governmental levels.	"Representative" bodies undemocratic (NCAA).

Source: Survey Data

Shaded cells indicate elements which have either direct associations with structural factors or have intervening rôles.

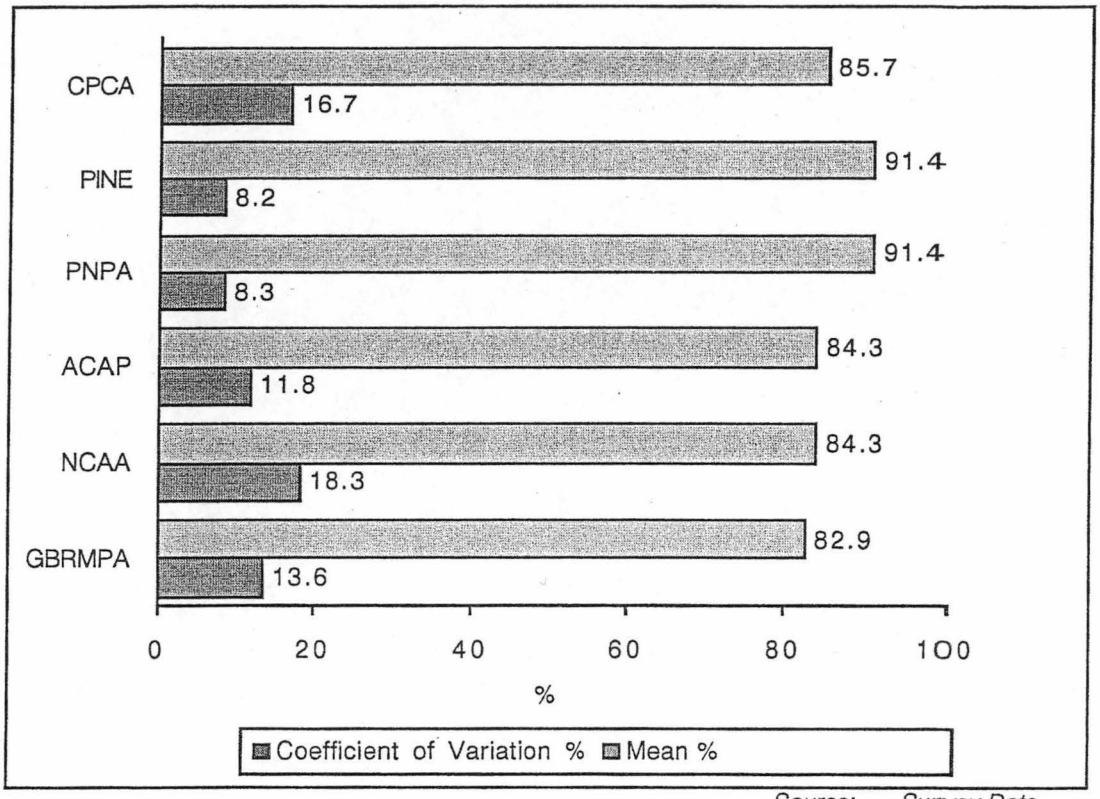
accordingly important to take into account the way management perceives the external environment and the organisational consequences of this perception - and coincidentally obviate any accusation of reification. To this end, the responses from senior managers in each organisation were isolated from the responses of other respondents with the objective of noting any significant differences.

HETEROGENEITY

Prominent amongst the elements which in varying degrees contribute to heterogeneity across the environments of all six organisations - that is, the generic elements - are competition for use of the natural resources of each protected area - even where approaches to land management seek to balance ecosystem sustainability with economic development, the sheer size of the organisation-sets (in current idiom, the stakeholders), interaction with the various levels of government, and relations with NGOs and INGOs. The organisation-sets not only vary in their levels of involvement - some, for example, have direct interests in using the natural resources of an area, whilst others have custodial rôles over that area - but they also have variable impacts on their respective organisations - some economic interests, for example, have markedly more influence than some recreational users. The highest level of heterogeneity was shared by the environments of the Peak National Park Authority and the Pinelands Commission, shown graphically in Figure 10.9, which also demonstrates that the ratings of heterogeneity in both these organisations showed the lowest dispersions. Not only did these exhibit dramatically higher means by comparison with the environments of other organisations, but also showed high levels of each of the generic elements noted above, and revealed rather more of the common elements described below than other organisations.

Instances in which elements contributing to environmental heterogeneity are common to more than a single organisation although not to all, include the increased organisation-set pressures which derive from a protected area's status - such as forming part or all of a UNESCO Biosphere Reserve or World Heritage Area. This first element showed an association with an element within control and information systems - itself

FIGURE 10.9 COMPARISON OF DESCRIPTIVE STATISTICS ENVIRONMENTAL HETEROGENEITY



Source: Survey Data

Key to Abbreviations:

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PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
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an underlying factor in organisational structure - there being several links between these organisation-set pressures and strategic planning and reporting to bodies with an interest in the protected area by virtue of its status - including governmental institutions. Also amongst the common elements contributing to environmental heterogeneity are two cases lying at the other end of the continuum - the absence of a resident human population and of private ownership of land both appearing to be linked to strong homogeneity, although as shown by the coefficients of variation, there was generally more variability in responses as homogeneity increased. The final common element contributing to environmental heterogeneity is where a differentiation in programme priorities existed along geographic lines, this element showing a number of apparent linkages with elements making up the various core dimensions and allied structural factors.

The *first* of these linkages was an inverse relationship with the only generic element affecting complexity in all six organisations, namely, a low level of spatial differentiation based on the degree to which the location of their facilities and personnel were dispersed geographically. *Secondly,* there were several cases in which geographic differentiation in programme priorities linked with centralisation, with divisionalisation facilitating rapid responses to new information and providing more detailed input into decisions - typified in, but more widespread than the Annapurna Conservation Area Project's use of geographic divisionalisation. *Thirdly,* by increasing the diversity of the advisory structures, geographic differentiation in programme priorities generally improved the quality of the intelligence on relevant political, legal, and social developments which was provided by the network of bodies available to each of the organisations under review. This, in turn, had the effect of increasing the agility of the organisations with respect to their environments. *Fourthly,* again as an element of environmental agility, reactions to environmental demands are conditioned by the priorities set by the strategic plan (the "can-only-do-so-much" syndrome), these reactions being catalysed by any geographic differentiation in programme priorities. *Lastly,* geographic differentiation in programme priorities accentuates one of the common elements identified as contributing to the infrastructure of the organisations - the division of work within the organisations so that subunits were responsible for entire tasks. The effects of geographic differentiation in programme priorities on this element was most prominent in the Annapurna Conservation Area Project, and was also present to lesser extents in the New Jersey Pinelands Commission, the Ngorongoro Conservation Area Authority, and the Great Barrier Reef Marine Park Authority.

The isolated instances in which there is an element which makes a unique contribution to the heterogeneity of an organisation's environment include the influence of long-term goals - the Annapurna Conservation Area Project is oriented toward ultimate self-sufficiency, however this extended focus also provides present-day focus for the field operations of the King Mahendra Trust, the statutory authority of which also represents a unique element - a *primus inter pares* in relation to its Nepalese organisational environment. The one remaining unique element is to be found in the case of the Tasmanian Parks and Wildlife

Service, the operations of which are not confined to the Central Plateau Conservation Area but extend throughout Tasmania, contrasting with the bailiwicks of the other organisations which are confined to single protected areas. No unique elements were displayed by either of the organisations which shared the highest level of heterogeneity. Of the other elements, worth noting is the sheer diversity amongst the members of the organisation-sets who have direct interests in a protected area, the widely-variable impact of such stakeholders on a managing organisation, and the divergence of influence on such organisations of those agencies which have some sort of custodial rôle over an area.

FIGURE 10.10 RELATIONSHIPS BETWEEN HETEROGENEITY AND THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE (*beta* COEFFICIENTS FROM FINAL MULTIPLE REGRESSION MODEL)

0.758	0.452	0.339	0.551	0.516	0.401	0.365
del	*cis*	*cpx*	*cen*	*for*	*agl*	*inf*

Key to Abbreviations:

del	delegation	*cen*	centralisation
cis	sophistication of control and information system	*for*	formalisation
		agl	environmental agility
cpx	complexity	*inf*	infrastructure

From the standpoint of the profile based on multiple regression, the heterogeneity of the external environment of an organisation is the dominant independent variable in the set examined in this Study. As shown in Figure 10.10, heterogeneity exercised significant influence over all seven core dimensions and allied variables of organisational structure with a strong set of *beta* coefficients ranging from 0.758 to 0.339. The outstanding links were with delegation (*beta* coefficient 0.758), centralisation (0.551), and formalisation (0.516). With only two exceptions, the remaining associations were all substantially stronger than with any other variable in the external environment.

The organisations which operate in heterogeneous environments typically, but not exclusively, have tended to evolve a distinctive set of structural characteristics centering around the core structural dimensions of complexity, formalisation, and centralisation, and extending into the allied factors which span all three of these structural dimensions. Typical of these organisations is the development of separate homogeneous structures to deal with each major, distinctive element of their

environment. For example, despite the fact that the multi-land use protected area concept underlies core programmes running throughout the Annapurna Conservation Area Project, in managing this Project, the King Mahendra Trust found it necessary to design programmes which were specific to particular areas, so different were the conditions and necessary priorities in different regions (see Figure 6.3). In this instance, the Unit Conservation Offices - and up to a point, the Northern and Southern Programme Coordination Sections - were developed as separate homogeneous structures to deal with major elements in the environment of the ACAP and which properly fell within these separate geographic bailiwicks, highlighting the contribution of spatial differentiation to ACAP's complexity.

Heterogeneity also characterises the environments of the organisations in instances where the various organisational subsystems themselves have heterogeneous environments. This situation may be seen clearly in the Peak National Park Authority, where the planning, conservation, and recreation subsystems have their own, specific, strongly heterogeneous environments. A not dissimilar situation exists in the Ngorongoro Conservation Area Authority with respect to the management of natural resources and community development subsystems. Coordination problems and other dysfunctions such as duplication and waste appear to be amongst the repercussions of this sort of internal differentiation, where complexity is a significant issue. In the interests of efficiency, the tendency amongst some of the organisations (*e.g.,* the Peak National Park Authority) is to utilise sophisticated control and information systems to monitor the environment, as well as organisational operations and performance. In addition, some of these systems overlap with formalisation, such as the standard operating procedures utilised by the Pinelands Commission. These seem to work well in a variety of situations, although it should be noted that it is possible to place excessive reliance on such procedures, an accusation which has been levelled at the Great Barrier Reef Marine Park Authority. The organisations with subsystems which have highly heterogeneous task environments (the prime examples of which are the Peak National Park Authority and the Pinelands Commission) are relatively complex, being differentiated in terms of a number of attributes, such as the extent of departmentation and the attendant variation in goals, together with the way in which activities are structured hierarchically. This is essentially

the argument put forward by Lawrence and Lorsch (1967) in a more general context, and in such settings as the PNPA and the Pinelands Commission, effective operation is only possible through complex means of coordination and integration.

The case of the Peak National Park Authority, which has the highest rating on both heterogeneity and technological complexity, suggests that organisations in which heterogeneity is particularly strong may be characterised by environments which are more technologically complex than organisations operating in homogeneous environments. This is borne out in the case of the Annapurna Conservation Area Project, the environment of which tends toward homogeneity as well as exhibiting the lowest technological complexity of all the organisations. However there is slight support for this contention beyond that.

Heterogeneous environments appear to encourage organisations to use a variety of standing committees, task forces, and standards and procedures, the operating diversity seemingly influencing organisations to utilise these to improve integration and coordination. Standards and procedures in the Pinelands Commission, for example, present as clear standards of job performance and detailed procedures for getting tasks accomplished. The complex interactions between the Peak National Park Authority and its constituent councils have spawned a plethora of standing committees some of which have specialised functions (*e.g.*, Regeneration, Licensing) and which also provide support for Authority members who hold analogous portfolios on the Executive Committee, whilst others are more general in character - all appear to play necessary and active roles in the work of the Authority. Task forces appear in many different guises in the six organisations, most usually in relation to research matters, but also in instances where specialists need to work together on common projects, as when critical issues groups in the GBRMPA or the Unit Conservation Offices in the ACAP need to cooperate on matters overlapping their areas of responsibility. Whilst the combination of standing committees, task forces, and standards and procedures have the effect of minimising jurisdictional conflicts, there are also explicit procedures in terms of infrastructure for what to do in the event of disagreement between work groups.

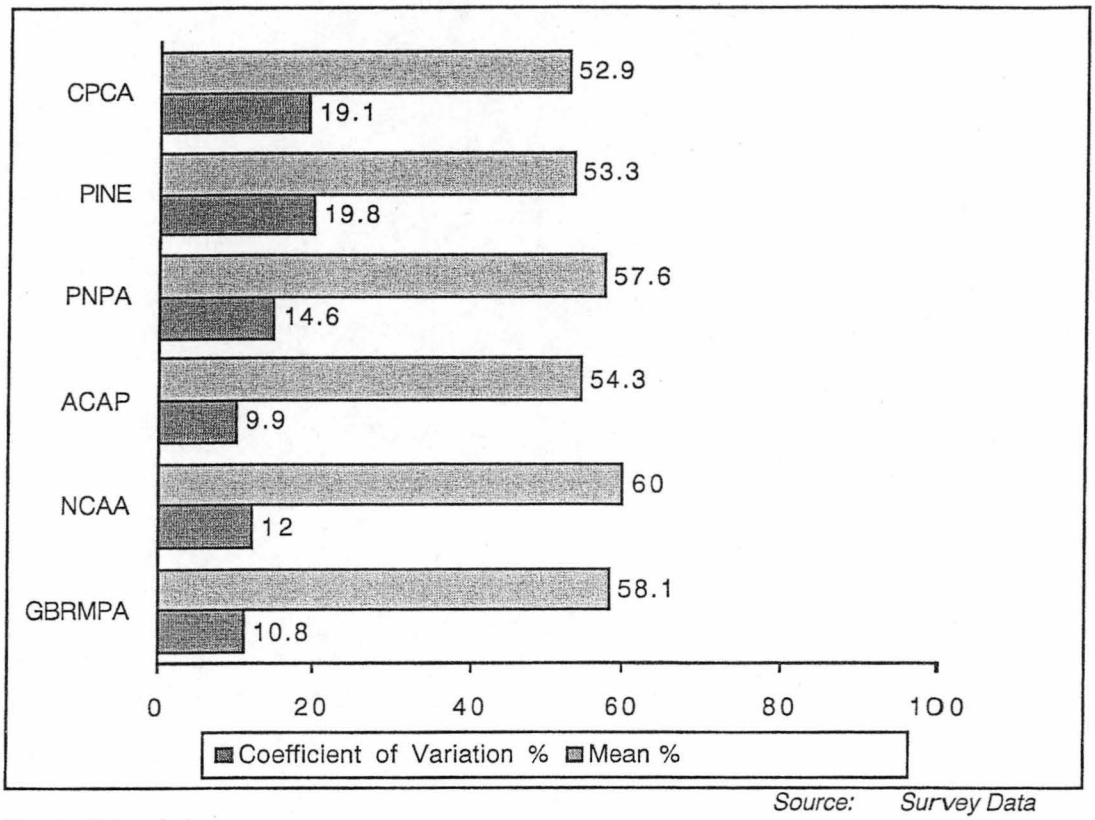
TURBULENCE

The environment of the Ngorongoro Conservation Area Authority exhibits the highest level of turbulence (Figure 10.11), generated by a compound of generic, common, and unique elements. The changing character of natural resource use constituted the only generic element which contributed to turbulence across the environments of all six organisations. This varied in both degree and ultimate cause, the latter including shifts in demographic patterns and the way in which the viability of some uses oscillates - particularly prominent in the environment of the NCAA. Three common elements appeared to have some influence in heightening the level of turbulence in the environments of several of the organisations: *firstly,* instabilities such as those induced by significant disease in flora or fauna within a protected area (as in the GBRMPA, the NCA, and the CPCA) or affecting the area indirectly (as in the case of the Peak National Park in relation to the outbreak of foot-and-mouth disease in the U.K. during 2000-2001); *secondly,* those created by shortcomings in infrastructure - especially in relation to tourism, and *thirdly,* advances in natural resource utilisation fostered by NGOs and INGOs.

This last element demonstrated several associations with elements within individual core dimensions and allied structural factors. The *initial* association was an inverse relationship with one of the three common elements within the structural factor of delegation, in which increased delegation of management decisions and responsibility for operational matters to field bases reduces the likelihood of infrastructure deficiencies. The direct relationship forming the *next* linkage was unique to the Great Barrier Reef Marine Park Authority in which the Authority delegated the routine management of the Marine Park to the Queensland Parks and Wildlife Service as a separate entity. In increasing the distance between users (*e.g.,* tourists and tourism operators) and the Authority, this delegation appears to have the potential to weaken the infrastructure which is necessary for the Authority to effectively pursue its goals.

The *final* association in this set of elements which contributed to turbulence, was between shortcomings in infrastructure (using tourism infrastructure as datum) and the generic element of complexity, and comprised low levels of both spatial and vertical differentiation together

FIGURE 10.11 COMPARISON OF DESCRIPTIVE STATISTICS ENVIRONMENTAL TURBULENCE



Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
NCAA	Ngorongoro Conservation Area Authority
ACAP	Annapurna Conservation Area Project (managed by King Mahendra Trust for Nature Conservation)
PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

with levels of horizontal differentiation which fell into the higher ranges. Although there was a single exception in each type of differentiation, these were marginal, borderline cases, and all three aspects of complexity have been treated as generic. Shortcomings in infrastructure also impinged upon the four common elements of centralisation: some of the organisations exhibited incipient centralisation prompted by the need for cooperation with government agencies - despite being sequestered by their status as statutory authorities - however there were also distinct accents on *de*centralisation of management functions which contrasted sharply with the bureaucratic tendencies of government agencies. There was some degree of interplay between these two - as there was, indeed, between the *de*centralisation of management functions and instances amongst the organisations in which divisionalisation was functional in providing more detailed input into decisions, and dysfunctional in

retarding responses to new information. This mirrors GBRMPA's use of "critical issues" divisionalisation, although this formed a contrast with the more common picture of divisionalisation facilitating rapid responses to new information and providing more detailed input into decisions, such as in the instance quoted under heterogeneity - the ACAP's use of geographic divisionalisation.

Shortcomings in infrastructure contributed to turbulence *via* two generic elements which limited environmental agility through existing policies, programmes, and structure (flexibility in outlook notwithstanding - policies and structure themselves also need to be flexible), and by funding and/or staffing shortfalls. On a reactive-proactive continuum (between "being able simply to re-act" and "being able to act positively"), *collectively* these limitations have a tendency to place an organisation more toward the reactive pole rather than the proactive pole. The other way in which shortcomings in infrastructure contributed to turbulence stemmed from the periodic updating of relevant management plans which in fact helps agility. Common elements affecting environmental agility comprised the tendency to be diverted by short-term, politically-driven changes, together with reactions to environmental demands which are conditioned by the priorities set by the strategic plan (the "can-only-do-so-much" syndrome as discussed under heterogeneity).

In relation to turbulence, several unique elements stood out: the large-scale climatic, political, and economic cycles which create turbulence in the environment of the Great Barrier Reef Marine Park Authority have no direct parallel in any of the other five organisations studied, although the cyclic activity evident in the GBRMPA was seen in a modified and more unpredictable form at the other end of the continuum in the environment of the Tasmanian Parks and Wildlife Service - an intimation that uncertainty may have a somewhat different significance than that attributed to it by some of the authors discussed in Chapter 2. Again, there was no direct parallel to the divisive and dysfunctional effects of the planning process in the Ngorongoro Conservation Area Authority which magnified the effects of change on the environment. In this respect, the Peak National Park Authority manifested a *prima facie* resemblance to the NCAA, although the effects of planning in the U.K. did not appear to amplify the dysfunctional effects of change in the same fashion, tending instead to generate a impression of obstructing development. The

Pinelands Commission evinced a singular flexibility in planning - a flexibility which gave it an unusual capacity to deal with unique situations. A distinctive variant on flexibility was apparent in the Annapurna Conservation Area Project, where the King Mahendra Trust displayed flexibility in coping with unanticipated events coupled with strategic planning, mitigating the effects of the low levels of unpredictability in its environment.

There also appear to be clear associations between stability and the flexibility which allows the application of a plan to unique situations as well as adapting that plan to changes in the environment (as in the Pinelands Commission and to a lesser extent in the ACAP), and between stability and bodies which facilitate dialogue between levels of government and the organisation managing a protected area - including serving as a conduit for inputs when reviewing changes to a plan (the Pinelands Commission and GBRMPA). These emphases on planning and communication increase environmental stability. There was no obvious pattern in the variability in responses as demonstrated by the coefficients of variation.

As shown in Figure 10.12, from the standpoint of the profile based on multiple regression, turbulence in the external environment of an organisation is the second most influential independent variable in the set examined here, having pronounced effects over all seven core dimensions and allied variables of organisational structure. The *beta* coefficients ranging from 0.556 to 0.189, the outstanding links were with complexity (*beta* coefficient 0.556), and infrastructure (0.474).

FIGURE 10.12 RELATIONSHIPS BETWEEN TURBULENCE AND THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE (*beta* COEFFICIENTS FROM FINAL MULTIPLE REGRESSION MODEL)

0.207	0.341	0.556	0.189	0.328	0.352	0.474
del	*cis*	*cpx*	*cen*	*for*	*agl*	*inf*

Key to Abbreviations:

del	delegation	*cen*	centralisation
cis	sophistication of control and information system	*for*	formalisation
		agl	environmental agility
cpx	complexity	*inf*	infrastructure

As Figure 10.11 graphically illustrates, the external environments of the Ngorongoro Conservation Area Authority, of the Great Barrier Reef Marine Park Authority, and of the Peak National Park Authority are all dynamic, unpredictable, expanding, and fluctuating, a set of characteristics which is consistent with the conception of environmental turbulence originally advanced by Emery and Trist (1965) and taken up by their intellectual successors. The environments of these Authorities are marked by change and by situations in which the information received within each organisation is often contradictory, at least partially a function of the size and complexity of the respective organisation-sets. Some of the planning in each of the Authorities has a rather speculative character, and on the occasions when plans have not been sufficiently flexible - to which both the GBRMPA and the PNPA admit - they have rapidly become obsolete as their environments take unpredictable turns. The uncertainty which plagues these environments makes it essential to develop and maintain the capacity to take calculated risks - essentially through increasing the sophistication and comprehensiveness of their control and information systems and, up to a point, increasing the extent of decentralisation. Contrasting with turbulence are the distinctly more stable environments of the Annapurna Conservation Area Project, the Pinelands Commission, and the Tasmanian Parks and Wildlife Service in its management of the Central Plateau Conservation Area. Generally, the relatively little change that occurs in the environments of these organisations is far more predictable, as information about the environments is readily available and usually fairly reliable, rendering it unnecessary to have highly sophisticated control and information systems. Environmental turbulence is, of course, a variable that ranges all the way from complete stability to total instability, and many organisations operate in neither very stable nor very turbulent environments, but rather in moderately dynamic environments. None of the organisations under review here appear to fall into this mid-ground.

The environment of the Great Barrier Reef Marine Park Authority typifies those environments in which an implicit (or potentially explicit) rivalry surrounds organisational activities, and which are accordingly susceptible to being perceived as turbulent because of the intense, multi-faceted, and continuous attempts to gain leverage. Environmental agility is crucial in these situations and where rivalry *is* explicit, as it is in settings not examined here, such as that occasioned by the historical

lack of unity in the administration of Italian parks and reserves (IUCN, 1987a), and up to a point in the Lake District National Park in the U.K. (IUCN, 1987b). The GBRMPA again typifies those environments in which there are crucial cyclical or other swings which are likely to be viewed as turbulent. Decision makers may perceive an environment as turbulent where there is sociocultural change (*e.g.,* the major cultural change originating in developments in Native Title[1]), change in the needs of an organisation's clientele (*e.g.,* moves to vary the zoning for commercial fishing), or unpredictable shifts in government policies (*e.g.,* the somewhat precipitate change in Commonwealth policy on the inclusion of some coastal areas into the Marine Park). The more of these components that occur together, the stronger will be the decision makers' inference about the degree of turbulence.

Environmental turbulence shapes organisations in significant ways, the turbulent environments such as those of the Great Barrier Reef Marine Park Authority and the Ngorongoro Conservation Area Authority presenting challenging blends of uncertainty and opportunity in contrast to the more stable environments of the Pinelands Commission and the Tasmanian Parks and Wildlife Service. From the evidence obtained during the course of this study, the more turbulent the environment in any of the organisations, the more importance senior managements attach to seeking information about prospective changes in the environment through environmental scanning and monitoring, and the greater the likelihood that management will endeavour to insulate the organisation from external turbulence to the extent it can through vertical integration - by setting up research, forecasting, and planning units which help in reducing uncertainty. These situations accordingly show increases in complexity (specifically horizontal differentiation), improvements in environmental agility, as well as increasing the sophistication of the information systems.

In principle, considerable flexibility should be needed to cope with high turbulence. The Ngorongoro Conservation Area Authority as the organisation with the most turbulent environment shows little evidence of

1 The developments in native title which are particularly significant in the Australian context concern the rights and interests of Aboriginal and Torres Strait Islander people in land and waters according to their traditional laws and customs, and which are recognised under Australian law. These rights can vary from a limited right of access to visit important places, to hunt and fish - to a right to possess, occupy, use, and enjoy the land in a way similar to freehold ownership.

the organic management style which might be expected, where delegation would be high, and centralisation and formalisation would be low. There are virtually none of the organic hallmarks such as free and open channels of communication, informality, and a loose administrative structure. Given the insulation afforded by their statutory authority status, the Great Barrier Reef Marine Park Authority and the Peak National Park Authority, with the next most turbulent environments, have rather less of these organic hallmarks than might be expected. Nevertheless, evidence of flexibility may be the sporadic friction noted by several respondents between some of the interdependent departments in the GBRMPA, as this may be attributable to what was expressed by staff in a different context as a need to continually "fine tune" operating plans. Respondents on the PNPA were unable to confirm an analogous situation in that organisation.

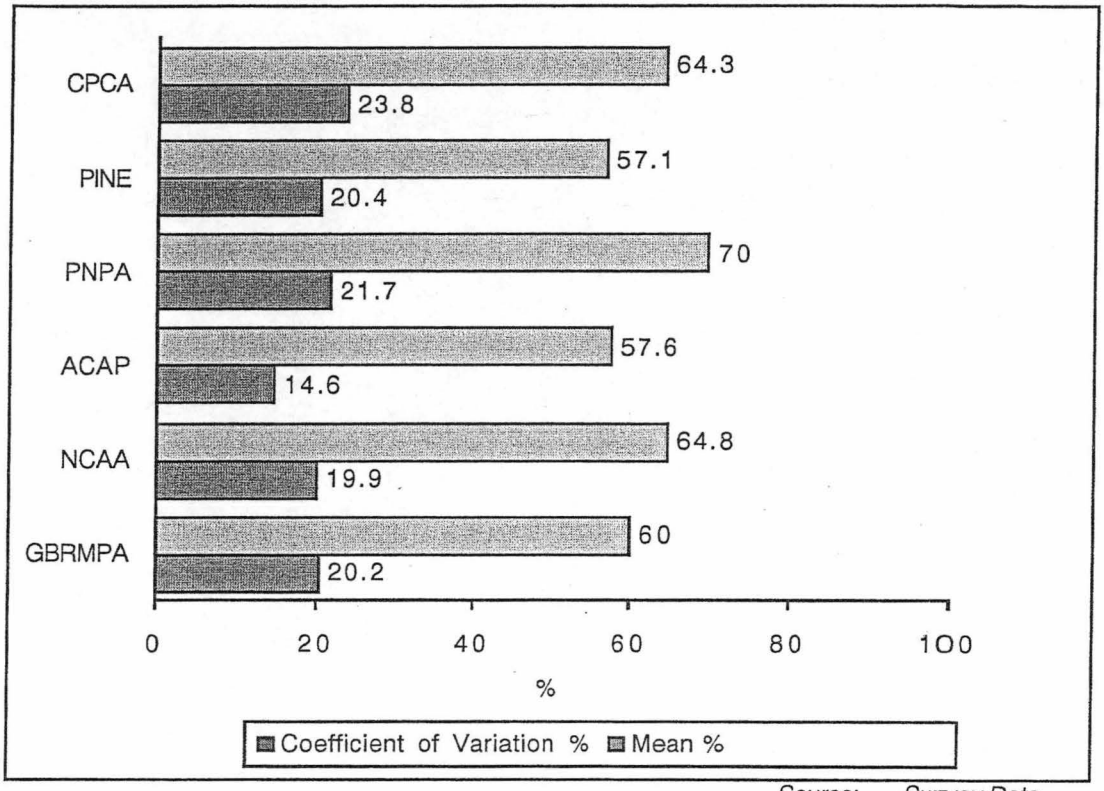
HOSTILITY

The sole generic element which contributes to hostility across the environments of all six organisations is when increases in pressures (such as those arising from demographic changes) combine with reductions in resources (perhaps through privatisation or nationalisation), culminating in increased competition for scarce resources. As Figure 10.13 highlights, the Peak National Park Authority demonstrates by far the highest level of environmental hostility, a level which is associated with a number of common elements. The sheer size and high diversity of the organisation-set bring with them an inherent risk, although the resulting hostility is modified somewhat by polarisation within the organisation-set around such issues as ecosystem sustainability *versus* economic development, and industry *versus* regulation. This particular polarisation also characterises the Great Barrier Reef Marine Park Authority, where there is additional polarisation between the Queensland and Commonwealth governments. In relation to planning processes, perceived injustices and/or frustration amongst potential developers or objectors foster hostility, whereas a sense of ownership or partnership has the effect of limiting hostility, as in the environments of the PNPA, the ACAP, and to a limited extent, that of the Pinelands Commission. This common element of perceived injustices affects environmental agility as one of the allied structural factors insofar

as it is associated with a tendency to be diverted by short-term, politically-driven changes.

Increases in resource use - as, for example, tourism in the Peak National Park and the NCA - place additional strains on facilities, which in turn

FIGURE 10.13 COMPARISON OF DESCRIPTIVE STATISTICS ENVIRONMENTAL HOSTILITY



Source: Survey Data

Key to Abbreviations:

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induce antagonism. This constitutes a further element fostering hostility which was common to several of the organisations, and appears to be associated with three separate elements of environmental agility. The *first* of these was with a generic element - the set of limitations on agility brought about by existing policies, programmes, and structure, and by funding and/or staffing shortfalls - analogous to the link with shortcomings in infrastructure in the discussion of turbulence. The *second* association was also with a generic element - increases in the diversity of advisory structures generally improved the quality of the intelligence on relevant developments which was provided by the

network of bodies available to each of the organisations under review, and accordingly enabled some of the dysfunctional effects of increases in resource use to be anticipated and ameliorated - tantamount to an increase in the agility of the organisations with respect to their environments. The *final* association here was with the limitations on agility which were brought about by difficulties in knowing how to effectively utilise a high level of awareness of environmental developments stemming from the high quantity of incoming quality information - an element common to several of the organisations.

The unique elements which generate hostility comprise, in the case of the environment of the Great Barrier Reef Marine Park Authority, a lack of agreement on how to operationalise World Heritage on such a large spatial scale. This element showed an association with a generic element of complexity - low levels of vertical and spatial differentiation, and with a common element of environmental agility, that is, the limitations on agility which were brought about by difficulties in knowing how to effectively utilise a high level of awareness of environmental developments stemming from the high quantity of incoming quality information. This is, of course, one of the consequences of having such a diverse and extensive organisation-set.

In the environment of the Ngorongoro Conservation Area Authority, the relatively high level of hostility shown in Figure 10.13 was largely generated by dissatisfaction with the lack of genuine participation in planning, whilst the primacy afforded the King Mahendra Trust by virtue of its statutory authority in the Annapurna Conservation Area Project spawned hostility in the guise of an envy factor - reduced to the level shown in Figure 10.13 only by the exercise of considerable tact on the part of officers of the Trust. The low level of hostility shown in Figure 10.6 against the Pinelands Commission, and which typified its environment, was a function of the interactions of socio-economic factors - low unemployment, low tax rates, high population growth, and high agricultural sales, allied with the partnership between levels of government which minimises opposition to Commission decisions.

From the standpoint of the profile based on multiple regression, as Figure 10.14 indicates, hostility in the external environment of an organisation is one of the least influential independent variables in the set examined

FIGURE 10.14 RELATIONSHIPS BETWEEN HOSTILITY AND THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE (*beta* COEFFICIENTS FROM FINAL MULTIPLE REGRESSION MODEL)

-0.016	0.108	0.074	0.141	0.093	0.045	0.008
del	*cis*	*cpx*	*cen*	*for*	*agl*	*inf*

Key to Abbreviations:

del	delegation	*cen*	centralisation
cis	sophistication of control and information system	*for*	formalisation
		agl	environmental agility
cpx	complexity	*inf*	infrastructure

here, although having effects over all seven core dimensions and allied variables of organisational structure. The *beta* coefficients ranged from 0.141 to 0.008, including one inverse relationship (with delegation - *beta* coefficient –0.016: it is reasonable to conclude that this negative coefficient is due to the way the least squares algorithm found the "best-fitting" regression equation). The strongest links were with centralisation (0.141), and the sophistication of control and information systems (0.108).

Based on the Questionnaire responses as captured in Figure 10.13, hostility is the common thread in the external environments of the Peak National Park Authority, the Ngorongoro Conservation Area Authority, and the Tasmanian Parks and Wildlife Service in its management of the Central Plateau Conservation Area. However, as noted in Chapter 7, the ratings of hostility in the PNPA environment may have been skewed as a consequence of disputes over mineral extraction which were current at the time the questionnaires were completed. Other evidence obtained more recently from sources within and outside the Authority generally confirm that the PNPA's proactive efforts to counterbalance the hostility (which planning inevitably attracts) have been substantially successful, indicative of a reasonable level of environmental agility. Accordingly, only the environments of the NCAA and the PWS have been regarded here as exhibiting significant but varying degrees of risk and domination, and as inducing stress and frustration. For the remainder of this study, the environment of the PNPA was treated instead as falling into the middle range of hostility, along with the Great Barrier Reef Marine Park Authority. Because they function in environments which are relatively safe, rich in opportunities, encouraging, and are manipulable or controllable by the organisation, the Annapurna Conservation Area

Project and the Pinelands Commission were considered to operate in more benign environments.

If control and information systems are sufficiently comprehensive, they can be instrumental in improving environmental agility and in monitoring events in the environment. This latter can, however, on occasion, have the side-effect of engendering inferences that the environment is hostile. In organisations which manage protected areas, stringent budgets can be regarded as indicative of hostility, as for example when state-supported agencies such as the Tasmanian Parks and Wildlife Service cannot access the government purse further despite an urgent need for more funds, then a reasonable inference of hostility can be drawn. On the other hand, when funds are readily available, as is generally the case in the King Mahendra Trust, then the opposite inference is warranted. In a different vein, some would argue that the *Great Barrier Reef Marine Park Act* 1975 and associated legislation (*e.g.*, the *Environment Protection and Biodiversity Conservation Act* 1999) fail to support the *raison d'être* of the GBRMPA by not disallowing seismic exploration for oil outside the Marine Park boundaries, and that such unsupportive or arbitrary laws can also lead to an inference of hostility. Minimal legal aggravation, on the other hand, coupled with a comfortable working relationship with government are likely to lead to the perception of the environment as benign, as in the case of the Pinelands Commission. Organisations whose activities have high community acceptance and support - such as the King Mahendra Trust in managing the Annapurna Conservation Area Project - are likely to consider their environment as benign, whilst those whose legitimacy is questioned - as in the case of the Ngorongoro Conservation Area Authority - are likely to consider their environment as hostile. To generalise, where organisations experience hostility on a number of important fronts, they will tend to regard their environments overall as quite hostile, whereas where they do not experience hostility on crucial fronts, they will tend to regard the environments as benign. If they experience hostility on some fronts but acceptance or ease of manoeuvre on others, they are likely to regard their environments as moderately hostile. There appears to be no simple formula for identifying the degree of hostility; judgment has to be exercised in weighing the various factors.

Amongst the information gleaned in the course of a telephone interview later in the study, a source in the Pinelands Commission indicated that on the rare occasions when an event in the environment precipitates a crisis, the Commission has a tendency to respond by centralising decision making. Although this was more-or-less consistent with a number of studies (*e.g.,* Astley and Zajac, 1991), it was realised that other work, such as that of Khandwalla (1992) supported such findings only partially, and accordingly the relationship was pursued in the contexts of the two Australian organisations during subsequent interviews with key respondents. Information from these respondents differed somewhat from the Pinelands finding, suggesting instead that rises in the lower levels of environmental hostility prompt centralisation, together with an associated paring of costly staff activities. As hostility continues to increase, this witnesses a sharp increase in staff services, conceivably following the line that as the environment continued to deteriorate once staff services were streamlined, an increased investment in staff services - particularly those involved with control and information systems - may facilitate understanding of environmental forces.

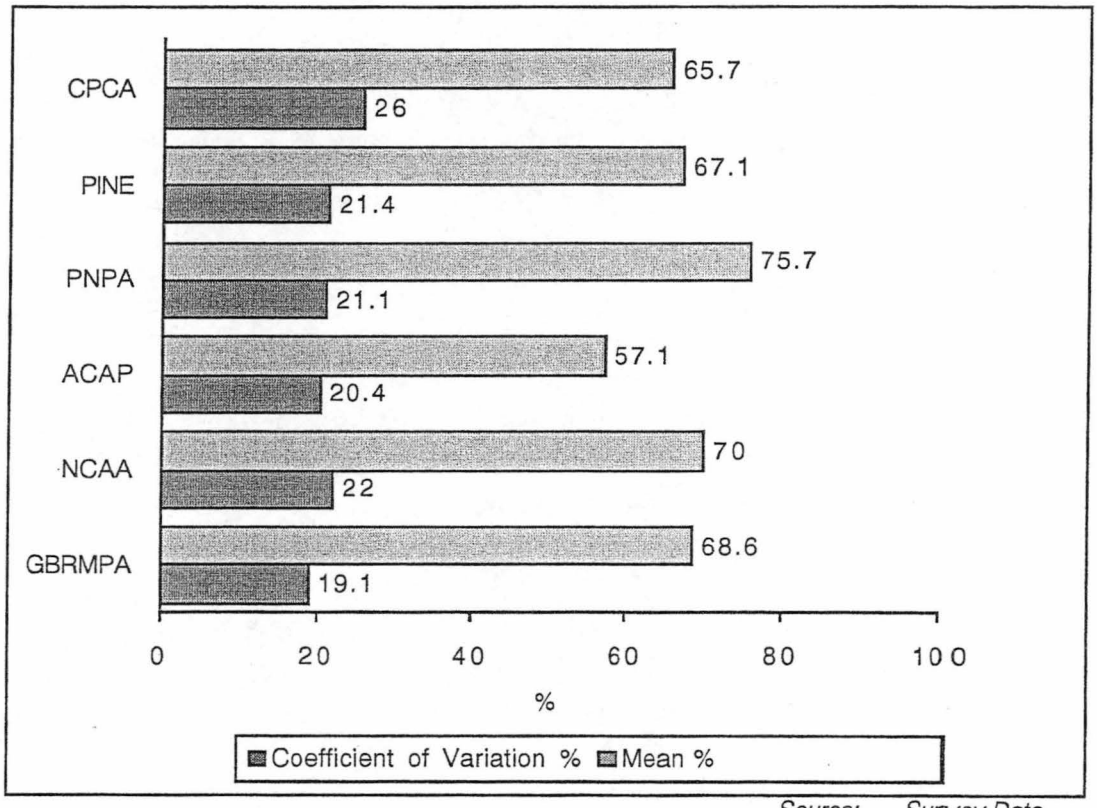
TECHNOLOGICAL COMPLEXITY

The highest level of technological complexity was shown by the environment of the Peak National Park Authority, highlighted graphically in Figure 10.15, which also demonstrates that the ratings of this variable in all six organisations showed relatively high dispersions. There were neither generic nor unique elements which influenced environmental technological complexity, however there were three common elements: *firstly,* the very high standard of sophistication in information technology required in dealing with the PNPA's environment, with management decisions making optimum use of both technically sophisticated information and technology, or in the case of the New Jersey Pinelands Commission in the monitoring of land-use change, water resources, and wetlands communities as well as in the operation of the regional transfer of development rights program.

Secondly, medium-level technology as found in the information management of the Great Barrier Reef Marine Park Authority, this level being dictated by the lack of involvement in the routine management of the Marine Park; the Central Plateau Conservation Area was

differentiated in this respect, with research utilising a high level of technological complexity, against a low level in program delivery. *Thirdly,* in environments such as that of the NCAA which are non-complex technologically, and which therefore do not require technically highly sophisticated information for making strategic decisions, deficiencies in technical sophistication are not significant. Although the statistical data places the NCAA second in the series of means, management decisions in the Authority do not appear to be heavily dependent upon either technically sophisticated information or technology. An analogous, but somewhat novel situation exists where

FIGURE 10.15 COMPARISON OF DESCRIPTIVE STATISTICS TECHNOLOGICAL COMPLEXITY IN THE ENVIRONMENT



Source: Survey Data

Key to Abbreviations:

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PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
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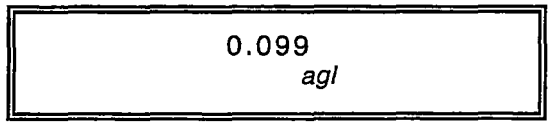
the level of technological sophistication has to align with ultimate self-sufficiency - as in the Annapurna Conservation Area Project - although here the lack of technical sophistication which Figure 10.15 highlights, is imperative.

FIGURE 10.16 RELATIONSHIP BETWEEN TECHNOLOGICAL COMPLEXITY AND ENVIRONMENTAL AGILITY AS AN ALLIED FACTOR OF ORGANISATIONAL STRUCTURE (*beta* COEFFICIENT FROM FINAL MULTIPLE REGRESSION MODEL)



Key to Abbreviation:

agl environmental agility

Taking technological complexity in the external environment of an organisation as directly related to the technical sophistication of the information needed for making strategic decisions, this is the least influential independent variable in the set examined in this study, as the slim profile based on multiple regression illustrated in Figure 10.16 shows, having effects on only a single allied structural variable - environmental agility, the *beta* coefficient for the relationship with which was 0.099.

Rapidly developing technologies, as with the high speed catamarans on the Great Barrier Reef, or technologies that are extremely capital intensive and computer-based, as in the case of the Peak National Park Authority, call for a high order of technical expertise in management for making decisions - including investment. Unless decision makers have a sound grasp of the pitfalls and potential of the technology concerned, they are likely to make serious errors. Although there was some divergence of opinion amongst respondents, the key decision makers within the Pinelands Commission view their respective environments as technologically complex, as do those in the Peak National Park Authority.

These perceptions of technological complexity appear to go hand-in-hand with using a range of management science techniques focussed on information management in order to optimise the utilisation of resources, coupled with a long-term planning orientation. Both these organisations have sophisticated control and information systems or systems that are of either high or moderate sophistication, and there is a reasonably high level of computerisation. At the other extreme, the key decision makers within organisations such as the King Mahendra Trust see their environments as relatively simple, these organisations tending to have managements with short-term, pragmatic styles, much less sophisticated information and control systems, and substantially less computerised operations technology.

In some of the organisational environments studied, technological complexity appears to be instrumental in determining how comprehensive an organisation's control and information system is as well as the level of sophistication of that system. In the case of the Pinelands Commission, for example, the technological complexity of the environment sometimes creates severe coping problems, and sophisticated control of operations becomes important in permitting Commission management to take prompt remedial action without jeopardising the creativity and initiative at the operating levels which are considered to be so vital in such environments. Not only that, but in similar situations, the Great Barrier Reef Marine Park Authority institutes various sophisticated and complex activities not only to *monitor* developments in its environment through scanning and background research, but also to enhance the Authority's *capacity to respond* to those developments through forecasting and long-term planning - its environmental agility. However, this is part of the pattern of unnecessary complexity in the Authority's planning systems and procedures identified by the Australian National Audit Office (ANAO, 1998). There is a necessary interaction between technological complexity and the level of sophistication of the control and information system which is well-illustrated by the Pinelands Commission, the control and information system of which makes close to optimal use of computer facilities and has the capacity to establish standards, procedures, and controls that enable the efficient use of highly complex technology. Accordingly, the Commission is able to take on problems and opportunities well beyond the capabilities of organisations with less sophisticated control and information systems - such as the Ngorongoro Conservation Area Authority or the Annapurna Conservation Area Project - irrespective of the technological complexity of their environments.

RESTRICTIVENESS

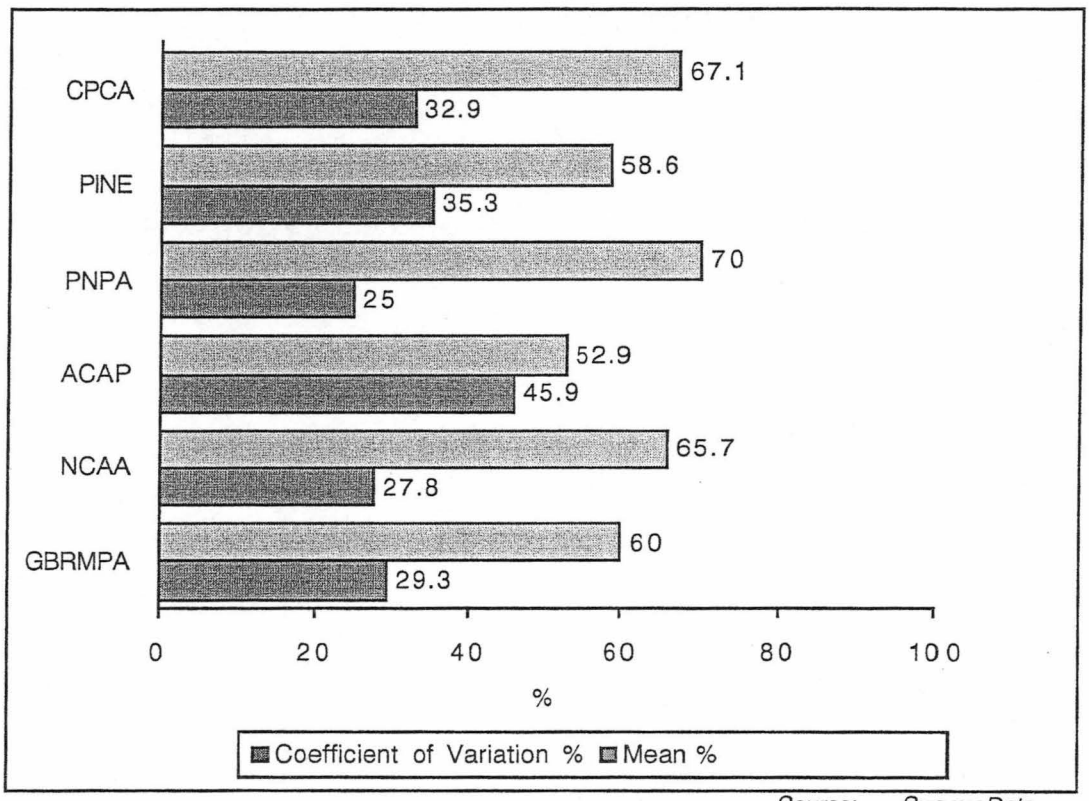
Here, there was a set of many restraining influences - legal, political, and social - which constituted the *first* of two generic elements contributing to restrictiveness across the environments of all six organisations, although it must be noted that the degree of restraint which these influences had on each of the organisations varied considerably. This is illustrated by the manifold legal, political, and social influences on the Great Barrier

Reef Marine Park Authority, contrasting with the very weak - almost negligible - level of *actual* restraint imposed on that Authority by all these constraints. There is also some differentiation between the effects of the different types of constraint, as for example, one type of restraint held sway (perhaps legal, as in the case of the Pinelands Commission) even though the political and social restraints were present to a relatively minor degree. The *second* generic element which contributed to restrictiveness across the environments of all six organisations was the complexity of interactions between each of the organisations and various governmental bodies (although here, again, the complexity varied considerably). This second element is patently associated with the set of limitations on agility brought about by existing policies, programmes, and structure, and by funding and/or staffing shortfalls, inasmuch as this latter generic element from the set of allied structural factors is clearly a function of the level of complexity of organisation-government interaction.

The highest level of restrictiveness was shown by the environment of the Peak National Park Authority, shown graphically in Figure 10.17, which also establishes that the ratings of restrictiveness in the Authority showed the lowest dispersion. Elements contributing to environmental restrictiveness in the PNPA which are common to more than a single organisation although not all, include the subordination of development goals to conservation goals, and the low levels of restrictiveness stemming from political and administration insulation conferred by cooperative relationships with various government levels (including the low restrictiveness stemming from selective insulation of an organisation from the objectives of new legislation). This last element was inversely associated with the limitations on agility which are brought about by the tendency to be diverted by short-term, politically-driven changes. An additional common element was economic restrictiveness - particularly where financial support was not commensurate with increased responsibilities - which is yet a further example of the limitations on environmental agility occasioned by existing policies, programmes, and structures, and by funding and/or staffing shortfalls. Prompted mainly by competition for resources, there was also an association with the factor of internal boundaries frequently interfering with joint problem solving in the Pinelands Commission and the Tasmanian Parks and Wildlife Service.

There were only two unique elements which influenced environmental restrictiveness: the lack of democracy in "representative" bodies in the case of the Ngorongoro Conservation Area Authority and, the case of the Pinelands Commission, the absence of economic restrictiveness, even when development has been channelled into less environmentally sensitive areas. Overall, levels of dispersion revealed by the coefficients of variation in Figure 10.17 were markedly higher than all the other independent variables, and that for the ACAP extraordinarily high at 45.9 per cent, reflecting either differing interpretations of the questions and/or contrasting viewpoints on what constitutes restrictiveness.

FIGURE 10.17 COMPARISON OF DESCRIPTIVE STATISTICS ENVIRONMENTAL RESTRICTIVENESS



Source: Survey Data

Key to Abbreviations:

GBRMPA	Great Barrier Reef Marine Park Authority
NCAA	Ngorongoro Conservation Area Authority
ACAP	Annapurna Conservation Area Project (managed by King Mahendra Trust for Nature Conservation)
PNPA	Peak District National Park Authority
PINE	New Jersey Pinelands Commission
CPCA	Central Plateau Conservation Area (managed by Tasmanian Parks & Wildlife Service)

From the standpoint of the profile based on multiple regression, restrictiveness in the external environment of an organisation is one of the least influential independent variables in the set examined here. Even so, as shown in Figure 10.18, restrictiveness has effects over all seven core dimensions and allied variables of organisational structure.

FIGURE 10.18 RELATIONSHIPS BETWEEN RESTRICTIVENESS AND THE CORE DIMENSIONS AND ALLIED FACTORS OF ORGANISATIONAL STRUCTURE (*beta* COEFFICIENTS FROM FINAL MULTIPLE REGRESSION MODEL)

–0.130	0.096	0.120	0.118	0.066	0.102	0.154
del	*cis*	*cpx*	*cen*	*for*	*agl*	*inf*

Key to Abbreviations:

del	delegation	*cen*	centralisation
cis	sophistication of control and information system	*for*	formalisation
		agl	environmental agility
cpx	complexity	*inf*	infrastructure

The *beta* coefficients ranged from 0.154 to 0.066, including one inverse relationship (with delegation - *beta* coefficient –0.130: it is reasonable to conclude that this negative coefficient is also due to the way the least squares algorithm found the "best-fitting" regression equation). The strongest links were with infrastructure (0.154), delegation (–0.130), complexity (0.120), and centralisation (0.118).

The environment of the Peak National Park Authority represents the archetype of a restrictive environment - the Authority must operate under many legal, political, and economic constraints, making it necessary that decision making in the Authority, especially the formulation of strategy, take into account the many constraints such an environment imposes on the organisation. A restrictive environment of this calibre spawns a need for careful planning and controlling of operations - highlighting the critical need for a sophisticated and comprehensive control and information system - together with a research-based approach to decision making. This is especially true because of the high proportion of legal restrictions which are imposed on the Authority, although it is the combination of constraints which generate significant complexity.

As Figure 10.17 highlights, the degree of restrictiveness inherent in the environments of all the organisations studied - particularly in those in which economic constraints are prominent, such as the environments of the Peak National Park Authority, the Tasmanian Parks and Wildlife Service, and the Great Barrier Reef Marine Park Authority - appears to be significantly linked with management styles dominated by planning and optimisation orientations. It had been anticipated that, following Khandwalla (1992), the restrictiveness of an environment would be found to be associated with an optimisation orientation which in turn would be

associated with sophistication of the control and information system. However there was *neither* evidence of a significant association between restrictiveness and the degree of sophistication of an organisation's control and information system *via* optimisation as an intervening variable, *nor* any direct or other apparent association between these variables.

SUMMARY

In pursuing a synergistic effect between conventional comparative study and the heuristic study of cases, this Chapter has proceeded by utilising the complementary interaction of a preliminary correlation analysis of the relationships between environmental and structural variables in the six organisations under review, a typological analysis of the environments of the organisations, and multiple regression and correlation analysis of the relationships between the environmental and structural factors. Information from secondary sources was used as a basis for comparison with the information gained from these analyses, as was information gained during follow-ups with internal and external respondents and others.

In stimulating the exploration of possible relationships between the dependent and independent variables, the bivariate correlations shown in Table 10.1 fulfilled their heuristic purpose admirably, catalysed by the differences which are apparent between the statistically significant bivariate correlations and the *beta* coefficients in the regression equations (as extracted to Figures 10.10, 10.12, 10.14, 10.16, and 10.18). Arising largely because the contaminating effects of confounding variables present in the simple bivariate correlations were eliminated in the regression equations when the effects of such variables were controlled statistically, these differences had particular impact in the cases where independent variables had relatively large bivariate correlations with dependent variables (*e.g., restrictiveness* with *environmental agility* and with *infrastructure*) but actually contributed little to predictive accuracy, given that other independent variables were already present in the equation (the *beta* values were some 60 per cent of the bivariate coefficients). At the other extreme, some independent

variables had relatively small bivariate correlations with dependent variables (*e.g., heterogeneity* with *centralisation, formalisation,* and *infrastructure; turbulence* with *delegation, complexity, formalisation,* and with *infrastructure; hostility* with delegation, a group where the bivariate coefficients were, medially, 60 per cent of the *beta* values) but were correlated in such a way with other predictors that they contributed significantly when added to the regression equation, that is, they suppressed irrelevant information in other independent variables, thus increasing the overall accuracy of estimation.

The typological analysis revealed a series of distinctive patterns in each of the variables in the external environments of the six organisations, with some 45 per cent of the constituent elements having direct or intervening associations with core dimensions and allied factors of organisational structure. Roughly 75 per cent of the generic elements - those contributing to a variable in the environment of all six organisations - were structurally relevant, whilst 56 per cent of the elements common to the environments of some of the organisations, and 9 per cent of the elements unique to a single organisation show linkages to structural factors. The most significant impacts appeared to derive from factors stemming from the respective organisation-sets (ranging from the sheer number and/or diversity of the stakeholders to the character of the pressures emanating from them), from the extension of this seen in agency relationships with different levels of government, NGOs, and INGOs (whether in terms of complexity, relative insulation, or level of interaction), and from resource pressures (whether stemming from competition for natural or financial resources, or deficiencies in supporting infrastructure). Whilst this classification process was essentially conventional in nature, it also assisted heuristically in exploring potential relationships between elements within the dependent and independent variables, complementing the bivariate correlations.

In examining management perceptions of the external environment, restrictiveness presented as the only independent variable in which there were some marked variations between the perceptions of managers and those of other respondents. Based on responses from senior managers within the Tasmanian Parks and Wildlife Service, management of this organisation perceived the environment as highly restrictive because of the many legal, political, and economic restraints with which they had to

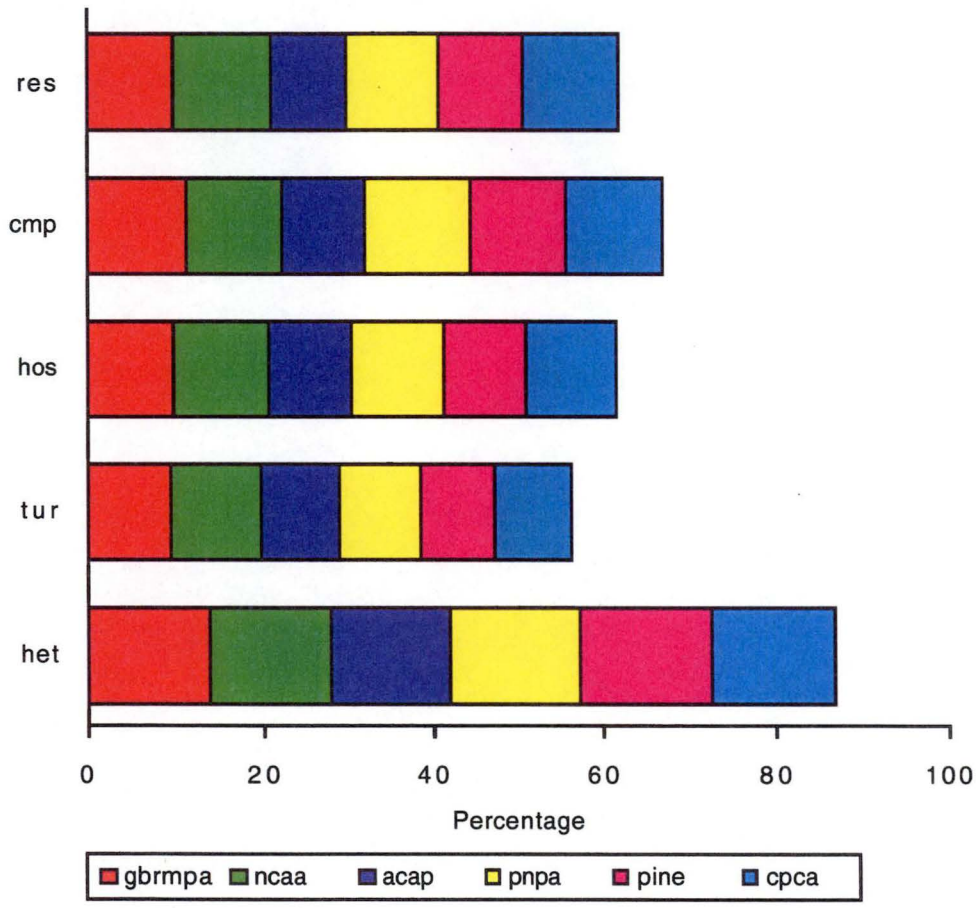
contend. On the other hand, internal managerial respondents in both the Pinelands Commission and the King Mahendra Trust perceived their environments as relatively free from constraints. A *prima facie* paradox then appeared - the Tasmanian Parks and Wildlife Service, the Pinelands Commission, and the King Mahendra Trust all exhibited more delegation and greater decentralisation than the Great Barrier Reef Marine Park Authority and the Peak National Park Authority, managers in both of which viewed the environments of their respective organisations as moderately constraining. Apparently, when there are few constraints, there may be little need for close control over the decision processes, but as constraints increase, the traditional patterns of decision making may need to be changed drastically - if necessary by management *fiat* - in order to take into account the new constraints. However this last response to the increasing constraints generally involves building technical expertise and setting up methods to cope more effectively with the constraints which, if they continue to increase, give rise to decisions which rely increasingly on technical advice. Essentially, organisations in highly restrictive environments rely on control and information systems to ensure that constraints are not violated and operations are efficient (Khandwalla, 1977). No comparable information was forthcoming from respondents within the Ngorongoro Conservation Area Authority, however other evidence suggests that the management of the NCAA exhibited tendencies similar to those of the Great Barrier Reef Marine Park Authority and it could therefore be inferred that NCAA managers may well have viewed the Authority's environment as moderately constraining.

To amplify the comparisons of central tendency and dispersion included within the individual chapters making up Part 2, the means were converted to percentages of the possible scores as set out in Figures 10.9, 10.11, 10.13, 10.15, and 10.17, allowing the examination of the *relative* strengths of the means in the six organisations in conjunction with the juxtaposed coefficients of variation which reflected the degree of *relative* variability. The measures of dispersion revealed that the data for some of the independent variables reflect widely differing opinions, judgments, or interpretations. In particular, the variability of the data for *technological complexity* in the environment of the CPCA and for the restrictiveness surrounding all six agencies exceeds a benchmark of 25 per cent, although only in the case of restrictiveness in the ACAP did the

variability rise to an unacceptable level. Aggregated profiles of the means for responses on the external environments of agencies are summarised in Figure 10.19.

The exploration of the relationships between the external environmental variables and the core dimensions and allied structural factors using multiple regression and correlation analysis produced results in the form of regression models. The key models themselves are included in Appendix 3, the relevant *beta* coefficients having been extracted and recorded in Figures 10.10, 10.12, 10.14, 10.16, and 10.18.

FIGURE 10.19 COMPARISON OF AGENCY MEAN PROFILES EXTERNAL ENVIRONMENTAL VARIABLES



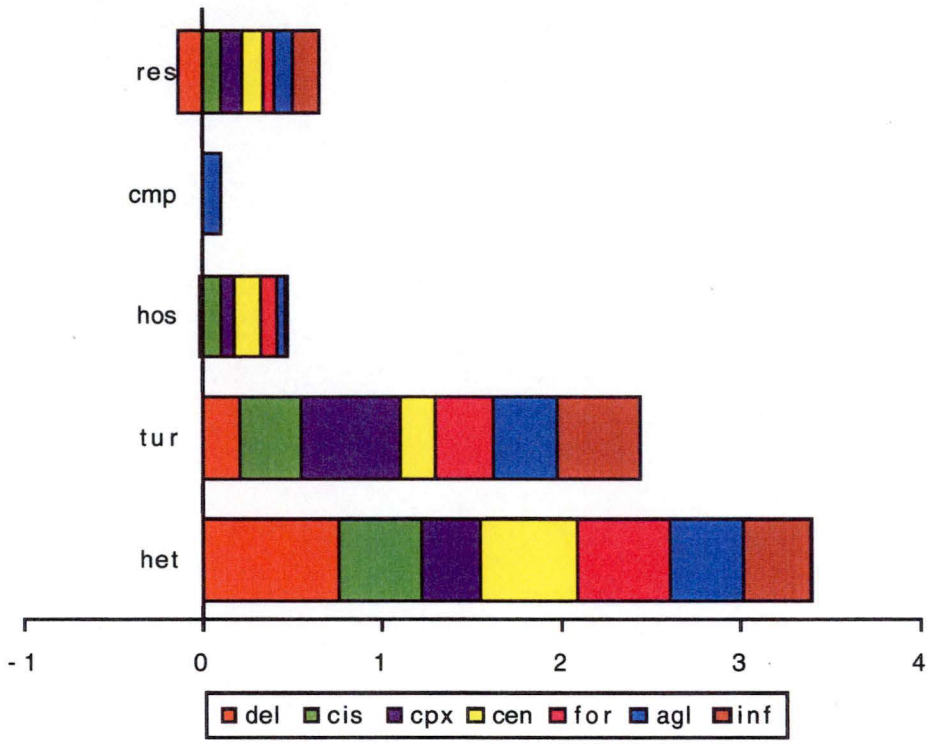
Source: Survey Data

Key to Abbreviations:

res	Restrictiveness	gbrmpa	Great Barrier Reef Marine Park Authority
cmp	Technological Complexity	ncaa	Ngorongoro Conservation Area Authority
hos	Hostility	acap	Annapurna Conservation Area Project (managed by the King Mahendra Trust for Nature Conservation)
tur	Turbulence	pnpa	Peak National Park Authority
het	Heterogeneity	pine	Pinelands Commission
		cpca	Central Plateau Conservation Area (managed by the Tasmanian Parks and Wildlife Service)

To assist comparison, profiles based on the regression models are depicted in Figure 10.20. The regression profiles present a dramatic image of heterogeneity and turbulence as the environmental variables having preeminent links with the core dimensions and allied factors of organisational structure. In these terms, heterogeneity exerts virtually

FIGURE 10.20 COMPARISON OF REGRESSION MODEL PROFILES EXTERNAL ENVIRONMENTAL VARIABLES



Source: Survey Data

Key to Abbreviations:

res	Restrictiveness	inf	Infrastructure
cmp	Technological Complexity	agl	Environmental Agility
hos	Hostility	for	Formalisation
tur	Turbulence	cen	Centralisation
het	Heterogeneity	cpx	Complexity
		cis	Sophistication of Control & Information Systems
		del	Delegation

half of the total potency of the environmental variables over the structural factors, turbulence over one-third, hostility and restrictiveness each roughly 7-8 per cent, whilst technological complexity exerts barely 1 per cent of the total. It is reasonable to conclude that, in relation to delegation, the negative coefficients for both hostility and restrictiveness in Figures 10.1, 10.14, and 10.18 are due to the way the least squares algorithm found the "best-fitting" regression equation.

PART 4

THE RESEARCH CONCLUSIONS

CHAPTER 11

CONCLUSIONS

CHAPTER 11

CONCLUSIONS

This thesis argues that the structures of organisations managing protected areas are significantly conditioned by the external environments in which those organisations operate. To this end, the work identifies and examines five key variables in the external environments of organisations managing selected protected areas, and analyses seven core dimensions and allied factors of organisational structure to establish the existence and nature of any relationships with the environmental variables.

These conclusions address the Propositions that were ultimately derived from the review of theory and empirical research as set out in Chapter 2, and which accordingly embody significant theoretically-based and empirically-researched themes which are critical to achieving the research objectives. A synopsis of the environmental variables highlights the dramatic patterns of relationship which are manifested by the six organisations under review, and forms the magnifying glass through which to inspect the emerging themes which bring to light some further insights into the way organisational environments influence agencies managing protected areas. The implications of this study for organisational design are identified, and finally, the project is reconsidered in the light of the Research Objectives.

THE PROPOSITIONS REVISITED

The following revised set of propositions offers insights into the way the structures of organisations managing protected areas are influenced by their environments. There appears to be no *prima facie* reason why these insights may not also be applicable to organisations operating in other contexts, however any extension of this type is beyond the scope of the evidence which underpins this research. Some of the original Propositions have been modified - some slightly, others extensively. Some variables have been excluded from the final version of the

Propositions on various grounds, new Propositions have been added where later information from secondary sources or respondents indicated the need, some Propositions have undergone revision simply to tighten their focus, some to admit aspects of variables previously omitted, to accommodate a rather more complex picture than had been anticipated, or to exclude a specific factor where there was insufficient evidence to justify retaining this feature.

PROPOSITION 1

The greater the heterogeneity in the environment, the more comprehensive and sophisticated the control and information system, and accordingly:

1.1 the greater the level of delegation;

1.2 the greater the organisational agility.

Technological complexity has been excluded from this final version of Proposition 1 on three grounds: *firstly,* that in terms of the mean scores, the proposed relationship between this variable and the sophistication of control and information systems as an intervening variable did not subsist across all agencies, but was apparent only in the cases of the Pinelands Commission and the Tasmanian Parks and Wildlife Service in its management of the Central Plateau Conservation Area. In neither of these cases did there appear to be any extraordinary factor which might justify a corollary to the basic Proposition, and in both instances, the level of sophistication in control and information systems demonstrated only weak links with delegation, a pattern which applied across all six independent variables in relation to environmental agility. *Secondly,* in relation to delegation, technological complexity had been eliminated at an early stage from the regression model, having failed to reach statistical significance, whilst the only evidence of a relationship with organisational agility was the extremely low value of the *beta* coefficient in the final multiple regression model. *Thirdly,* there was no other evidence to suggest that technological complexity ought to be retained as an independent variable in this Proposition.

Heterogeneity, on the other hand, presented a more positive picture: on the one hand, the relationship between heterogeneity and sophistication of control and information systems was generally substantiated by the pattern of the mean scores, this intervening variable showing clear links

with delegation. Although the cases of the Ngorongoro Conservation Area Authority and the Peak National Park Authority were atypical, there was considerable strength in the overall association between heterogeneity and delegation as reflected in the *beta* coefficient of 0.758 in the regression model. The relationship between the intervening variable and environmental agility was slightly less definitive, with half of the agencies demonstrating distinct linkages, as mirrored in the moderate *beta* coefficient (0.401) in the regression model. The overall trend across the six agencies, however, presents as something of an anomaly: it appears as an inverse relationship, such that as the level of sophistication in control and information systems increased, the agility of agencies to respond to their environments fell. There was no evidence to imply that heterogeneity ought not to be preserved as an independent variable in this Proposition.

PROPOSITION 2

The more heterogeneous the external environment facing an organisation:

2.1 the greater the structural complexity of the organisation through horizontal, vertical, and spatial differentiation;

2.2 the greater the tendency on the part of the organisation to develop separate homogeneous structures to interact with each major environmental element;

2.3 the internal inefficiencies created by this differentiation will be counteracted by designing and utilising sophisticated controls and information to monitor the environment and functioning of sub-systems.

The original version of Proposition 2 has undergone extensive revision to admit two related aspects of complexity which had been discussed in Chapter 2 as part of the Review of Theory and Empirical Research but which had been omitted from the original set of Propositions as being of marginal relevance to this study. In the first instance, the original Proposition was split into the new Proposition's stem and Proposition 2.1, the latter then being specified more closely in the new Proposition which has been added at 2.2. The evidence from the mean scores suggests that Proposition 2.1 and its tightened focus in Proposition 2.2 reflect with reasonable accuracy the relationships between heterogeneity and complexity, even though the intensity of the relationships does differ slightly from that which might be expected from theory, in that the rate of increase in structural complexity is only about 20 per cent of that of

heterogeneity. This situation is only partially attributable to the anomalies presented by both the Annapurna Conservation Area Project and the Pinelands Commission, neither case presenting any exceptional factor which might justify formulating a corollary to the basic Proposition. This evidence is consistent with the regression model, in which the *beta* coefficient of 0.339 reveals a relationship of moderate strength between heterogeneity and complexity. In the second instance, a new Proposition was added at 2.3 to explain how agencies adjust to the dysfunctional side effects inherent in structural differentiation.

Both additions were stimulated by comments made by a respondent internal to the Great Barrier Reef Marine Park Authority and similar remarks emanating from both an internal respondent and an outside observer of the Tasmanian Parks and Wildlife Service in expressing the view that organisational units seemed to be hiving-off sub-units closely linked with stakeholder groups in particular. As evidence of this, each respondent pointed to specific examples within the agencies concerned, going on to indicate that this increasing internal differentiation (although the differentiation of the latter agency was not attributable solely to the Service's management of the Central Plateau Conservation Area) had been accompanied by wasteful work practices, difficulties in achieving a coordinated work effort and, in some cases, the emergence of duplicate mechanisms and resources. Organisational reactions to these dysfunctions varied - even within these two agencies - the only response bearing a direct relationship with the external environment being that which appears in Proposition 2.3, that is, the extent of sophistication in controls and information to monitor the environment and functioning of sub-systems.

Evidence from secondary sources suggests that the differentiation phenomena described above may well not be confined to the two agencies which prompted the original comments, and this, coupled with the treatment of the phenomena in the literature, prompted Proposition 2.3 to be put forward as also of potential application across the agencies under review. The reciprocal relationship between complexity and sophisticated control and information systems proposed in Proposition 2.3 is supported by the mean scores and secondary evidence. An indicative estimate of the strength of the relationship between these two variables was provided by partial regression which confirmed the indirect

support offered by the multiple regression model itself that the association was of moderate strength.

The overall trend of the mean scores showed conclusively that increased heterogeneity was associated with increases both in complexity and in the sophistication of control and information systems, with complexity increasing at roughly 10 per cent the rate of heterogeneity, and the sophistication of the control and information systems increasing at just over 20 per cent of the heterogeneity rate. These variations obviously indicate differing intensities in the relationships, although they do not significantly distort the essential linkages. Information from individual agencies generally supports this finding as well as the terms of Proposition 2.3. There are, nevertheless, some departures from the general pattern of interdependence. The most marked of these is the Annapurna Conservation Area Project in which both complexity and the level of sophistication of control and information systems diminish as the Project's environment becomes more heterogeneous. *Prima facie,* this suggests the corollary that organisations operating in simple, uncomplicated environments will have relatively unsophisticated control and information systems, borne out by the ACAP ranking lowest on both complexity and sophistication of control and information systems. The Pinelands Commission does not conform to the general pattern on complexity, whilst the Peak National Park Authority differs with respect to control and information systems. There did not appear to be sufficient consistency in the data for either of these agencies to warrant a corollary to the basic Proposition, and in addition there were no other sources which presented any evidence to indicate that heterogeneity ought not to be retained as an independent variable in this Proposition.

PROPOSITION 3

Increases in environmental heterogeneity and turbulence generate organisational uncertainty, resolution of which is achieved by increasing structural decentralisation.

The relationship between heterogeneity and decentralisation proposed here appears to be sustainable based on the mean scores, the multiple regression model, and secondary evidence. The Ngorongoro Conservation Area Authority and the Peak National Park Authority represent departures from the general pattern, the remaining four

agencies conforming to the tenor of this Proposition. The regression model reveals a relationship between heterogeneity and decentralisation which is well-above average in strength. In neither the NCAA nor the PNPA did there appear to be any extraordinary factor which might justify a corollary to the basic Proposition, nor was there was any evidence to indicate that heterogeneity should not be retained as an independent variable in this Proposition. There is a slight anomaly in that the rate of increase in decentralisation overall was only about 10 per cent of that of the rate of increase in heterogeneity, but this does not significantly distort the essential relationship.

There appears to be a defensible but somewhat weaker relationship between turbulence and decentralisation, the mean scores, the multiple regression model, and secondary evidence showing reasonable correspondence in the conclusions which they sanction. Insofar as the mean scores are concerned, four of the agencies conform to the substance of this Proposition, with both the Pinelands Commission and the Great Barrier Reef Marine Park Authority representing minor departures from the general pattern. In neither agency did there appear to be any unusual element which might justify a corollary to the basic Proposition. The overall rates of change in which decentralisation increased at some 72 per cent of that of the rate of turbulence, are consistent with the regression model which showed a *beta* coefficient of 0.189 for the relationship between turbulence and decentralisation. Whilst turbulence was substantiated as an independent variable in this Proposition, the evidence provided by the mean scores and the regression model was not of the same order as with heterogeneity.

Both *delegation* (Proposition 1.1) and *decentralisation* (Proposition 3) are included separately for the reasons noted earlier, that is, whilst *delegation* of authority forms a core element in the centralisation-decentralisation continuum, it also overlaps with other dependent variables *via* various intervening variables. The *degree* of delegation, the *type* of decision which was delegated and the *actual* extent of delegation where this differed from the level of formal delegation were considered to be material to the analysis.

PROPOSITION 4

As hostility in the environment increases:

4.1 centralisation increases initially, accelerating the decisions required for environmental agility;

4.2 decentralisation subsequently increases to optimise access to local information and maintain environmental agility;

4.3 differential hostility will be met with selective decentralisation, facilitating different responses to the environments of organisational subsystems, generating an overall environmental agility;

4.4 formalisation increases in organisational operations.

The original version of Proposition 4 has been refined considerably in order to accommodate the rather more complex picture presented by the different agencies. Proposition 4.1 has been revised slightly, and a new Proposition 4.2 added in order to allow for phenomena such as that manifest by the Pinelands Commission where, despite the low level of hostility in its environment, the Commission has on its own admission a tendency to respond to hostile situations by centralising decision making. In the cases of the Great Barrier Reef Marine Park Authority and the Tasmanian Parks and Wildlife Service in its management of the Central Plateau Conservation Area, it appears that where there are increases in low-range hostility in their environments, these two agencies tend to respond by centralising operations and trimming those staff activities which are perceived as costly. Where hostility continues to increase in their environments, the resources committed to staff services in both these agencies tend to increase - at times fairly dramatically - possibly on the grounds that since cutting-back staff services did not diminish hostility (and did not even slow its rate of growth), restoring and strengthening those services - especially those concerned with control and information systems - may help to improve understanding of the environmental forces facing the organisations.

A further new Proposition was added at 4.3 to take into consideration the situation that, although the level of hostility in the environments of the Annapurna Conservation Area Project and the Pinelands Commission is generally low, secondary sources on both agencies indicate quite clearly that where hostility occurs, it differs either between the Unit Conservation Offices in ACAP or between functional areas in the case of the Pinelands Commission, spawning some degree of decentralisation highly specific to either area or function, and generally limited in duration. As evidence

from secondary sources conveys an impression that the centralisation-decentralisation phenomena described above may well have a wider incidence amongst the agencies under examination, Propositions 4.1 - 4.3 have been put forward as potentially applying to all the agencies under review. In resequencing Proposition 4.2 (now 4.4), the substance of the Proposition remained unaltered.

Whilst the original form of the Proposition was derived from the theoretical literature and empirical research, the revised formats of Propositions 4.1 - 4.3 draw as well on secondary sources of evidence. The mean scores provide substantial support for the relationships between hostility and centralisation-decentralisation which are contained in Propositions 4.1 - 4.3, for whilst the Tasmanian Parks and Wildlife Service departs slightly from the general pattern, the other five agencies conform to the thrust of these parts of the Proposition. The *beta* coefficient of 0.141 from the multiple regression model may be regarded as indicative for Propositions 4.1 - 4.3, whilst for the relationship between hostility and formalisation advanced in Proposition 4.4, multiple regression reveals a *beta* coefficient of only 0.093. This is mirrored in the mean scores, where the increases in formalisation are confined to four of the agencies, and the rate of increase overall is only some 17 per cent of the increases in the independent variable.

PROPOSITION 5

> The extent to which an organisation is able to provoke change or adapt to externally induced change will be determined by the degree of flexibility in the organisation's policies and structure, and by the levels of turbulence and restrictiveness in the environment.

Hostility has been excluded from this final version of Proposition 5 on the grounds that in the final multiple regression model there was only very weak evidence of a relationship between hostility and organisational agility with respect to the environment, the extremely low value of the *beta* coefficient at 0.045 suggesting that this relationship was inconsequential from the standpoint of this study. This viewpoint was supported by the mean scores, which provided only tenuous evidence of any relationship between hostility and the environmental agility of agencies. This evidence was in any event confined to the Great Barrier Reef Marine Park Authority and the Ngorongoro Conservation Area Authority, and there was no conspicuous backing from any other source

for the retention of hostility as an independent variable in this Proposition.

On the other hand, based on the combination of their *beta* coefficients in multiple regression, and the patterns of their mean scores, both turbulence and restrictiveness have been retained as independent variables. In achieving a *beta* coefficient of 0.352 in the regression model, turbulence demonstrates a moderately strong relationship with environmental agility, and this is supported by the mean scores in five out of the six agencies, where increases in turbulence were associated with increased ability on the part of the five agencies either to provoke change or adapt to externally induced change. The only exception here was the Pinelands Commission. Whilst restrictiveness was unequivocally substantiated as an independent variable in this Proposition, the evidence provided by the mean scores and the regression model was not of the same order as with turbulence. In four of the agencies, increased restrictiveness was linked with increased ability to induce change or adapt to change emanating from external sources, and this, paralleled with a *beta* coefficient of 0.102, indicated that restrictiveness was defensible as a valid element in this Proposition.

PROPOSITION 6

The greater the heterogeneity and restrictiveness in the task environments of the major subsystems of an organisation, the more an organisation will rely on the expertise of professional personnel in those subsystems, and accordingly:

6.1 the greater the decentralisation;

6.2 the less the formalisation.

Technological complexity has been excluded from this final version of Proposition 6 on the grounds that, having failed to reach statistical significance, this variable had been eliminated at an early stage from the regression model, the status of this variable being confirmed by the pattern of the mean scores which indicated that the proposed relationship between this technological complexity and formalisation was negligible. In addition, the means disclosed no link between technological complexity and formalisation, and the relationship with centralisation-decentralisation existed only in the Great Barrier Reef Marine Park Authority (at a relatively insignificant level) and in the Ngorongoro Conservation Area Authority, neither case exhibiting

anything unusual which might justify a corollary to the basic Proposition or to suggest that technological complexity ought to be retained as an independent variable in this Proposition.

In considering the remaining independent variables, it was necessary to supplement the means scores and regression coefficients with the results of follow-up communications with selected respondents on each of the agencies, as it was essential to glean an understanding of the extent to which each organisation relied upon professional expertise in their major subsystems - including their control and information systems - to deal with aspects of the task environments of those subsystems. (The original version of this Proposition was modified to exclude the reference to professional norms, as there was insufficient evidence on adherence to such norms to justify retaining this feature.)

Against the backdrop of this pool of information, heterogeneity in the task environments of the major subsystems of agencies was found to display strong links with both decentralisation and formalisation as dependent variables, with the combination of mean scores, multiple regression, and follow-up communications making it amply clear that this Proposition offers a legitimate picture of the reliance which agencies place on professional expertise in those subsystems when dealing with increased heterogeneity in their environments. There is a slight anomaly in that the rate of increase in formalisation overall was only about 10 per cent of that of the rate of increase in heterogeneity, duplicating the situation in which, as noted under Proposition 3, decentralisation increased at a similar rate. It is not considered, however, that either of these anomalies significantly distort the essential relationships.

Restrictiveness in the task environments of agency major subsystems was also associated with centralisation and formalisation. On the one hand, analysis of the mean scores showed that all but the Pinelands Commission and the Tasmanian Parks and Wildlife Service (as manager of the CPCA) demonstrated moderate increases in both centralisation and formalisation relative to increases in restrictiveness. Multiple regression together with follow-up communications corroborate the mean scores in establishing the credibility of this Proposition in describing the reliance which agencies place on professional expertise in key

organisational subsystems in the face of increased environmental restrictiveness. When the data is examined as a whole across all six organisations, two anomalies present themselves - *firstly,* centralisation increases at a rate of only 35 per cent of the rate at which restrictiveness increases, whilst *secondly,* formalisation displays a rate of increase which is even lower at 6 per cent of the rate of increase of restrictiveness. This extremely low percentage corroborates the very low value of the *beta* coefficient in the regression model (0.066) - a value which in other circumstances would have prompted the rejection of any relationship between restrictiveness and formalisation. However neither case presents any exceptional factor which might justify modifying the basic Proposition, and the relationship in each instance is, nevertheless, quite distinct. In addition, there appeared to be no evidence from other sources to indicate that restrictiveness ought not to be preserved as an independent variable in this Proposition.

PROPOSITION 7

Turbulent environments are likely to induce:

7.1 the insulation of key operating activities from uncertainty to enable the maintenance of relatively high formalisation in these key functions;

7.2 low formalisation in boundary-spanning units.

The mean scores and multiple regression established that a *prima facie* relationship existed between turbulence and formalisation, in addition to which the *beta* coefficient of 0.328 indicated that the relationship was of medium strength, and the mean scores confirmed that although formalisation increased at less than 20 per cent the rate of increase in turbulence, the relationship was entirely defensible, secondary evidence confirming that the two diverse aspects of the relationship as proposed in Propositions 7.1 and 7.2 were tenable.

Effectiveness and efficiency require that key operating activities - the equivalent of the "technical core" proposed by Thompson (1967) - be insulated from the uncertainties and restrictions imposed by the environment. To the extent that an organisation succeeds in sealing off its technical core, units making up that core can be constructed around the nature of the technology rather than to meet externally imposed constraints. There is clear evidence that four of the agencies under

review have very effective boundary-spanning units which fulfil this buffering role, the most notable examples from each agency being set out below, together with an assessment of the level of formalisation.

ANNAPURNA CONSERVATION AREA PROJECT

Here, for example, the Unit Conservation Offices serve as the key centres for KMTNC's field operations in pursuing the ultimate goal of self-sufficiency. Toward the ultimate independent functioning of the ACA, the UCOs necessarily work in conjunction with the Village Development Committees which form the underpinning for the Conservation Area Management Committees and their subsidiaries. Even though the UCOs are subject to general oversight by the relevant Programme Coordinator (Northern or Southern), and need to conform with the overall policies of the KMTNC, each UCO has considerable latitude in their operations, substantial freedom to exercise discretion, and only the barest of standardised guidelines. Given their isolation and professional background, the UCOs are expected to be able to deal with all but the most acute situations. Although ACAP as a whole exhibits a relatively high mean, as ACAP's prime boundary-spanning devices, the UCOs characteristically show a low level of formalisation.

PINELANDS COMMISSION

Prominent amongst the boundary-spanning features of the Commission's overall management style which are important factors in buffering the Commission's technical core from environmental influences, is the Local Review Officer programme which streamlines the Commission's building application process, the Local Review Officer - whose role is essentially that of a facilitator - being the first and often only point of contact with the Commission for private landowners. The degree of formalisation within the Commission generally is relatively low, and mirrors the political and administrative autonomy which the Commission itself enjoys. The Local Review Officers not only have to operate under general oversight and within overall policies, but they also have to observe designated procedures in their facilitator roles, albeit these are streamlined as far as legal requirements permit. Overall, the Pinelands Commission's boundary-spanning units have circumscribed discretion and operate under standardised guidelines, however within those bounds, there is little by way of programmed behaviour. As noted in Chapter 8, the

Commission is atypical of the organisations examined, with measures of formalisation varying only slightly across the organisation, probably due to the high proportion of professionals, culminating in a level of formalisation falling between moderate and low.

TASMANIAN PARKS AND WILDLIFE SERVICE

Perhaps the key boundary-spanning feature in relation to the Service's responsibilities for the Central Plateau Conservation Area is the position of District Manager (Central North) and the links this position necessarily maintains with the relevant District Community Consultative Committee (DCCC) - the primary method for community input to operations at the District level. This relationship is complementary to the community engagement programmes at both local and State policy level, programmes which pre-existed the DCCC concept and which also span boundaries through their linkages with appropriate branches of the Service, as part of the integrated community consultation network set out in Figure 9.4. As an agency of the Tasmanian State Government, the Parks and Wildlife Service operates under the policies of its parent department and is subject to the normal constraints of public service regulations and procedures. So whilst the District Manager within whose remit the CPCA falls has minimal discretion in some matters - generally of a fiscal or staffing nature where consistency and uniformity are required - the Manager also has considerable latitude in others, particularly those involving professional judgement on, for example, natural resource management, and those which fall within the province of the DCCC or other advisory body. As a category, moderate to low formalisation would seem to be an appropriate designation.

GREAT BARRIER REEF MARINE PARK AUTHORITY

GBRMPA's main boundary-spanning units comprise the stakeholder liaison units in each of the four critical issues groups which link the Authority to its network of advisory committees and user/industry groups, including Reef Advisory Committees, government agencies at both the Commonwealth and Queensland State levels, and numerous others as noted in Figure 4.2. These stakeholder liaison units, along with the Aquarium, exhibit most of the qualities which identify low levels of formalisation, job incumbents having a great deal of discretion over what, when, and how tasks are to be performed, with only general policy and

professional guidelines. The low degree of formalisation in these units is a function of the high proportion of professionals in the critical issues groups, and of the considerable discretion allowed to Aquarium staff. Having some boundary-spanning characteristics, the Program Delivery Group presents a mixed picture: areas such as environmental impact management and the administration of permits tend to be highly formalised, whilst others such as indigenous liaison operate with formalisation limited essentially to project and liaison objectives.

Contrasting with these four agencies, the Peak National Park Authority (PNPA) and the Ngorongoro Conservation Area Authority (NCAA) exhibit relatively high formalisation in their boundary-spanning units. In the PNPA, the boundary-spanning departments, such as those concerned with planning and legal matters, are quite strongly formalised, with policies and procedures necessarily followed closely in decision making. This may arise partly because of the Authority's significant links with local government and is at odds with the finding of a low degree of formalisation for the Authority as a whole. In the case of the NCAA, high formalisation is probably linked with the Authority's dubious sensitivity to the human aspects of its external environment as revealed in the land rights controversy, in the lack of genuine public participation in the planning process, and in the consequential differences in the goals of conservation and community development.

PROPOSITION 8

Organisations in heterogeneous and turbulent environments coordinate disparate activities through endeavouring to ensure that:

- 8.1 internal boundaries between organisational units do not interfere with solving joint problems;
- 8.2 division of work is accomplished in terms of:
  - 8.2.1 overall task responsibility;
  - 8.2.2 integration of core and support work.

The relationship between hostility and infrastructure is rather vexed, and has been excluded from this final version of Proposition 8 on the grounds that, although three agencies - the Annapurna Conservation Area Project, the Great Barrier Reef Marine Park Authority, and the Ngorongoro Conservation Area Authority - conformed to the substance of this Proposition on the mean scores, the remaining three agencies refuted the Proposition. Despite careful examination, none of those

agencies showed any unusual element which might warrant a corollary to the basic Proposition, and notwithstanding their inclusion, the overall rate of change at which infrastructure increased was less than half that of the rate of hostility. Contrasting with the evidence from the mean scores, the final multiple regression model showed the extremely low value for the *beta* coefficient at 0.008, indicating that the relationship between hostility and infrastructure was very weak indeed. Although there was nothing to imply that hostility ought to be retained as an independent variable in this Proposition, the secondary sources were nevertheless thoroughly examined for any evidence which might support the relationship suggested by the pattern in the mean scores - a search which was to no avail.

The other independent variables in the Proposition emerged rather differently. Based on the multiple regression model and secondary evidence, heterogeneity and infrastructure were revealed as related in terms of this Proposition. The heterogeneity-infrastructure link exhibits a *beta* coefficient of 0.365 through multiple regression, indicating a moderate strength in the relationship. The mean scores are ambiguous: on the one hand they conform with the thrust of the Proposition, for even though the Annapurna Conservation Area Project and the Pinelands Commission fall outside the general pattern, the remaining four agencies *are* consistent with the Proposition's contention. On the other hand, however, the overall tendency of the mean scores suggested that an inverse relationship existed, such that increases in heterogeneity would be associated with decreases at a similar rate in infrastructure. This anomaly was discounted in the light of the countervailing evidence, as was any need to justify a corollary to the basic Proposition, since there did not appear to be any relevant factor inherent in either the ACAP or the Pinelands Commission, and no evidence to indicate that heterogeneity should not be retained as a variable in this Proposition.

The relationship between turbulence and infrastructure is markedly stronger than that with the heterogeneity-infrastructure link, with the mean scores, the multiple regression model, and secondary evidence all showing remarkable congruity. On the mean scores, all but the Pinelands Commission fit this Proposition, but there did not appear to be any unusual element which might justify a corollary to the basic Proposition. The level of infrastructure increased at almost precisely the

same overall rate as the increases in turbulence, paralleling the finding from the regression model which showed a *beta* coefficient of 0.474 for the relationship between turbulence and infrastructure, the combined evidence substantiating turbulence as an independent variable in this Proposition.

THE EXTERNAL ENVIRONMENT IN RETROSPECT

The five external environmental variables examined in this study vary significantly in their relationships with the structural variables in the six organisations reviewed. The evidence overall supports the conclusion that heterogeneity and turbulence have the most conspicuous linkages with the structural variables, accounting for something in the order of eighty per cent of the total relationships. The organisations themselves also vary dramatically in the patterns of relationship which they manifest, as highlighted in the following summary.

HETEROGENEITY

The essence of environmental heterogeneity lies in the number of components external to an organisation that have the capacity to influence that organisation's operations. The heterogeneity of an environment may be traced back to the diversity in characteristics and needs of the relevant organisation set, and may correlate with the variety of organisational outputs. The more heterogeneous the environment, the greater the number of components to monitor, these components tending to be heterogeneous as well. For example, the high level of heterogeneity shared by the environments of the Peak National Park Authority and the Pinelands Commission was in both cases produced by a combination of factors, including varied land use, land ownership, resident human population, and proximity to large cities. Even the agency rated lowest on heterogeneity - the Great Barrier Reef Marine Park Authority - serves more than sixty stakeholder groups based on diverse interests in each of the fishing, tourism, and shipping industries, government, public interest groups with an array of persuasions, and a variety of non-governmental organisations. These three agencies also bear out the conclusion that wide variety in the outputs of organisations generally reflects highly variegated, heterogeneous environments, and appears to correlate with increased organisational size, although this

was not explored here. It would appear that the greater the homogeneity, the fewer components which management needs to monitor, allied with which the components themselves tend to be homogeneous, although it should be stressed that it was not possible to verify this in the present study.

TURBULENCE

Turbulent environments are marked by change and by situations in which information reaching the organisation is often contradictory, circumstances which are typical of the Ngorongoro Conservation Area Authority's environment - although some of the deficiencies can be traced to shortcomings in planning and communication. Knowledge of the future is essentially speculative and rapidly becomes obsolete as the environment takes unpredictable turns, a characteristic which was alluded to - perhaps prophetically - by one of the key outside observers of the Annapurna Conservation Area Project. In managing the Central Plateau Conservation Area, the Tasmanian Parks and Wildlife Service presents the contrasting case of a stable environment in which change is infrequent and predictable, with environmental information being readily available and generally reliable. Environments in which there are crucial cyclical or other swings (such as that of the Great Barrier Reef Marine Park Authority) and environments in which there is significant change in the needs of an organisation's stakeholders (as in the environment of the Ngorongoro Conservation Area Authority) can lead decision makers to perceive the environment as turbulent, with the perceived turbulence proportional to the number of concurrent components. Increasing turbulence shapes an organisation by bringing with it the need for management to gather intelligence on prospective critical changes in the environment through the organisation set (the Great Barrier Reef Marine Park Authority presenting the archetypal model here with its "critical issues groups"). An alternative is insulating the organisation from external turbulence through devices such as vertical integration - prominent in the case of the Pinelands Commission, where this device complements the insulation conferred by the cooperative partnership with Federal, State, and local governments. In addition, an organic management style has evolved in the Commission, marked by open communication channels, relatively low formality, and loose structure, all of which combine to confer the Commission's characteristic of

administrative flexibility - a *sine qua non* in any organisation attempting to cope with high turbulence - something which is lacking in the Ngorongoro Conservation Area Authority.

HOSTILITY

Events in the environment can lead to inferences that the environment is hostile, clearly illustrated by the way in which stringent budgets can be perceived as indicative of hostility when state-supported agencies such as the Tasmanian Parks and Wildlife Service cannot get more money out of the State Government despite an urgent need for more funds. When, however, funds are readily available - as tends to be the case with the New Jersey Pinelands Commission - then the opposite inference is warranted. Arbitrary or unsupportive laws can also lead to an inference of hostility - as occasionally happens in the case of the Great Barrier Reef Marine Park Authority when, for example, changes to the pilotage requirements within the Reef lagoon are mooted by the Authority yet ignored by the Commonwealth Government. The King Mahendra Trust (in managing the Annapurna Conservation Area Project) and the Pinelands Commission typify the other extreme, both basking in generally sympathetic legislative environments and both enjoying comfortable working relationships with their respective governments - leading to the perception of their environments as benign. Organisations whose activities have a high level of community acceptance and support are likely to consider their environment as benign - the archetype here being the King Mahendra Trust in its work in the Annapurna Conservation Area Project, whereas those whose legitimacy is questioned - such as the Ngorongoro Conservation Area Authority - are likely to consider their environment as hostile. Identifying the degree of hostility cannot be reduced to a simple formula, but requires the exercise of considerable judgment in weighing the various factors.

TECHNOLOGICAL COMPLEXITY

Although this is the least influential independent variable in the set examined in this study, technological complexity in the external environment of an organisation is not without its potency, being directly related to the technical sophistication of the information needed for making strategic decisions in the case of the Pinelands Commission. By

extension, organisational environments which are technologically uncomplicated are those which lack technical refinement from this strategic decision standpoint - as with the Annapurna Conservation Area Project. Where the environments of organisations are perceived by key decision makers as technologically complex - as with the Pinelands Commission and the Tasmanian Parks and Wildlife Service - there appears to be an orientation toward long-range planning and optimal utilisation of resources through the use of management science techniques focussed on information management. Where environments are viewed as technologically uncomplicated - as with the King Mahendra Trust - information and control systems are significantly less sophisticated. The evidence indicates an association between the levels of technological complexity and homogeneity in an organisation's external environment such that the higher the level of homogeneity in an organisational environment, the lower the level of technological complexity, as instanced by the King Mahendra Trust in its management of the Annapurna Conservation Area Project.

RESTRICTIVENESS

Involving a plethora of legal, political, economic, and cultural constraints, restrictive environments are, of their nature, complex environments, and decision making, especially in the formulation of strategy, must carefully take into account the many constraints imposed by these environments. Operating in such highly restrictive environments, organisations like the Tasmanian Parks and Wildlife Service in managing the Central Plateau Conservation Area, and the Peak National Park Authority, have to rely on *systems* rather than personal power to ensure that constraints are not violated and operations are efficient. The Ngorongoro Conservation Area Authority typifies political restrictiveness: as a parastatal, a semi-autonomous state-owned enterprise, the Authority falls under the broad jurisdiction of the Ministry of Tourism, Natural Resources and the Environment, and more significantly, the NCAA Board of Directors includes some governmental representatives to monitor the Authority's actions. The Authority accordingly operates under the glare of governmental scrutiny and must be conscious of the potential political ramifications of its actions. Along with the NCAA, as a state-supported agency, the Tasmanian Parks and Wildlife Service is subject to governmental budget processes and a variety of other economic

constraints, whilst legal restrictions are placed on the Service by virtue of the status of the Central Plateau Conservation Area as part of the Tasmanian Wilderness World Heritage Area . Some of the organisations managing protected areas are subject to cultural constraints, such as the Great Barrier Reef Marine Park Authority in which a part-time member position on the Authority itself was created in 1995 to represent the interests of the Aboriginal communities adjacent to the Marine Park, and appointment to the Indigenous Liaison Team within Program Delivery is *de facto* restricted to those of Aboriginal or Torres Strait islander origins.

EMERGING THEMES

In the multiple case studies reported in Chapter 4-9 of this thesis, a series of themes was seen as emerging as overlays to the interplay of the independent and dependent variables. These emerging themes bring to light some further insights into the way organisational environments influence agencies managing protected areas: by imposing restrictions on goal achievement, through the impact of international status and land-use conflicts, by conferring some measure of environmental insulation on organisations, and through the intricacies of community partnership.

RESTRICTION ON GOAL ACHIEVEMENT

Some degree of restriction on goal achievement is inescapable in the face of competing demands, particularly where conservation goals have been accomplished by subordinating development goals - as in the cases of the Ngorongoro Conservation Area Authority and the Peak National Park Authority - or for that matter, conversely, although the only agency examined in this study which appeared - on occasion - to place a higher priority on development than conservation, was the Great Barrier Reef Marine Park Authority, in such isolated instances as the Magnetic Quays development. Such imbalances commonly arise from inequalities in institutional power as, for example, in the NCAA, where part of the imbalance arises because the Pastoral Council has effectively been relegated to a role subordinate to the Conservation Area Authority itself. Only where ecosystem sustainability is balanced with economic development, as with the approach to land management adopted by the Pinelands Commission, is optimal goal achievement possible.

IMPACT OF INTERNATIONAL STATUS

The size and diversity of their organisation-sets creates difficulties for many of the agencies, and whilst the number of stakeholders, the frequent polarisations in their attitudes, and the variety of their viewpoints are all significant factors in generating an heterogeneous environment. The more disparate viewpoints there are, the greater the level of potential hostility, the evidence indicating that this may characterise, particularly, situations in which a protected area falls within a World Heritage Area, as in the cases of the Great Barrier Reef Marine Park and the Central Plateau Conservation Area. In the first instance, the hostility emanates from a lack of agreement on how to operationalise World Heritage on the massive spatial scale of the Great Barrier Reef, and in the latter, hostility arises from the considerable diversity amongst the stakeholders who have direct and indirect interests in the CPCA as part of the Tasmanian Wilderness World Heritage Area. An analogous situation pertains in the New Jersey Pinelands which, as a Biosphere Reserve, involves issues related to both public and private land holdings, intergovernmental and public/private partnerships, and ecological sustainability and growth management. As indicated earlier, this complex picture lies behind the Pinelands role as a testing ground for innovations in land management, a complexity which is not, however, shared with the Ngorongoro Conservation Area, even though this forms part of the Serengeti-Ngorongoro Biosphere Reserve under UNESCO's Man and the Biosphere Programme.

LAND-USE CONFLICTS

Land-use conflicts are inevitable in any protected area, although the level of conflict is particularly high in the Ngorongoro Conservation Area where, driven by a growing need for cropping, by population pressures, by diminishing land resources, and by deficiencies in planning participation, there is an increasing pattern of conflicts between wildlife managers and livestock owners which are exacerbated by the way in which management decisions appear to be made out of context - the need to match resources and resource-users being given less than adequate attention. These conflicts over land use are *mutatis mutandis,* much the same across the agencies, the only significant differences

stemming from changes in inter-governmental policies, such as the shifting emphases within the European Community which affect the Peak National Park Authority, and those which find their origins in perils emanating from Pandora's box, amply illustrated by the recent outbreak of foot-and-mouth disease in the United Kingdom which also had an impact on that Authority.

INSULATION

Some organisations which manage protected areas are at least partially insulated from their environments, insulation which derives from a position of privilege *vis-à-vis* other organisations, and which is best exemplified by the King Mahendra Trust and the Pinelands Commission. In managing the Annapurna Conservation Area Project, the Trust enjoys a primacy in relation to some of the governmental elements in its environment by virtue of its statutory authority, whilst in the Pinelands Commission, the partnership between federal, state, and local government units generates a level of political and administrative cooperation tantamount to partial environmental insulation.

COMMUNITY PARTNERSHIP

There is another sense in which partnership modulates the external environment of organisations managing protected areas: the alliances which are either contrived or encouraged between agencies and the communities in their environments in order to provide public engagement. These are represented here by the Tasmanian Parks and Wildlife Service's Northern District Community Consultative Committee in relation to the Central Plateau Conservation Area, the Peak National Park Authority's use of education programmes, and the sense of ownership achieved in all but Mustang in the Annapurna Conservation Area *via* village committees which determine how revenue is to be spent. The most obvious contrast is the lack of genuine participation in the gestation of the General Management Plan for the Ngorongoro Conservation Area which appears to have magnified the divisive and dysfunctional effects of the changes involved.

IMPLICATIONS FOR ORGANISATIONAL DESIGN

Designing an entire organisation requires applying the propositions set out earlier in this Chapter to the organisation's subsystems, commencing from the most strategic and exposed subsystem, such as the top management subsystem, and moving progressively to the consideration of the environments and designs of successively less strategic subsystems. Differentiation is greatest in organisational subsystems, and accordingly matching the organisational subsystems with their particular environments is necessary in order to reconcile the opposing forces of differentiation and integration.

Whilst the selected environmental variables have been examined and some of the principal structural consequences of their variation have been sketched out, it should be recognised that, whether analysing or designing an organisation, all variables need to be considered concurrently. The environment of any organisation is a specific *configuration* of particular levels of these and other variables. To illustrate this point, one fairly common environmental configuration in the present study was low to moderate heterogeneity, hostility, and technological complexity, with turbulence at high levels in two agencies and low in two others. Another slightly less common configuration was comparatively low levels of heterogeneity, hostility, and technological complexity with high levels of restrictiveness. Again, a configuration which occurred in some agencies involved low levels of hostility, technological complexity, and restrictiveness with either high levels of heterogeneity and low turbulence or low heterogeneity and high turbulence.

It would be rare for all the variables in an organisation's environment to offer a consistent picture of a feasible organisation structure, the more common situation being one in which there is at least some degree of disparity amongst the design implications arising from different variables in an organisation's environment. To illustrate with an extract from the environmental configuration of the Annapurna Conservation Area Project: the King Mahendra Trust normally manages the ACAP in an environment which tends toward the homogeneous and is relatively stable, two elements which neither impede organisational certainty nor

advance organisational uncertainty, and following the tenor of Proposition 3, are essentially neutral with respect to structural decentralisation. If, however, the assassinations in the Nepalese Royal Family in June 2001 had destabilised Nepal to an even more profound extent, both heterogeneity and turbulence would almost certainly have been affected, particularly had there been any conspicuous and lasting increase in Maoist insurgency. Increases in heterogeneity and turbulence, in turn, would have had the effect of heightening organisational uncertainty, with a consequential increase in structural decentralisation consistent with Proposition 3. Given that all environmental variables are intrinsically qualitative, measurement of the levels of heterogeneity and turbulence is extremely problematic, and accordingly, guidelines on interpreting the design implications arising from different variables in an organisation's environment cannot be reduced to clear-cut formulas. Guidelines can, nevertheless, prevent such gross errors as adopting a uniform set of practices throughout the ACAP organisation, ignoring the special needs of the Unit Conservation Offices which, as ACAP's prime boundary-spanning elements, need to have significant levels of freedom in line with the varied priorities in their regions.

In examining the general proposition that environment determines structure, the review of theory and empirical research in Chapter 2 mined the common theme which runs through the works of Burns and Stalker, Lawrence and Lorsch, and Emery and Trist, that forces in the environment of an organisation create task demands to which the organisation responds with appropriate structural modification. From a systems perspective, an organisation and its external environment are essentially symbiotic systems and also have the effect of inducing a reciprocal force-field. For the organisation to continue to pursue its *raison d'être,* it needs to draw inputs from the environment which, in turn, draws on the organisation's outputs. Including amongst its components multifarious organisations and institutions, the external environment is exceedingly complex, and is the source of many forces through the array of contingencies, opportunities, constraints, and problems which it poses for individual organisations. For its own part, the organisation not only reacts to events in the environment, but may also take a proactive stance through such devices as diversification and vertical integration. In responding to the environment as well as in trying to influence it, the

organisation acquires a distinctive structure. Since the uncertainty which arises from an organisation's dependence on its environment cannot be eliminated, an option within the control of management is designing the organisation to facilitate decision response to the uncertainty. Accordingly, in conditions of high uncertainty, a flexible, organic structure will permit adaptation to rapid changes, whereas in low uncertainty, a mechanistic structure will be preferred on the grounds of efficiency and optimum managerial control.

Looking through the lens of the organisational elements which have the most direct interaction with the environment, the boundary-spanning units, what can be said about the extent to which the environment determines the structure of these units? These boundary-spanning units were discussed in relation to Proposition 7 earlier in this Chapter, and would appear, *prima facie,* to be particularly susceptible to the influence of the environment. The prime boundary-spanning devices in the Annapurna Conservation Area Project - the Unit Conservation Offices - appear to be essentially organic in nature, although they each lack the size necessary to make any definitive statement on their structure. The Pinelands Commission's Local Review Officer programme, in common with the Pinelands Commission's boundary-spanning units overall, tend more toward a mechanistic character (largely due to the necessary circumscribed discretion and standardised guidelines under which they operate), even though there is a strong flavour of organic structure. This situation is replicated in the Tasmanian Parks and Wildlife Service in relation to the Central Plateau Conservation Area, the *position* of District Manager (Central North) having an organic quality whilst his staff and the rest of the Service are obliged to operate as an integral part of the mechanistic structure of its parent Department of Primary Industries, Water and the Environment. The Service itself exemplifies the manner in which many organisations are embedded in larger organisations, such embedded organisations having interfaces with differing external environments, and being subject to two sets of environmental pressures: pressures from their own immediate environments and pressures from those that affect the organisational system in which they are embedded. Their structure should, therefore, reflect both types of pressure.

Neither the Peak National Park Authority nor the Ngorongoro Conservation Area Authority exhibit any real indications of organic

structure in their boundary-spanning units, although it is possible to see definite organic structure in the main boundary-spanning units of the Great Barrier Reef Marine Park Authority's Aquarium, in the stakeholder liaison units within the Authority's four critical issues groups, and in such components as the Indigenous Liaison Unit within the Program Delivery Group. These organic characteristics are present despite many of the characteristics of the Australian Public Service's mechanistic structure being manifest in the GBRMPA. The structure of these stakeholder liaison units and Aquarium functions are evidently linked to their intimate relations with the environment, and typify those organisations and organisational subunits which need to monitor their environments or subenvironments more closely than others. However, whilst the environment may have relatively little impact on other organisational activities which enjoy some measure of shielding, no subunit (or organisation) is so autonomous that it can afford to insulate itself *completely* from its environment.

It was pointed out in Chapter 10 that as organisations relate to their external environment primarily through their management, it is conceivable that the environment may be misperceived or distorted by an emotive reaction. In the same vein, environments may be contrived to reflect the structures from which they are perceived, so that managers in structures in which differentiation is strong will tend to perceive a heterogeneous environment, whilst those in decentralised structures will perceive more environmental uncertainty as a consequence of their structural arrangement. This may, in part, explain Lawrence and Lorsch's findings as outlined in Chapter 2. As a consequence of the combined effects of the increasing volatility, unpredictability, and sheer number of the forces which affect contemporary organisations, it is also possible that managers may perceive that their capacity to predict change has been degraded, in effect exacerbating the level at which they perceive turbulence to exist.

REVISITING THE RESEARCH OBJECTIVES

As stated in the Chapter 1 Introduction to this Thesis, the research objectives for this work were:

> OBJECTIVE 1
>
> To enhance understanding of the structural and contextual dimensions of organisations managing protected areas, through identifying and evaluating the contingency variables in the environment which influence the design of these organisations.
>
> OBJECTIVE 2
>
> To contribute to the development of the theory underpinning the relationship between environment and organisation through identifying and analysing the theoretical and actual relationships between the environments and the structures of organisations managing protected areas.

These Objectives were pursued through a chain consisting, at the operational level, of the tentative formulations which emanated from the review of theory and empirical research and which are embodied in the Propositions set out at the end of Chapter 2. Eventually, some of the original Propositions were modified to varying extents and new Propositions were added, however as a set, they define the characteristics of a workable design for an organisation managing a protected area, and have guided the interpretation of the answers to the Research Questions, which in turn enabled the achievement of the Working Aims and ultimately the Research Objectives themselves.

Establishing configurations for the external environmental variables as well as for the core dimensions and allied structural factors of six separate organisations which manage protected areas, enabled the establishment of their environmental and structural profiles. In thus answering Research Questions 1, 2, and 4, the first two Working Aims were concomitantly achieved. Working Aim 3 was accomplished through resolving Research Questions 3 and 5: a systematic comparison of the environmental and structural profiles of the six agencies established that key differences *did* exist between the task environments of structural elements of particular organisations, the comparison also disclosing some variations between the task environments in relation to their capacity, volatility, and complexity, together with indications of the way in which contingency factors vary in their impact on structural variables.

In pursuing Research Question 6, the main elements of organisational structure in each agency were examined for their degree of sensitivity to the effect of the contingency variables, and accomplishing the requirement of Working Aim 4 for an analysis of the nature and strength of relationships between the external environment and organisational structure disclosed by the systematic examination. In order to reconcile any anomalies in the patterns of relationships or in the profiles, the environmental and structural elements were examined for the presence of, and conditions supporting, these anomalies, and achieved Working Aim 5 through addressing Research Question 7.

The achievement of the Research Objectives must necessarily be qualified insofar as the extent to which it is reasonable to generalise from the findings of this work. The preeminence of heterogeneity and turbulence as the factors having the strongest links with the structural characteristics examined here may not be reflected in organisations operating in other contexts - whether in the management of protected areas or in totally different settings. The overriding consideration should always be achieving a *form* of organisation which is matched as closely as possible to the *purposes* of the organisation, regardless of the way in which other organisations are structured. Only when there are close similarities in desired outcomes, culture, and methods should the basic form of one organisation or group of organisations be applied to another - and even then, only with careful fine tuning. For any situation, it is likely that only a relatively modest number of variables (of the many present) will actually be relevant to the purposes at hand, and it is precisely the identification of these key variables which is so crucial to structural adequacy. The danger is always that the *patterns* of activity that help one organisation to be successful may be dysfunctional for another, and perhaps actually inhibit organisational effectiveness. To optimise effectiveness, the form of organisation must be matched to the purpose for which it is created - a purpose which emanates from the environment.

A CONCLUDING NOTE

Whilst isolating a single message out of this research proved problematic, the nature of some of the final set of Propositions suggests that the external environment of an organisation managing a protected area will determine the critical functions the organisation must carry out, which in turn will set the broad parameters of the structures which will be

appropriate. This appears to at least *approach* the underlying concept of equifinality, an oft-cited but underdeveloped construct in organisation theory, and which occurs when different structural alternatives yield the same functional effect. There seems to be some measure of agreement in the literature that equifinality has come to mean that the final state of an organisation can be achieved through multiple different organisational structures even if the contingencies the organisation faces are the same (*e.g.,* Galunic and Eisenhardt, 1994; Pennings, 1992; Donaldson, 1995; Gresov and Drazin, 1997). In continuing this research into other organisations which manage protected areas and into other types of organisations, there is a strong temptation to approach it from an equifinality standpoint, perhaps developing the functional equivalence view of organisational design mooted by Gresov and Drazin (1997).

Whether these implications can be legitimately extended to organisations operating in the wider resource management field would rely on the concept of the universality of management originated by Fayol (1963) and which has since been well-articulated in the literature. Extension seems plausible on the premise that there is a constancy in the fundamental functions of management across all organised activity, and that the differences which exist from one field of application to another arise from such factors as specific organisational environments, however this is beyond the scope of the evidence which underpins this research, and accordingly must remain purely speculative.

The immediate challenge is to develop a greater understanding of the significant influence which the structures of organisations charged with managing protected areas can have on their effectiveness and efficiency, together with an appreciation of the ways in which such structures are themselves influenced by the external environments of the managing organisations. As Cox (1995, 244) phrased it:

> An ecosystem is a mosaic of interdependent organisms linked to each other through the evolution of time and dependent on the land, air, and water resources that sustain it. One of the species in that evolution, *Homo sapiens,* in its quest for a better life, alters the many landforms and life processes that sustain it. Humankind is currently endeavouring to protect the ecological integrity of a great many ecoregions around the world, in order to maintain as full a range of biodiversity and economic sustainability as is possible. To maintain the integrity and biodiversity of our landscapes, we must employ a full range of mechanisms and organisational arrangements to protect our natural resources, as any one particular method of protection alone is not sufficient.

... a strong echo of Caldwell's (1972, 119) sentiments to which this Thesis owes its origins.

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APPENDIX 1

SPECIMEN QUESTIONNAIRE

QUESTIONNAIRE

Please circle whichever item in each 7-point scale is closest to describing the actual situation as you see it in relation to the *(insert name of organisation)*.

On each 7-point scale, "1" represents the statement on the left, and "7" the statement on the right, ***except*** in Questions 4.1-4.7 (on page 5), where each scale is set out as a series of numerical ranges (*e.g.*, "Less than 20", "20 < 40", *etc* ["<" = Less than]).

Please feel free to make any additional explanatory or qualifying comments on page 9 and/or on the final page.

If you have any questions about the Study, please contact:

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Note: The actual questionnaires allowed more space for respondents to circle the appropriate numeral: the spaces have been condensed here to permit the requisite margins.

1 On each of the following factors, please rate the external environment within which the *(insert name of organisation)* functions.

In rating this environment, please consider, where relevant, the social, economic, political, and technological aspects of the environment

1.1	Very homogeneous (*e.g.*, very similar stakeholders)	1	2	3	4	5	6	7	Very heterogeneous (*e.g.*, a great diversity of types of stakeholders)
1.2	Very dynamic, changing rapidly in technical, economic, and cultural dimensions	1	2	3	4	5	6	7	Very stable; virtually no change
1.3	Very safe; little threat to survival and well-being of *(insert acronym of organisation)*	1	2	3	4	5	6	7	Very risky; a false step can mean the undoing of *(insert acronym of organisation)*
1.4	Very unpredictable; very hard to anticipate the nature or direction of changes in the environment	1	2	3	4	5	6	7	Very predictable; very easy to forecast the future state of affairs in the environment
1.5	Very strong cyclical or other periodic fluctuation	1	2	3	4	5	6	7	Virtually no periodic fluctuation
1.6	Rich in opportunities; not at all stressful	1	2	3	4	5	6	7	Very stressful, exacting, hostile; very hard to keep afloat
1.7	Technologically, a very sophisticated and complex environment	1	2	3	4	5	6	7	An environment demanding little in the way of technological sophistication
1.8	A dominating environment in which initiatives of *(insert acronym of organisation)* count for very little against the forces of the business or political environment	1	2	3	4	5	6	7	An environment that *(insert acronym of organisation)* can control and manipulate to its own advantage
1.9	A very restrictive, constraining environment (*e.g.*, severe legal , social, economic, or political constraints)	1	2	3	4	5	6	7	A very constraint-free, unrestricted environment

2 To what extent has the Chief Executive of the *(insert name of organisation)* delegated authority to others to make each of the following classes of decision?

Please rate the *actual* rather than the merely formal delegation of authority. The delegation can be to individuals or groups.

2.1 **Development of new initiatives or services**

No delegation of authority	1 2 3 4 5 6 7	Complete delegation of authority

2.2 **Marketing/public relations tactics for a new service and changes in the marketing/public relations tactics for existing services.**

No delegation of authority	1 2 3 4 5 6 7	Complete delegation of authority

2.3 **The selection and dismissal of senior personnel**

No delegation of authority	1 2 3 4 5 6 7	Complete delegation of authority

2.4 **Negotiating with staff or their unions about pay and conditions**

No delegation of authority	1 2 3 4 5 6 7	Complete delegation of authority

3 Please rate the extent to which each of the following is used or done in the *(insert name of organisation)* .

3.1 **Quality control of operations by using sampling or other techniques**

Not used at all	1 2 3 4 5 6 7	Used to a very great extent; applied to almost all operations

3.2 **Cost control of operations by fixing standard costs and analysing the variations of actual costs from those standards**

Not used at all	1 2 3 4 5 6 7	Used to a very great extent; applied to almost all operations

3.3 **Control of inventories, funds, etc., and scheduling of operations by means of quantitative techniques (*e.g.*, linear programming)**

Not used at all	1 2 3 4 5 6 7	Used to a great extent; applied to almost all operational areas

3.4 **Internal auditing**

Not used at all	1 2 3 4 5 6 7	Used to a very great extent; covers almost all activities of *(insert acronym of organisation)*

3.5 **Systematic evaluation of managerial and senior staff**

Not used at all	1 2 3 4 5 6 7	Used to a very great extent; almost all such personnel are covered

3.6 **Establishment of cost centres for cost control of operations**

Not used at all	1 2 3 4 5 6 7	Used to a very great extent in virtually all operating levels

3.7 **Electronic data processing**

Not used at all	1 2 3 4 5 6 7	Covers almost all internal and external transactions

3.8 **Research and development in the design of services and processes**

Not done at all	1 2 3 4 5 6 7	Done to a great extent whether in-house or under external contract

3.9 **Long-term forecasting**

Not done at all	1 2 3 4 5 6 7	Done to a great extent; detailed forecasts covering at least 5 years

4

4.1 How many different job titles are there within the *(insert name of organisation)* **?**

Less than 20	20 < 40	40 < 60	60 < 80	80 < 100	100 < 120	More than 120

4.2 What proportion of employees hold university higher degrees?

Less than 10%	10 < 20%	20 < 30%	30 < 40%	40 < 50%	50 < 75%	75 - 100%

4.3 How many vertical levels separate the Chief Executive from those employees working on output in the deepest single division of *(insert acronym of organisation)***?**

1 or 2	3 or 4	5 or 6	6 or 7	8 or 9	10 or 11	12 or more

4.4 What is the average number of organisational levels in *(insert acronym of organisation)***?**

1 or 2	3 or 4	5 or 6	6 or 7	8 or 9	10 or 11	12 or more

4.5 What is the number of separate geographic locations where *(insert acronym of organisation)* **employees work?**

1 - 3	4 - 6	7 - 9	10 - 12	13 - 15	16 - 18	19 or more

4.6 What is the average distance of the outlying geographic locations from the headquarters of *(insert acronym of organisation)***?**

Less than 10 kilometres	10 < 50 kilometres	50 < 100 kilometres	100 < 250 kilometres	250 < 500 kilometres	500 < 1000 kilometres	1000 kilometres or more

4.7 What proportion of the total work force of *(insert acronym of organisation)* **is located at the outlying geographic locations?**

Less than 10%	10 < 20%	20 < 30%	30 < 40%	40 < 50%	50 < 75%	75 - 100%

5

5.1 **How much direct involvement does top management have in gathering the information which will be used in decision making?**

None	1 2 3 4 5 6 7	A great deal

5.2 **To what degree does top management participate in the interpretation of the information which will be used in decision making?**

Not at all	1 2 3 4 5 6 7	Considerably

5.3 **To what extent does top management directly control execution of decisions?**

Not at all	1 2 3 4 5 6 7	Completely

5.4 **How much discretion do first-line supervisors have over establishing the budget for their units?**

A great deal	1 2 3 4 5 6 7	None

5.5 **How much discretion do first-line supervisors have over determining how the performance of their units will be evaluated?**

Substantial	1 2 3 4 5 6 7	None

5.6 **How much discretion do first-line supervisors have over selecting and dismissing personnel?**

Considerable	1 2 3 4 5 6 7	None

5.7 **How much discretion do first-line supervisors have over personnel rewards (*e.g.*, salary increases, promotions)?**

Very great	1 2 3 4 5 6 7	None

5.8 **How much discretion do first-line supervisors have over purchasing of equipment and supplies?**

Substantial	1 2 3 4 5 6 7	None

5.9 **How much discretion do first-line supervisors have over establishing new projects or programmes?**

Considerable	1 2 3 4 5 6 7	None

5.10 **How much discretion do first-line supervisors have over how work exceptions are to be handled?**

Very great	1 2 3 4 5 6 7	None

6

6.1 **Written job descriptions are available for:**

Operative line employees only	1 2 3 4 5 6 7	All employees including the Chief Executive

6.2 **Where written job descriptions exist, how closely are employees supervised to ensure compliance with standards set in job descriptions?**

Very loosely	1 2 3 4 5 6 7	Very closely

6.3 **How much latitude are employees allowed from standards set in any job descriptions?**

A great deal	1 2 3 4 5 6 7	None

6.4 **What proportion of non-managerial employees are given written operating instructions or procedures for their jobs?**

A very low proportion	1 2 3 4 5 6 7	All

6.5 **Where non-managerial employees who are given written instructions or procedures for their jobs, to what extent are the instructions followed?**

Not at all	1 2 3 4 5 6 7	Very closely

6.6 **To what extent are supervisors and middle managers free from rules, procedures, and policies when they make decisions?**

A great deal	1 2 3 4 5 6 7	Not at all

7

7.1 **How aware is the** *(insert name of organisation)* **of what is happening in its external environment?**

(insert acronym of organisation) has only a general idea of what related organisations are doing	1 2 3 4 5 6 7	*(insert acronym of organisation)* is well aware of what related organisations are doing

7.2 **How aware is the** *(insert name of organisation)* **of technological developments in its area?**

(insert acronym of organisation) is unaware of relevant technological developments	1 2 3 4 5 6 7	*(insert acronym of organisation)* is well informed about relevant technological developments

7.3 **How aware is the** *(insert name of organisation)* **of political/legal/social developments that might affect it?**

(insert acronym of organisation) is unaware of political/legal/social developments that might affect the organisation	1 2 3 4 5 6 7	*(insert acronym of organisation)* is well informed about political/legal/social developments that might affect it

7.4 **How does the** *(insert name of organisation)* **deal with changes in the external environment?**

(insert acronym of organisation) does not respond to changes in its environment unless it is forced to do so	1 2 3 4 5 6 7	*(insert acronym of organisation)* anticipates changes in its environment and prepares itself for them in advance

7.5 **How does the** *(insert name of organisation)* **cope with demands placed upon it from the external environment?**

(insert acronym of organisation) accepts all demands the environment makes and tries to meet them	1 2 3 4 5 6 7	*(insert acronym of organisation)* works actively to change any demands the environment makes if those demands are likely to harm the organisation

7.6 **How does the** *(insert name of organisation)* **adapt to changes in the external environment?**

(insert acronym of organisation) is unable to adapt to changes because of its existing structure and policies	1 2 3 4 5 6 7	*(insert acronym of organisation)* adapts to most changes because its policies and structure are flexible

8

8.1 **How do internal boundaries influence joint problem solving?**

Boundaries between departments and/or divisions often interfere with solving joint problems	1 2 3 4 5 6 7	Boundaries between departments and/or divisions rarely interfere with solving joint problems

8.2 **With what frequency do inter-unit meetings occur?**

Meetings seldom occur across levels or between departments	1 2 3 4 5 6 7	Meetings across levels or between departments occur regularly

8.3 **How is work divided within the** *(insert acronym of organisation)* **?**

Work is divided so that each subunit does only a piece of an overall task	1 2 3 4 5 6 7	Work is divided so that each subunit is responsible for the whole of an overall task

8.4 **How are core work and support work organised?**

Work is divided so that core work is separated from support work and belong to different departments	1 2 3 4 5 6 7	Work is designed so that core work and support work are integrated and within the same department

ADDITIONAL OBSERVATIONS

If there are any other observations which you believe are relevant to this Project, it would be appreciated if you would note them below and/or overleaf.

Please return to:

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ADDITIONAL OBSERVATIONS

Thank you for your responses to this Questionnaire - they are greatly appreciated, and will be most valuable in helping our understanding of the ways in which the management of the World's protected areas are organised at present, and perhaps lead to some fresh ideas on how our management might be improved still further.

APPENDIX 2

DATA SET: ALL AGENCIES

DATA SET : ALL AGENCIES

	RSP	het	tur	hos	cmp	res	del	cis	cpx	cen	for	agl	inf
GBR	a	6	13	11	5	5	12	38	23	27	26	34	22
	b	7	13	17	6	5	8	48	16	46	34	38	25
	c	6	11	10	4	4	10	32	21	41	31	32	21
	d	6	10	13	5	5	15	49	21	37	32	33	20
	e	6	12	10	3	5	20	45	25	30	32	34	19
	f	6	12	12	5	2	20	39	15	39	29	25	15
	g	6	14	11	5	2	13	48	20	39	30	34	20
	h	4	12	13	6	5	10	45	22	32	32	34	22
	i	5	11	12	4	4	15	55	17	38	28	32	20
	j	6	14	17	5	5	12	49	14	37	32	33	20
NCA	a	4	14	15	4	6	10	54	21	32	32	34	19
	b	5	10	12	5	5	13	39	18	44	29	28	17
	c	6	14	17	5	5	12	55	23	40	31	34	22
	d	6	13	11	3	2	16	45	20	39	30	34	22
	e	7	13	11	6	5	8	32	25	46	34	38	20
	f	7	13	17	6	5	10	48	22	39	34	34	25
	g	6	11	12	5	4	10	48	14	41	26	32	21
ACA	a	6	11	10	4	4	15	49	17	38	28	32	20
	b	5	10	13	5	5	15	38	21	37	32	33	20
	c	6	12	10	5	2	12	49	16	37	32	33	19
	d	6	12	13	3	2	20	45	21	30	32	34	20
	e	7	13	12	4	6	10	39	21	39	34	25	19
	f	6	10	15	4	2	16	39	15	27	29	34	15
	g	5	12	12	3	5	20	54	18	44	29	28	17
PNP	a	6	14	17	5	5	12	32	23	39	26	34	22
	b	7	13	17	5	5	12	49	17	37	32	32	20
	c	6	11	18	6	7	15	38	21	38	28	31	19
	d	7	14	11	6	5	8	48	25	46	34	26	20
	e	6	9	11	3	3	8	48	25	37	34	25	19
	f	6	12	12	6	4	10	55	14	41	31	32	21
	g	7	12	17	6	5	15	49	21	46	32	38	19
PIN	a	7	10	11	5	5	15	49	15	30	32	33	20
	b	6	9	8	4	2	25	49	24	32	25	35	21
	c	6	13	10	3	5	20	45	16	37	32	34	17
	d	7	14	13	4	4	12	49	21	37	32	30	17
	e	6	12	12	4	3	25	39	21	27	34	25	15
	f	6	7	12	6	6	20	45	16	39	29	34	16
	g	7	11	12	5	5	20	49	24	32	25	32	19
	h	6	13	13	5	5	13	45	20	39	30	20	22
	i	7	12	17	6	2	10	54	21	43	29	25	15
CPC	a	4	12	18	6	3	10	49	24	32	25	31	17
	b	6	14	17	6	5	25	48	22	32	32	34	25
	c	6	9	15	3	7	20	45	21	30	32	32	19
	d	7	11	10	3	6	15	54	17	38	28	32	20
	e	7	12	15	6	5	12	48	22	32	32	26	15
	f	6	12	12	5	5	10	49	21	37	25	33	20
	g	6	13	8	4	3	25	49	24	32	32	35	21
	h	7	13	17	4	4	10	38	18	39	34	34	19
	i	5	10	13	4	2	16	39	21	44	29	20	17
	j	5	7	12	6	6	20	45	16	43	29	28	16
	k	7	9	11	4	6	10	54	16	39	34	34	25

Key to Abbreviations:

RSP Respondents (codes only)
GBR Great Barrier Reef Marine Park Authority
NCA Ngorongoro Conservation Area Authority
ACA Annapurna Conservation Area Programme/King Mahendra Trust for Nature Conservation
PNP Peak District National Park
PIN New Jersey Pinelands Commission
CPC Tasmanian Parks & Wildlife Service (responsible for Central Plateau Conservation Area)

het Heterogeneity
tur Turbulence
hos Hostility
cmp Technological Complexity
res Restrictiveness
del Delegation
cis Sophistication of Control & Information System
cpx Complexity
cen Centralisation
for Formalisation
agl Environmental Agility
inf Infrastructure

All scale reversals have been rectified.

APPENDIX 3

FRAMEWORK FOR MULTIPLE REGRESSION & CORRELATION ANALYSIS

MULTIPLE REGRESSION AND CORRELATION ANALYSIS

The framework for developing, interpreting, and validating the multiple regression and correlation analysis was constructed around the following elements: the statistical power of the regression, selection of variables, determination of the impact of the size of the sample on the statistical power of the regression, testing the assumptions in multiple regression, together with estimating, interpreting, and validating the regression models.

STATISTICAL POWER, SELECTION OF VARIABLES, AND SAMPLE SIZE

Deriving models of the complex interactions between agency environments and the core dimensions and allied factors of agency structures involved resolving two opposing considerations: on the one hand, a comprehensive description predicated the inclusion of many variables, whereas the principle of parsimony suggested that for ease of understanding, the interactions should be described with as few variables as possible. Resolution was achieved during the research design process through striking a balance between these two viewpoints by adopting the smallest number of independent variables that explained the most substantial part of the variation in the dependent variables. The interplay between the number of independent variables, the sample size, and the chosen significance level in detecting a significant coefficient of multiple determination *(R^2)* was examined as recommended by Hair *et al* (1995), based on the work of Cohen and Cohen (1983). It was clear that the five independent variables initially used here, coupled with specifying an appropriate significance level, and being satisfied with detecting the value of the coefficient of multiple determination 80 per cent of the time it occurs (corresponding to a power of 0.80), the overall sample of 51 respondents would detect R^2 values of 23 per cent or greater.

TESTING THE ASSUMPTIONS IN MULTIPLE REGRESSION

Multivariate analysis requires that the assumptions underlying the statistical techniques be tested twice: *first* for the separate variables, akin to the tests of assumption for univariate analysis, and *second* for the multivariate model variate (described later). *Normality of the data* - the most fundamental assumption in multivariate analysis - had been established prior to validating and summarising the source data.

Linearity was established between the dependent and independent variables, as scatterplots did not indicate any nonlinear value of the multivariate approach. Based on the *constant variance* of each dependent variable across the range of independent variable values, *homoscedasticity* allows a "fair test" of the relationship across all values of the variables. An indication of the homoscedasticity of the data was provided by the normality of the bulk of the data which had been previously confirmed by measures of skewness, with what was tantamount to homoscedasticity being validated by the scatterplots. This series of tests for the assumptions underlying regression analysis indicated that there was no need for concern, even in the instances in which the normality (and by extension, the constant variance) of one dependent and one independent variable showed slight anomalies.

ESTIMATING, INTERPRETING, AND VALIDATING THE REGRESSION MODELS

In estimating, interpreting, and validating the regression models, regression and correlation analysis was selected as making the most complete use of the data and accordingly providing the most potent test of the various types available. In common with many regression studies, one purpose here is to compare the importance of different explanatory variables, yet despite the fact that regression is an old and well-known technique, there is still debate about how to assess the importance of the explanatory variables. Thorough evaluations of several measures are presented in Darlington (1990) and Bring (1994), and whilst there is no clear-cut answer as to which measure to use, standardised regression coefficients were chosen as consistent with the aims of this study for, as frequently occurs in multiple regressions, the size of the various coefficients cannot be compared when the independent variables are measured on different scales, *e.g., environmental turbulence* is measured here on a ratio scale, whereas *complexity* is measured on a variety of seven-point scales based on numerical ranges or percentage groupings. However transforming the coefficients into *beta* weights (*i.e.,* the coefficients of the independent variables when all variables are expressed in standardised [*Z* score] form), allows comparison of the *relative* effect on the dependent variables of each independent variable by giving the change in predicted value of the dependent variable per standard deviation increase in each predictor variable. The effect of this is the same as if all dependent and independent variables were measured in the same units: the coefficients are then directly comparable

to one another, the largest coefficient indicating which independent variable has the greatest influence on the dependent variable.

The backward stepwise regression procedure was selected as the most suitable for this application, on the grounds that it enabled assessment of the relationship between all the independent variables and each of the dependent variables, and provided the most flexible options through which to control the models considered. This stepwise technique is essentially an adaptation of backward elimination that allows variables that were eliminated earlier to be reintroduced later (Neter, Wasserman, and Kutner, 1989). In studies of this sort in which there are relatively small pools of independent variables, support for backward stepwise search over forward stepwise search for is provided by these Authors who emphasise the importance in such circumstances of making a preliminary assessment of the relationship between all independent variables and each of the dependent variables. Implementing this approach, regression equations were initially determined for all five dependent variables, the backward stepwise procedure then being followed using 0.100 as the maximum acceptable probability of F for removing variables, and 0.050 as the minimum acceptable probability of F for adding variables.

Two types of significance tests were used in conjunction with the multiple correlation and regression. The F statistic was used to establish if the overall value of R was statistically significant, whilst the t statistic served as a test of the significance of the individual regression weights - of particular utility in evaluating the relative importance of each independent variable when combined with the other independent variables in the equation. Although this study does not utilise the predictive capabilities of the source equations, their overall accuracy is of interest here, reflected by the adjusted coefficient of multiple determination *(adjusted R^2)* in indicating the proportion of the variation in a dependent variable which is explained by the independent variables *operating jointly,* and which has been adjusted for any artificial inflation induced by the number of independent variables.

MULTIPLE REGRESSION: FIRST EQUATIONS

Y′		*het*	*tur*	*hos*	*cmp*	*res*	Adj R^2	*F*-ratio Prob
del	=	0.786	+ 0.216	+ 0.033	− 0.099	+ 0.096	0.861	64.010 <0.0001
cis	=	0.429	+ 0.334	+ 0.068	+ 0.081	+ 0.086	0.972	356.021 <0.0001
cpx	=	0.305	+ 0.545	+ 0.014	+ 0.122	+ 0.040	0.956	283.392 <0.0001
cen	=	0.470	+ 0.165	− 0.001	+ 0.286	+ 0.081	0.970	466.318 <0.0001
for	=	0.510	+ 0.326	+ 0.081	+ 0.023	+ 0.063	0.987	794.178 <0.0001
agl	=	0.401	+ 0.352	+ 0.045	+ 0.099	+ 0.102	0.976	423.752 <0.0001
inf	=	0.337	+ 0.466	− 0.042	+ 0.101	+ 0.141	0.918	516.103 <0.0001

Key to Abbreviations:

het	heterogeneity	*cmp*	technological complexity
tur	turbulence	*res*	restrictiveness
hos	hostility		
del	delegation	*cen*	centralisation
cis	sophistication of control and information system	*for*	formalisation
		agl	environmental agility
		inf	infrastructure
cpx	complexity		

Shading in the equation indicates that a variable is not statistically significant on *t*-test.

Notes on First Equations

In all instances, the statistical significance for the overall value of *R* was established by the *F* statistic.

Dependent Variable: Delegation

The adjusted coefficient of multiple determination at 0.861 indicated that just over 86 per cent of the variation in *delegation* was explained by the regression equation. The values of *t* for the independent variables were significant except in the case of *hostility* which failed to reach statistical significance. Of the remaining independent variables, *heterogeneity* exhibited the strongest influence on delegation, with *turbulence* of somewhat lesser strength, and *technological complexity* and *restrictiveness* showing significantly weaker effects.

Dependent Variable: Sophistication of Control & Information System

The adjusted coefficient of multiple determination at 0.972 indicated that just over 97 per cent of the variation in the level of *sophistication of control and information systems* was explained by the regression equation. All independent variables displayed significant *t* values except *technological complexity* which did not reach statistical significance.

Dependent Variable: Complexity The adjusted coefficient of multiple determination at 0.956 denoted that just under 96 per cent of the variation in *complexity* was explained by the regression equation. Initial statistical significance was displayed by *t* values for all variables except *hostility* which failed to attain statistical significance at this point.
Dependent Variable: Centralisation The adjusted coefficient of multiple determination at 0.970 showed that 97 per cent of the variation in *centralisation* was explained by the regression equation. The values of *t* for the independent variables were significant except in the cases of *hostility* and *technological complexity,* both of which failed to achieve statistical significance.
Dependent Variable: Formalisation The adjusted coefficient of multiple determination at 0.987 denoted that roughly 99 per cent of the variation in *formalisation* was explained by the regression equation. The values of *t* for all independent variables were significant except in the case of *technological complexity* which failed to reach statistical significance.
Dependent Variable: Environmental Agility Just under 98 per cent of the variation in *environmental agility* was explained by the regression equation as indicated by the adjusted coefficient of multiple determination at 0.976.
Dependent Variable: Infrastructure The adjusted coefficient of multiple determination at 0.918 indicated that roughly 92 per cent of the variation in *infrastructure* was explained by the regression equation. All the independent variables except *restrictiveness* displayed significant *t*-values, *restrictiveness* failing to attain statistical significance.

MULTIPLE REGRESSION: FINAL EQUATIONS

Y'		*het*	*tur*	*hos*	*cmp*	*res*	Adj R^2	*F*-ratio Prob
del	=	0.758	+ 0.207	− 0.016		− 0.130	0.874	81.477 <0.0001
cis	=	0.452	+ 0.341	+ 0.108		+ 0.096	0.975	450.172 <0.0001
cpx	=	0.339	+ 0.556	+ 0.074		+ 0.120	0.965	355.306 <0.0001
cen	=	0.551	+ 0.189	+ 0.141		+ 0.118	0.976	511.911 <0.0001
for	=	0.516	+ 0.328	+ 0.093		+ 0.066	0.988	1012.508 <0.0001
agl	=	0.401	+ 0.352	+ 0.045	+ 0.099	+ 0.102	0.976	423.752 <0.0001
inf	=	0.365	+ 0.474	+ 0.008		+ 0.154	0.982	644.692 <0.0001

Key to Abbreviations:

het	heterogeneity	*cmp*	technological complexity
tur	turbulence	*res*	restrictiveness
hos	hostility		
del	delegation	*cen*	centralisation
cis	sophistication of control and information system	*for*	formalisation
		agl	environmental agility
		inf	infrastructure
cpx	complexity		

Notes on Final Equations

Dependent Variable: Delegation

In multiple regression, *hostility* was the first variable to be eliminated from the regression equation, having initially failed to reach statistical significance. The subsequent removal of *technological complexity* on the same grounds modified the probabilities balance amongst the excluded variables to the extent that it was feasible to force *hostility* back into the regression model. The overall value of the coefficient of multiple correlation and the individual regression weights were established as being statistically significant, indicating that the independent variables were themselves significant in explaining delegation. The adjusted coefficient of multiple determination indicated that slightly less than 88 per cent of the variation in *delegation* was explained by the independent variables operating jointly and adjusted for any artificial inflation induced by the number of independent variables remaining in the regression equation. The direct relationship with *heterogeneity* stands out clearly as the most significant in terms of influencing the level of delegation, the relationship with *turbulence* and the inverse relationship with *restrictiveness* being both clearly of secondary significance, whilst the impact of *hostility* is minimal.

Dependent Variable: Sophistication of Control & Information System

Having failed to reach statistical significance, *technological complexity* was removed as an independent variable in Step 2. Virtually 98 per cent of the variation in the *sophistication of the control and information system* was explicable by the regression equation, as indicated by the adjusted coefficient of multiple determination (0.975). The values of *t* for all current independent variables were statistically significant, and the conclusion was reliably drawn that the four remaining independent variables *are* significant in explaining the *sophistication of the control and information system.* The *beta* coefficients indicate that, in relation to the *sophistication of control and information systems, heterogeneity* and *turbulence* are the most significant of the independent variables, the largest change in this *sophistication* being induced by *heterogeneity* changing one standard deviation unit. *Hostility,* by contrast, has a relatively minor impact on the level of *sophistication,* whilst *restrictiveness* is established as having a negligible effect.

Dependent Variable: Complexity

Hostility was removed as an independent variable in Step 2 having failed to reach statistical significance. This elimination altered the probabilities balance amongst the variables such that both *restrictiveness* and *technological complexity* failed to retain statistical significance. Although *restrictiveness* was removed from the model, the subsequent elimination of *technological complexity* created a set of probabilities which made it tenable to force the re-admission of not only *restrictiveness* but also *hostility* on the grounds of achieving statistical significance. The regression equation accounted for almost 97 per cent of the variation in *complexity* as shown by the adjusted coefficient of multiple determination (0.965). The *t* values for the remaining independent variables having been determined to be statistically significant, it was concluded that *heterogeneity, turbulence, hostility,* and *restrictiveness are* significant in explaining delegation. The *beta* coefficients indicate that, in relation to *complexity,* the most significant of the independent variables is *turbulence,* a one standard deviation unit change in which induces the largest change in the dependent variable. Less potent links with *complexity* were indicated by *heterogeneity* and *restrictiveness,* with *hostility* having an unsubstantial effect.

Dependent Variable: Centralisation

Hostility was removed as an independent variable in Step 2 having failed to reach statistical significance, however once *technological complexity* was eliminated in Step 3 as an independent variable on this same basis, the probabilities made it possible to force *hostility* back into the regression equation. The adjusted coefficient of multiple determination at 0.976 established the regression equation as explaining almost 98 per cent of the variation in centralisation. The statistical significance of the values of *t* for all remaining independent variables was established, allowing the conclusion that the four remaining independent variables - *heterogeneity, turbulence, hostility,* and *restrictiveness* - are significant in explaining *centralisation.* The *beta* coefficients indicate that, in relation to *centralisation,* the direct relationship with *heterogeneity* is the most prominent, with the direct relations with *turbulence, hostility,* and *restrictiveness* being of secondary significance in terms of their influence on the level of centralisation with one standard deviation unit change in *restrictiveness* inducing the least change in the dependent variable.

Dependent Variable: Formalisation

Having failed to reach statistical significance, *technological complexity* was rejected as an independent variable. The adjusted coefficient of multiple determination at 0.988 indicated that virtually all of the variation in *formalisation* was explained by the regression equation. The values of *t* for the four remaining independent variables all exhibited statistical significance, allowing the conclusion that *heterogeneity, turbulence, hostility,* and *restrictiveness* are significant in explaining *formalisation.* On the basis of the *beta* coefficients, the greatest change in the level of *formalisation* would be brought about by one standard deviation unit change in *heterogeneity,* followed in order of influence on *formalisation* by *turbulence, hostility,* and *restrictiveness,* the last two being of negligible impact.

Dependent Variable: Environmental Agility

Just under 98 per cent of the variation in *environmental agility* was explained by the regression equation as indicated by the adjusted coefficient of multiple determination at 0.976. The values of *t* for all independent variables achieved statistical significance, permitting the conclusion that *heterogeneity, turbulence, hostility, technological complexity,* and *restrictiveness* are significant in explaining *environmental agility.* The greatest change in *environmental agility* as indicated by the *beta* coefficients would be brought about by one standard deviation unit change in *heterogeneity,* with the influence of *turbulence* being somewhat less and the other independent variables revealing considerably lower magnitude - *technological complexity* and *restrictiveness* having roughly comparable direct impacts on the dependent variable. *Hostility* demonstrates insubstantial effects on *environmental agility.*

Dependent Variable: Infrastructure

Abandoning *restrictiveness* as an independent variable on the grounds of failing to reach statistical significance modified the probabilities balance amongst the variables such that both *technological complexity* and *hostility* failed to retain statistical significance. Although *hostility* was removed from the regression equation, when *technological complexity* was subsequently eliminated, it generated a set of probabilities which made it permissible to force the re-entry of not only *restrictiveness* but also *hostility,* as both variables had achieved statistical significance. Some ninety-eight per cent of the variation in *infrastructure* was explained by the regression equation, as indicated by the adjusted coefficient of multiple determination (0.982). As the values of *t* for the four remaining independent variables were statistically significant, it was concluded that *heterogeneity, turbulence, hostility,* and *restrictiveness* are significant in explaining *infrastructure.* The *beta* coefficients demonstrate that the greatest change in *infrastructure* would be occasioned by a one standard deviation unit change in *turbulence.* The influence of *heterogeneity* on *infrastructure* is of lesser degree, and the direct relationship of *restrictiveness* with the dependent variable is of a much lower order of magnitude. *Hostility* has a negligible effect on *infrastructure.*

POST-DERIVATION REQUIREMENTS

In multiple regression, once the variate has been derived, it acts collectively in predicting the dependent variable, necessitating assessing the assumptions for the variate itself. The assumptions which needed to be addressed for the regression variate were the same as for the individual variables with the addition of the *independence of the error terms. Normality* in the variate in both model sets was assessed, as before, using normal probability plots. In all instances the residual line approximated the diagonal of the normal distribution with no substantial or systematic departures; accordingly, all standardised residuals were considered to represent a normal distribution, and the regression variate was found to meet the assumption of normality. In order to demonstrate the combined effects of all independent variables in each model, the initial assessment of *linearity* was made *via* residual plots, none of which exhibited any nonlinear pattern, thus ensuring that the overall equations were linear. This was followed by the construction of partial regression plots, the key features of which are summarised in Table A3.1.

Plotting residuals provided a reliable means of assessing *constant variance,* and comparisons with the null plot showed no consistent pattern, allowing the conclusion to be drawn that variance *is* constant overall. As multiple regression assumes that each predicted value is independent, it was essential to examine the *independence of the error terms.* This was achieved by plotting the residuals against potential sequencing variables, the random pattern displayed in each instance confirming the residuals as independent.

TABLE A3.1 SUMMARY OF KEY FEATURES OF PARTIAL REGRESSION PLOTS

The dependent variables below	*exhibited*	*well-defined relationships with these independent variables*	*moderately well-defined relationships with these independent variables*	*very weak relationships with these independent variables*
Delegation		Heterogeneity	Turbulence Restrictiveness	Hostility
Sophistication of the Control & Information System		Heterogeneity Turbulence	Hostility	Restrictiveness
Complexity		Heterogeneity Turbulence	Restrictiveness	Hostility
Centralisation		Heterogeneity	Turbulence Hostility Restrictiveness	
Formalisation		Heterogeneity	Turbulence	Hostility Restrictiveness
Environmental Agility		Heterogeneity	Turbulence	Hostility Technological Complexity Restrictiveness
Infrastructure		Heterogeneity Turbulence	Restrictiveness	Hostility

Before accepting the regression results as valid, it is necessary to examine the degree of multicollinearity and its effect on the outcome. To this end, it was necessary to ascertain the degree of association between the independent variables, as a first step toward which a correlation matrix was constructed (Table A3.2) to allow scrutiny for multicollinearity amongst the independent variables.

The intercorrelation coefficients were generally well below the correlation coefficient value of r = 0.900 recommended by Hair *et al.* (1995), indicating low levels of multicollinearity. This *prima facie* finding was confirmed by the fact the tolerance/variance inflation factor (VIF) values indicate inconsequential collinearity, since no value of VIF exceeds

TABLE A3.2 CORRELATION MATRIX OF INDEPENDENT VARIABLES
PEARSON PRODUCT-MOMENT CORRELATIONS *[r]*
COEFFICIENTS OF DETERMINATION *[r^2]*

	Hetero-geneity	Turbulence	Hostility	Technological Complexity	Restrictive-ness
Heterogeneity	1				
Turbulence	0.065 (0.004)	1			
Hostility	– 0.146 (0.021)	0.677 (0.458)	1		
Technological Complexity	– 0.273 (0.075)	0.842 (0.709)	0.512 (0.262)	1	
Restrictiveness	0.484 (0.234)	0.838 (0.702)	0.445 (0.198)	0.623 (0.388)	1

All correlations significant at the 0.01 level (non-directional [two-tailed] test)
Correlation coefficients *[r]* are shown in plain text
Coefficients of determination *[r^2]* are shown in brackets

10.000 and the tolerance values show that in no case does collinearity explain more than 10 per cent of the variance in any independent variable - no tolerance value falling below 0.940. These results indicate that interpretation of the regression variate coefficients should not be affected adversely by multicollinearity.

The regression model was validated empirically and theoretically. *Empirically,* cross validation was used, as cost and time pressures precluded collecting new data - the method of choice for validation. The data was split into two sets: the model building set and the validation set, the latter being used as the counterpart of new data. The sets were essentially uniform in composition, and conformed very closely to the size recommended by Neter, Wasserman, and Kutner (1989). The regression models for each of the dependent variables were estimated for the model building set and compared with those of the relevant validation set.

In the development of each of the regression equations for the dependent variables, some differences were displayed between those generated by the model building set and those from the validation set, both with respect to the sequence in which independent variables were removed and re-entered, and the order of magnitude of the *beta* coefficients. In general, both these types of difference were inconsequential, the only differences of any note arising from a comparison of the individual coefficients:

- as with the overall data, *hostility* was removed from the validation set for the dependent variable *delegation,* however it did not subsequently attain statistical significance and could not be justifiably re-entered. This contrasted with its re-entry in both the model building set and in the overall data. The omission of *hostility* from one of the sets at any point confirmed that it was a marginal predictor, as indicated by the low *beta* value (–0.016) after its reinstatement in the overall model;
- *Hostility* was also excluded from the validation set for *centralisation,* and did not subsequently achieve statistical significance in this set, unlike its occurrence in the model building set and the aggregate data, in which this variable was able to be re-admitted to the regression equation in the backward stepwise approach. The low *beta* value which it evinced in Equation 4.1 (–0.001) was perhaps a reliable indicator of its very low significance in relation to *centralisation;*
- the independent variable *technological complexity* in the validation set for *environmental agility* was removed, in contrast to its retention in the model building set and in the overall data. Nevertheless the omission of this variable from the validation set casts some doubt on it as an independent variable, as suggested by the low *beta* value (+0.099) in the overall model.

Comparison of the two sets and the overall model fit demonstrated a high level of similarity of the results in terms of the coefficients of multiple determination *(R^2)* and *adjusted R^2,* as shown in Table A3.3. The three summary measures shown underneath the Table bear out the consistency across all three sets of data. There was minimal evidence of the variances of the regression coefficients developed from the model building set being slightly larger than those obtained from the coefficients from the entire data set. Neter, Wasserman, and Kutner (1989) suggest this is common with split data, however here the differences were purely nominal in virtually all cases, confirming the size of the model building set as satisfactory.

From a *theoretical* standpoint, the regression model was validated by comparison with conceptual implications derived from information from sources other than the interviews and questionnaires, an aspect which is developed in Chapter 10.

This Appendix examines and analyses the interview and questionnaire data. The regression analysis was specified in terms of dependent and

TABLE A3.3 SPLIT DATA VALIDATION OF MULTIPLE REGRESSION COMPARISON OF COEFFICIENTS OF MULTIPLE DETERMINATION *[R^2]* AND *ADJUSTED R^2*

Dependent Variable	Overall Data	Model Building Set	Validation Set
Delegation	0.874 (0.863)	0.900 (0.882)	0.868 (0.842)
Sophistication of Control and Information System	0.975 (0.972)	0.980 (0.976)	0.970 (0.965)
Complexity	0.968 (0.965)	0.966 (0.959)	0.974 (0.968)
Centralisation	0.978 (0.976)	0.981 (0.978)	0.977 (0.972)
Formalisation	0.989 (0.988)	0.990 (0.988)	0.988 (0.986)
Environmental Agility	0.979 (0.976)	0.973 (0.966)	0.988 (0.985)
Infrastructure	0.982 (0.981)	0.979 (0.976)	0.985 (0.983)
Means	0.964 (0.960)	0.967 (0.961)	0.964 (0.957)
Standard Deviations	0.040 (0.043)	0.030 (0.036)	0.043 0.052
Coefficients of Variation (%)	4.2 (4.5)	3.1 (3.7)	4.5 (5.4)

Coefficients of Multiple Determination *[R2]* are shown in plain text
Adjusted Coefficients of Multiple Determination *[Adjusted R^2]* are shown in brackets

independent variables, the sample was examined for adequacy in relation to the objectives of the study, and the assumptions were assessed for the individual variables. The regression model having been estimated and interpreted, the diagnostic tests were administered that confirmed the appropriateness of the results, and the models were finally validated.