

INFORMATION PROCESSES
AS A UNIFYING THEME
IN LAND MANAGEMENT

by John S. Cook BSurv, BA, BEcon, PhD

(November 1996)

The electronic version of this paper
published in the Portable Document Format
may be cited as follows:

John S. Cook, 'Information processes as a unifying theme in land management', Paper presented at an International Conference on Land Tenure and Administration, University of Florida, held at Orlando, Florida, (12-14 November 1996), On-line, Internet URL: <ftp://www.plas.bee.qut.edu.au/survey/jscftp/publicat/9611jsc.pdf> (accessed [give date of download])

INFORMATION PROCESSES AS A UNIFYING THEME IN LAND MANAGEMENT

ABSTRACT

Spatial organisation in a modern society relies on information and communication processes that generate a consensual public knowledge about geographical boundaries, locations and place names. Spatial knowledge underpins the rule of law whenever rules direct that particular actions are permissible or impermissible in particular places. Such places include various political jurisdictions, administrative areas, private real property and public lands. The need for spatial organisation to effect law and order is common to practically all societies, despite their technological sophistication. Potential benefits increase with growing complexity in technologies that exploit natural resources, but so do the risks of potential harm. The organising ability to exploit the benefits and reduce the risks depends in part on the descriptive power of language, the predictive power within a variety of scientific disciplines, and the prevailing information and communication technology. However, information degenerates systemically under entropic processes. The effects may be gradual and imperceptible from day to day but become substantial over time. Creating more effective land administration may depend on greater understanding of these underlying information processes. These processes impose limitations on the ability to generate and maintain understandings concerning how land can be used across the boundaries of different cultures, scientific disciplines and institutions.

INTRODUCTION

The literature on land tenure is extensive, diverse and seemingly without a common thread. However, land tenure systems serve a similar purpose despite their historical setting or cultural background. Although argument may exist on matters of detail, the purpose generally is to establish understandings at a social level about how individuals may access and use resources.

Any idea of a 'right to life' is practically meaningless without some ability to access and use the resources needed to sustain life. Accordingly, a thing that a society needs to learn early is how to behave in accessing and using particular life-sustaining resources. This implies evolution of some rule-governed or predictable behaviour where people arrive at mutual understandings about each

others rights and obligations regarding those resources. ¹

Some aspects of human behaviour become less uncertain, and thus more predictable, through the processes of organisation. A broad interpretation of 'organisation' includes practically all situations where net benefits accrue from collective action. More obvious formal examples include firms, labour unions, governments and universities. They generally rely on written sets of rules or constitutions to arrive at concerted collective actions. However, other forms of organisation seem to evolve spontaneously without any conscious design. Examples include language, customary land tenures, scientific paradigms, shared value systems and fundamental ethical codes. ²

The prevailing levels of language development and the technology of information and communication determine the scope and complexity of organisation that is possible. Customary land tenure systems depend on living human memories to store knowledge about the rules, and oral traditions, demonstrations, visitations and perambulations to show information about places and boundaries. ³ The constraints on communication usually confine the social organisation to the level of a tribe, clan or manor. In contrast, some rule-governed behaviour is national and international in its scope. Such large scale organisation depends on high standards of literacy to allow encoding, decoding and recording of sophisticated rules. It also depends on mass communication sufficient to establish a social acceptance and substantial voluntary compliance. The consequences of not achieving such voluntary compliance may include undue costs in law enforcement, corruption of law enforcement agencies, widespread civil disobedience and general disrespect for law and order.

In summary, the scope of rule-governed behaviour involved in organising access and use of resources depends on:

- technical possibilities and constraints involved in observing, articulating, communicating

1 Ronald A. Heiner, 'The origin of predictable behavior', *American Economic Review*, Vol.73 No.4 (September 1983), especially at the Conclusion, pp.585-6

2 Kenneth J. Arrow, *The limits of organization*, The Fels lectures on public policy analysis, (New York: Norton, 1974) p.33 provides a similar broad meaning to the term 'organisation'

3 Discussion on perpetuating boundary evidence through boundary perambulations appears in John S. Cook, 'Perambulating the boundaries of Sydney', *Australian Surveyor*, Vol.37 No.3 (September 1992) pp.202-7

and storing knowledge

- perceived benefits and costs involved in establishing and maintaining knowledge of rules pertaining to resource management
- political or power relationships involved in deciding, administering, adjudicating and enforcing rules that guide human behaviour.

People usually overlook the actual system of communication and control inherent in land tenure systems. Perhaps the first task of an analyst concerned with land tenure is to give that system a name to identify it uniquely as a worthwhile area of study. Possibly ‘cadastral organisation’ may serve the purpose, for want of a better name.

SPONTANEOUS AND PURPOSIVE ORGANISATION

Modern systems theory distinguishes between spontaneous and purposive organisation. Self-organisation often emerges, seemingly naturally or spontaneously, without any apparent conscious design or external supervising agent. The spontaneous forms occur in many informal relationships and understandings encountered in families, clans and social conventions. These organisational forms seem to have no particular purpose other than those that may exist in the mind of an observer. Spontaneous organisation contrasts with a variety of other relationships based on formal written rules establishing ‘purposively constructed’ forms of organisation.⁴ Examples include political constitutions, institutions of property and contract, incorporation of bodies corporate, various statutes and the rationale for legal decision making. The purpose of this rule-governed behaviour often finds explicit expression as aims, objectives or purpose of the organisation. Alternatively, a purpose may find expression implicitly in circumstances deemed out of control and needing the adoption of particular rules.

The distinction between spontaneous and purposive organisation is not so sharp as to place them in mutually exclusive categories. The distinction often resides in an observer’s level of consciousness. As Blackstone observes concerning institutions of property and security of title:

There is nothing which so generally strikes the imagination, and engages the affections of mankind,

4 James S. Coleman, ‘Constructed organization: first principles’, *Journal of Law, Economics and Organization*, Vol.7, Special issue (1991) pp.7-23

as the right of property; or that sole and despotic dominion which one man claims over the external things of the world, in total exclusion of the right of any other individual in the universe. And yet there are very few, that will give themselves the trouble to consider the original and foundation of this right. Pleased as we are with the possession, we seem afraid to look back to the means by which it was acquired, as if fearful that some defect in our title; or at best we rest satisfied with the decision of the laws in our favour, without examining the reason or authority upon which those laws have been built.

.....

These inquiries, it must be owned, would be useless and even troublesome in common life. It is well enough if the mass of mankind will obey the laws when made, without scrutinising too nicely into the reasons for making them. But, when law is to be considered not only as a matter of practice, but also as a rational science, it cannot be improper or useless to examine more deeply the rudiments and grounds of these positive constitutions of society. ⁵

Blackstone's observations point out the dilemma of trying to value institutions that get their value from the fact that people can simply rely on them and take them for granted. Consequently, policy makers and managers may easily overlook the need to sustain these fundamental institutions with essential resources to prevent their deterioration.

Blackstone's idea of law as a 'rational science' also identifies law as purposive organisation. Ascribing a purpose to an organisation implies some design to achieve the purpose. That in turn implies some prospects of testing the design in the light of experience to see if the design is successful. The cognitive processes inherent in the design and assessment of social policy as embodied within various policy statements, statutes and court decisions are analogous to hypothesising and testing in the physical sciences. ⁶ This provides a methodological basis for testing social policy generally. It also provides a rational basis for designing management information systems. As an example, the development of Geographic Information Systems to monitor land related policies cannot proceed rationally without knowing what hypotheses need proving.

Blackstone's comments are of far-reaching significance although he may not have realised it. In pointing out the advantage of not needing to worry about some things and getting on with other things, he alludes to the economic benefits of specialisation and organisation. However, specialisation involves a 'disequilibrium-creating process' that alienates people with particular

5 Sir William Blackstone, *Commentaries on the laws of England*, 15th. edn., Vol.2, ed. by Edward Christian, (London: Strahan, 1809) p.2

6 W. Lawrence Church, 'Legal systems', *Institutions in agricultural development*, ed. by Melvin G. Blase, (Ames, Iowa: Iowa State University Press, 1971) p.218. Giandomenico Majone, 'Policies as theories', *Omega: the international journal of management science*, Vol.8 No.2 (1980) rpt. as 'Policies as theories', *Policy Studies Review Annual*, Vol.5, ed. by Irving Louis Horowitz, (Beverly Hills, California: Sage, 1981) p.16

knowledge from those who do not have it.⁷ Furthermore, complexity compounds with the encoding of specialised knowledge in specialised language,⁸ and when those with specialised observing powers see things that others fail to see.⁹ Knowledge differentials materially affect who can trust who in political and market dealings, especially in trying to resolve who ought to have foreseen any difficulties and who should absorb the risk if things go badly.¹⁰

REGULATION AND THE DESIGN OF PURPOSEFUL ORGANISATION

Designing an organisation with some purpose in mind leads to the possibility of finding some rational basis for that design. Achieving things by design implies ‘control’ or ‘management’ and relates to strategic planning generally and statutory planning in particular. One view of ‘control’ is to elicit conditions or situations deemed to be desirable.¹¹ This view manifests itself in prescriptive regulation and often has pejorative connotations as a form of social engineering. Alternatively, ‘control’ may try to avoid particular conditions deemed undesirable. Thus, control aimed at avoiding traffic collisions creates a situation where drivers retain considerable autonomy in deciding their actual destination and increases the possibility that they will arrive safely. Morgan argues that avoiding an undesirable circumstance is qualitatively different and not merely a mirror image of eliciting a desirable state.¹²

Blackstone’s comments appeared at much the same time as Adam Smith’s *Wealth of Nations*. Blackstone’s work was influential in consolidating English law at the time of its writing whereas Smith’s work became a seminal work in classical economics.¹³ Smith saw that specialisation narrowed people’s interests to a point where they could become ‘the dupes of political, religious

7 J. Hirschleifer and J. Riley, ‘The analytics of uncertainty and information - an expository survey’, *Journal of Economic Literature*. Vol.17 No.4 (December 1979) p.1414

8 Ian Reinecke, ‘The trouble with techno-speak’, in Stuart Macdonald, D. McL. Lamberton and Thomas Mandeville (eds.), *The trouble with technology: explorations in the process of technological change*. (London: Frances Pinter, 1983) pp.193-201.

9 Richard Thomson, *The psychology of thinking*, (Harmondsworth, Middlesex: Penguin, 1959) p.63.

10 Roland M. McKean, ‘Products liability: implications of some changing property rights’, *Quarterly Journal of Economics*. Vol.84 (1970) pp.611-626.

11 Milan Zeleny, ‘The law of requisite variety: is it applicable to human systems?’, *Human Systems Management*, Vol.6 No.4 (1986) p.269 in an editorial comment

12 Gareth Morgan, ‘Rethinking corporate strategy: a cybernetic perspective’, *Human Relations*, Vol.36 No.4 (1983) p.353

13 Blackstone’s *Commentaries* appeared in 4 volumes between 1765 and 1769. *Wealth of Nations* was first published in 1776

or economic interests'.¹⁴ Moreover, he suggested that government interference often made things worse. He wrote at a time when the government of England seemed particularly inept. Popularisers construed his ideas as a general argument to limit the role of government in their own attempts to influence public policy.¹⁵ However, the ubiquitous nature of external economies and diseconomies has reached global proportions in the pollution of air and water resources. Moreover, pollution occurs under both capitalist and socialist regimes. The need for satisfactory regulatory responses in land management is now more important than ever. The responses are likely to have important implications for land development, management and administration everywhere.

Two approaches in particular seem to offer some hope for a better design of regulatory mechanisms. The first resides in systems theory; the second, at the interface between economics and law. Some integration of these approaches seems desirable. Moreover, arguments about whether governments or markets fail are simply different aspects of the same problem. Government has a function of establishing rules in which markets can operate. Accordingly, if markets fail it means that governments have failed also in establishing satisfactory rules. Usually, the limits to organisation seem to reside in:

- technical constraints in describing and measuring aspects of the system requiring control, and
- the benefits of organisation compared with its information costs.

Systems theory approaches

Systems theory aims to overcome the fragmented approach of traditional science. The systems approach is to develop a holistic view by identifying various subsystems and how they interact to do increasingly complex tasks. Systems theory now sees phenomena of 'emergence' and 'hierarchy' as important elements in a recognised area of study involving self-organisation and self-regulation.¹⁶ Some theorists study spontaneous organisation to see if it provides insight into

14 Adam Smith, *Wealth of Nations*, Books I-III, ed. Andrew S. Skinner (Harmondsworth, Middlesex: Penguin, 1974)

15 Arthur J. Taylor, Arthur J., *Laissez-faire and state intervention in nineteenth century Britain*, (London: Macmillan, 1972) pp.14-5

16 As an example, the following articles express the viewpoint of systems thinking and cybernetics: G. J. Dalenoort, 'The paradigm of self-organization: studies of autonomous systems', pp.1-22; A.M. Andrew, 'The paradigm of self-organizing systems', pp.23-41; D. L. Velkov, 'Self-organization in the context of cybernetics: philosophical

the complexity of modern government. As Zeleny observes:

If the forces or rules that bring about such spontaneous orders are understood, then such knowledge could be used to produce orders that are far more complex than those attempted by deliberately arranging all the activities of a complex society. This is not an argument against planning but rather against the simplistic tinkering and interfering with orders that are much too complex to be viewed as mechanical contrivances.¹⁷

Some systems seem to maintain a unity, wholeness and relative autonomy although their components 'are being continuously or periodically disassembled and rebuilt, created and decimated, produced and consumed'.¹⁸ As an example, biological cellular structures retain distinctiveness and cohesiveness despite regular renewal of their molecular populations. Similarly, human families, organisations and societies retain identity despite gains and losses of membership.

The term 'autopoiesis' now identifies this feature of 'self-production'. Zeleny argues that:

The range of applications of autopoiesis is extending from atoms and molecules, organisms and nervous systems, language and communication, to social behavior, human societies, planning and management.¹⁹

The expectation in management is that some deliberate manoeuvre or strategy will produce a desired result or avoid some undesired consequence. Causing a desired result depends first on a perception of how the system behaves. Next, management depends on being able to describe, signal or order what needs to be done to effect the manoeuvre. Perceiving a system's behaviour involves a cognitive model or theory. The mind of a single individual may contain some intuitive idea, vision, theory, map or model to direct that individual to purposive action. However, the ability either to direct or persuade other people to participate in concerted action depends on some articulated model. The model needs to be expressed in a language that lets people know what to do to achieve a desired result. Modelling or theorising is not merely an option but a

aspects', pp.42-59; D. Gernet, 'The formation of hierarchal structures as a key to self-organization', pp.60-72; *The paradigm of self-organization: current trends in self-organization*, Studies in cybernetics, 19; ed. by G. J. Dalenoort, (New York: Gordon and Breach, 1989). In contrast, an economic viewpoint is contained in Oliver E. Williamson, 'Economic institutions: spontaneous and intentional governance', *Journal of Law, Economics and Organization*, Vol.7 Special issue, (1991) pp.159-87

17 Milan Zeleny, 'Self-organization of living systems: a formal model of autopoiesis', *International Journal of General Systems*, Vol.4 No.1 (1977) p.27

18 Milan Zeleny, 'What is autopoiesis?', *Autopoiesis: a theory of living organization*, ed. by Milan Zeleny, North Holland series in general systems research, 3, (New York: North Holland, 1981) p.5

19 Milan Zelany, 'Self-organization of living systems: a formal model of autopoiesis', p.25

logical necessity in the management or control function.²⁰

The quest for economy in transmitting rules regarding location provides interesting examples of how regulatory failures derive necessarily from paying too little attention to problems of communication. The options are to tell or show people what needs to be done. Telling people, orally or in writing, depends on:

- ability to encode and decode in signs or language needed to achieve regulation
- the available time and channel capacity between sender and receiver, and
- the prevailing ‘noise’ or interference affecting the communication channel.

In land administration, maps and plans often provide a basis for communicating regulatory information. Their success in regulation depends on whether they convey sufficient detail accurately, and readers have sufficient map reading literacy to relate the information on maps to facts on the ground. Where insufficient literacy prevails, a traditional approach to perpetuating boundary evidence involves regular perambulations of boundaries to keep the knowledge alive. Although the examples here relate to land administration, the communication principles involved are quite general, and apply in most forms of education, training and technology transfer.

People learn and forget things. They may die without necessarily passing on the benefits of their personal experience to succeeding generations. The countervailing forces of creation and destruction reflect in much of the procedures required to create and perpetuate evidence generally and evidence of property rights in particular. Boulding describes two basic countervailing forces as ‘time arrows’. One leads to entropy, decay and the breakdown of organisation. The other leads to evolution and increasing complexity.²¹ Autopoietic thinking may have some relevance in considering systems that live, learn and evolve. Evolving systems include not only living organisms, but also forms of social organisation such as language, economic and legal systems. The confines of a particular language at a particular time impose limits to any ability to describe a system under regulation. Accordingly, ascribing ‘purpose’ to some systems identifies a characteristic of the observer rather than inherent characteristic of those systems. Maturana, a

20 Roger C. Conant and W. Ross Ashby, ‘Every good regulator of a system must be a model of that system’, *International Journal of Systems Science*, Vol.1 No.2 (1970) pp.89-97

21 Kenneth Boulding, ‘Forward’, *Autopoiesis: a theory of living organisation*, p.xi

leader in developing this approach, argues that changing the nature of the enquiry into these systems is more useful. He suggests changing the line of questioning from ‘How does the organism obtain information about its environment?’ to ‘How does it happen that the organism has the structure that permits it to operate adequately in the medium in which it exists?’²²

Beer analysed organisational structure using cybernetic principles to elicit the essential conditions for adequate operation, viability or sustainability of purposive systems. He incorporated these principles in his Viable System Model. This Model has a potential for wide application in land management matters.²³ The Model provides a systematic and systemic approach to regulatory issues. Some important analytical steps emerge from his approach in identifying particular features of purposive systems including:

- identifying the purpose that individuals may attribute to a system and establishing sufficient consensus so that people are not seriously at cross purposes and likely to negate each other’s efforts
- identifying criteria for success and establishing consensus to place those criteria beyond serious dispute
- identifying useful statistical indicators to measure success, and then establishing consensus to place their usefulness beyond serious dispute
- modifying either or both the system’s performance and its performance targets in the light of experience and any changed circumstances.

A system’s viability depends on a satisfactory response mechanism to deal with each threat to the

22 Humberto R. Maturana, ‘Introduction’ in Humberto R. Maturana and Francisco J. Varela, *Autopoiesis and cognition: the realization of the living*, Boston studies in the philosophy of science, 42 (Dordrecht: Reidel, 1980) p.xvi

23 The model is described in a number of books and articles including the following: Stafford Beer, *Decision and control: the meaning of operational research and management cybernetics*, (London: Wiley, 1966); Stafford Beer, *The heart of enterprise*, (Chichester: Wiley, 1979); Stafford Beer, *Brain of the firm*. 2nd. edn. (Chichester: Wiley, 1981), (First edition published in 1972); Stafford Beer, ‘The will of the people’, *Journal of the Operational Research Society*, Vol.34 No.8 (1983) pp.797-810; Stafford Beer, ‘The Viable System Model: its provenance, development, methodology and pathology’, *Journal of the Operational Research Society*, Vol.35 (1984) pp.7-25; Stafford Beer, *Diagnosing the system for organizations*, (Chichester: Wiley, 1985); Paul Espejo and Roger Hamden (eds.) *The Viable System Model: interpretations and applications of Stafford Beer’s VSM*. Chichester: Wiley, 1989; John S. Cook, ‘A cybernetic approach to land management issues’, PhD diss. , Queensland University of Technology, 1994, pp.88-120

system. Conceivably, a system may survive without satisfactory response mechanisms if the relevant threats do not arise. However, survival may then depend more on good luck rather than good management. Assuming good luck does not always prevail, Beer identifies five subsystems needed to sustain a purposive system's viability. Table 1 outlines these subsystems and their functions.

| <p style="text-align: center;">TABLE 1 FUNCTIONAL COMPONENTS OF BEER'S VIABLE SYSTEM MODEL</p> | | |
|--|---------------------------------|--|
| FUNCTION | MAJOR THRUST OF ACTIVITY | DESCRIPTION OF ACTIVITY |
| SUB-SYSTEM 1 | PRODUCTION | Operations that fulfil the purpose or primary objectives of the organisation |
| SUB-SYSTEM 2 | COORDINATION | Coordination of the separate operations of Sub-System 1 into a coherent overall production process. This includes arriving at voluntary agreements on production standards and practices |
| SUB-SYSTEM 3 | CONTROL | A residual function to manage aspects of current production that are otherwise unmanageable. It identifies problems of control not revealed by routine reporting in Sub-System 1 or coordination functions of Sub-System 2. It includes a sporadic auditing function aimed at identifying potential for synergy in existing operations |
| SUB-SYSTEM 4 | INTELLIGENCE | Research and development into new technological, political and market conditions affecting the operating environment to identify future directions of the organisation |
| SUB-SYSTEM 5 | POLICY | Arbitration between the demands of the present and the future. A source of authority and responsibility for operation of the system as a whole |

Insights from study of autopoietic systems, Beer's cybernetic model and game theory seem to parallel much of the recent literature in strategic thinking. In practice, the number of possible outcomes that can emerge when individuals act spontaneously is so large that prediction is futile. Therefore, rigid planning may stifle spontaneity and adaptiveness in dealing with circumstances that planners do not foresee. Several different viewpoints seem to converge towards a strategy

of strengthening an organisation so that it can seize on opportunity as it presents itself.²⁴ The implications are therefore that an organisation should:

- operate as efficiently as possible by eliminating practices that waste time and resources
- strengthen bonds of interdependence between operating elements of a system by developing commonality of purpose and mutuality of benefit from corporate undertakings
- strengthen bonds of interdependence between the organisation and people outside the organisation by developing mutuality of benefit with people who interact with the system and who can influence its working environment.

The interface between economics and law

The economic rationale for organisation is that it can create synergies. More is achievable when people work together than when they work separately. However combining the work of individuals can obscure the value of their individual contributions, especially where they occur at an early stage in value adding processes. This raises the possibility that some person or small group of persons will appropriate the proceeds of increased productivity that is attributable to other people's efforts. Perceived arbitrariness and inequity in distribution of wealth and incomes are among the most perplexing problems of most economic systems. Thus, organisations gain the synergy available from merging information and skills at some cost since people need also to learn to work together and trust each other. This learning requires a significant social investment, and much is lost if corruption breaches that trust. The nature of this social investment is apparent in the cross-cultural anthropological studies of Ruth Benedict who distinguished between:

societies with high social synergy where their institutions insure mutual advantage from their undertakings, and societies with low social synergy where the advantage of one individual becomes a victory over another.²⁵

Maslow, a leading contributor to motivation theory, was clearly of the opinion that management was capable of creating good or bad working environments. He proffered the view that:

Even the best individuals placed under poor social and institutional circumstances behave badly. One can

24 As examples, Richard R. Nelson, 'Why do firms differ, and how does it matter?', *Strategic Management Journal*, Vol.12 Special issue (Winter 1991) pp.61-74; Oliver E. Williamson, 'Strategizing, economizing, and economic organization', *ibid.*, pp.75-94; Michael E. Porter, 'Towards a dynamic theory of strategy', *ibid.*, pp.95-117

25 Lecture material by Ruth Benedict cited in A. H. Maslow, *The farther reaches of human nature*, (Harmondsworth, Middlesex; Penguin, 1971) p.194

set up social institutions which will guarantee that individuals will be at each other's throats; or one can set up social situations which will encourage individuals to be synergic with each other. ²⁶

Traditionally, property institutions have given some level of security in accessing and using resources. In an influential work on the philosophy of economics, Joan Robinson suggested that:

In the absence of respect for property it would be quite impossible to achieve a reasonable standard of life. Even the simplest investment - ploughing for next season's harvest - would not be worth while on a scale beyond what a man could guard at harvest time. ²⁷

The ubiquitous nature of externalities drew increasing suspicion that an unfettered market system produced too much of some and too little of other commodities. In 1920, Pigou addressed the divergence between social and private benefits and costs arising from uncompensated services and uncharged disservices. He suggested that corrections might be achieved by appropriate taxes and subsidies through government intervention. ²⁸ In 1960, Coase wrote an influential article that challenged Pigou's approach to externalities. ²⁹ This article drew considerable attention to how legal rules influence market operations and promote economic efficiency. In what became known as the Coase theorem, Coase suggested that, in the absence of transaction costs, people would negotiate over externalities to achieve efficiency in resource allocation. The literature on this topic is now extensive. ³⁰ However, the Pigovian approach involves costs in determining appropriate levels of taxation, compensation and subsidisation. Similarly, the Coasian approach involves costs in observing, describing, communicating, interpreting and learning to reorganise affairs between parties who express dissatisfaction with existing property right allocations. Either approach involves information costs to arrive at the rules needed to achieve satisfactory organisation.

Various approaches to organisation identify transaction costs as a factor limiting the ability to organise. However, little has been done at a microeconomic level to analyse the processes whereby people invest valuable time to gain observation and communication skills, or the effects

26 *ibid.*, p.204

27 Joan Robinson, *Economic philosophy*, (Harmondsworth, Middlesex: Penguin, 1962) p.11

28 A. C. Pigou, *The Economics of Welfare*, (London; Macmillian, 1920) p.191.

29 R.H. Coase, 'The problem of social cost', *Journal of Law and Economics*, Vol.3 No.4 (October 1960) pp.1-44

30 Oliver E. Williamson, *The economic institutions of capitalism*, (New York: Free Press, 1985) p.xi refers to 'transaction cost economics' and pp.409-36 contains an extensive bibliography of the literature on this topic. This aspect of economics is also known variously by terms such as a 'property rights paradigm', 'institutional economics', 'economics of organisation', and 'information economics'

on production of actually employing these skills. Learning occurs in an immense variety of circumstances but communication theory identifies a number of common elements that seem to provide some basis for further analysis. The production processes include observing, describing (or encoding), interpreting (or decoding), storing in human and artificial forms of memory and retrieving. The nature of the investments include development of powers of observation, language skills and communication channels and capacities. In effect, microeconomic theory needs to extend to several fundamental cognitive tasks. A considerable volume of well documented historical experience surrounds the processes whereby people describe and interpret land rights. This experience reflects the practical problems arising from the countervailing forces that create and destroy information. The experience extends over many cultures and through centuries of social, economic and technological change. Building on this experience is important not only in land and environmental regulation but also in regulation more generally.

THE RULE OF LAW AND INTEGRATED RESOURCE MANAGEMENT

Practically all legal systems try to avoid undesirable social, economic and ecological conditions and establish a 'rule of law'. Considerable discussion on the meaning of this term appears in the literature of jurisprudence.³¹ It appears also in the Preamble to the Universal Declaration of Human Rights where it says that:

it is essential, if man is not to be compelled to have recourse, as a last resort, to rebellion against tyranny and oppression, that human rights should be protected by the rule of law

The Declaration purports to represent aspirations of 'peoples of the United Nations'.³² It declares that people have a right to participate in the government of their country, if the will of the people provides a basis for government authority.³³ It declares also that everyone has 'the right to life',³⁴ 'the right to own property alone as well as in association with others', and security against arbitrary deprivation of property.³⁵ A 'right to life' implies access to resources that sustain life, and a right to food, clothing, housing and medical care, among other things.³⁶

31 'Rule of law' is used in the sense expounded by Joseph Raz, 'The rule of law and its virtue', *Law Quarterly Review*, Vol.93 No.2 (April 1977) pp.195-211
32 Preamble to the Universal Declaration of Human Rights
33 Article 21
34 Article 3
35 Article 17
36 Article 25

Many recent global concerns about the atmosphere and the oceans derive from land use activities. Air and water are fluid resources and not readily amenable to control through property right regimes. These resources mobilise nutrients in soils to sustain plant and animal life. However, they can also become life-threatening by mobilising and concentrating toxins and pollutants. Moreover, the problems do not stop at the real estate boundaries of individual land owners. They require resolution across local, state and national boundaries. Recent experience shows that resolution depends ultimately on agreement within the international community. The systems approach to regulation recognises the voluntary efforts to coordinate activity as a Subsystem 2 activity of Beer's Viable System Model.³⁷ Arriving at a consensus and agreeing to be bound by a higher level of authority illustrates the ideas of 'hierarchy' and 'emergence' in dealing with increasing complexity.³⁸

In human affairs, the possibility of appeal to higher authority exhausts itself when sovereign states agree to be bound by international law. Eventually, control occurs from within the system rather than through external observers and controllers. This raises important practical issues of who observe the observers, who controls the controllers, or who polices the policing mechanisms. The quality of administration depends on the quality of information communicated through the political, administrative and legal decision making processes. This depends in turn on:

- the state of scientific knowledge or ignorance and the behaviour of scientists in suggesting the rationale for resource regulation
- the popularisation of ideas through various pressure groups, the mass media, politicians and a voting public in democratic decision making processes
- the behaviour of administrators and expert advisers to government in giving effect to various laws
- the behaviour of expert witnesses, lawyers, judges, and lay juries in legal decision making.

The Brundtland Report of 1987 placed 'sustainable development' as a high priority item on a

37 Referred to in Table 1

38 Referred to in footnote 16

global agenda.³⁹ The 1992 Earth Summit and Rio Declaration arrived at a degree of international agreement on environmental issues that is probably unprecedented in world history.⁴⁰ Agenda 21 provided an action statement arising from the Earth Summit. This statement saw a need for a more integrated approach to resource management issues in the following terms:

Integration should take place at two levels, considering, on the one hand, all environmental, social and economic factors (including, for example, impacts on various economic and social sectors on the environment and natural resources) and, on the other hand, all environmental components together (i.e. air, water, biota, land, geological and natural resources). Integrated consideration facilitates appropriate choices and trade-offs, thus maximising sustainable productivity and use.⁴¹

The idea of integrated resource management depends on integrated resource management information deriving from several learned disciplines. Integrated resource management may be little more than political expressions of good intentions if authorities ignore the problems of interdisciplinary communication and collaboration. Each specialisation has its own experience and language that will not translate without distortion across disciplinary or cultural boundaries unless investments are made in learning the languages that will allow the transfer. The real problem is not so much in learning the language skills but that many people either pretend or believe they already possess the necessary skills.

QUALITY IN RESOURCE MANAGEMENT INFORMATION

Confidence in resource management ability is inherent in current ideas about 'natural resource management' and policies aimed at 'sustainable development'. Underpinning these ideas are assumptions that natural resources need management and are manageable. Moreover, a general expectation exists that science will give resource management some rational basis, provided authorities maintain adequate research and development funding. However, recent history suggests that people may have placed too much confidence in science and management. Many current concerns highlight the fact that science and technology are expensive and their consequences are often far from benign. Revetz argues, as an historian of science, that science and technology have created a series of unprecedented problems that pose grave threats to the

39 United Nations World Commission on Environment and Development (Gro-Harlem Brundtland, Chairperson), *Our Common Future*, known also as the Brundtland Report

40 Declaration of the United Nations Conference on Environment and Development endorsed by the United Nations General Assembly Resolution 47/190 (1992) See UN Doc.A/CONF, 151/26/REV.1 Vols. 1-3 (1992)

41 *Agenda 21*, para.10.3. (Agenda 21 is the set of detailed action plans giving effect to the principles of the Rio Declaration referred to in the previous footnote)

biosphere.⁴² Examples include nuclear and biological weapons, acid rain, toxic wastes, imprudent use of pesticides, soil degradation, and a greenhouse effect. He contends:

This is the lesson of the great biosphere problems of the last decade. Faced with problems not of its choosing (though indirectly of its making), science, which is the driving force and ornament of our civilisation, could not deliver the solutions. When asked by policy-makers "What will happen and when?" the scientists must, in all honesty, reply in most cases, "We *don't* know, and we *won't* know, certainly not in time for your next decisions".⁴³

Scientific specialisation may solve some problems but it often creates other problems. Specialisation solves a problem imposed by limits to human cognition by allowing scientists to concentrate on particular aspects of an overall system. However, the process of taking things apart for analytical purposes creates a problem because putting things back together again for integrated resource management purposes is not an easy task. Polanyi describes the situation thus:

Gestalt psychology has proved quite generally that we cannot focus our attention on the particulars of a whole without impairing our grasp of the whole; and that, conversely, we can focus on the whole only by reducing our awareness of the particulars to the contribution they make to the whole.⁴⁴

An analyst dealing with an isolated system may predict a system's performance if the system remains isolated and environmental conditions remain unchanged. However, highly interactive situations occur typically in human organisation and biological processes. Simple cause and effect analysis may be quite misleading. One action may set off a chain of reactions involving second and subsequent rounds of effects to produce unintended outcomes. What may seem obvious in one discipline or culture may be nonsensical or counterintuitive to people in other disciplines or cultures. Moreover, causes and consequences may become so intertwined as to be practically inseparable and undistinguishable.

The need for interdisciplinary collaboration

42 Jerome R. Ravetz, 'Usable knowledge, usable ignorance: incomplete science with policy implications', *Knowledge: Creation, Diffusion, Utilization*, Vol.9 No.1 (September 1987) p.87

43 *ibid.*, pp.89-90

44 Michael Polanyi, 'Faith and reason', *Psychological issues*, Vol.8 No.4 Monograph 32, rpt. in Fred Schwartz (ed.), *Scientific thought and social reality: essays by Michael Polanyi*. (New York: International University Press, 1974) p.119. Compare George A. Miller, 'The magical number seven, plus or minus two: some limits on our capacity for processing information', *Psychological review*. Vol.63 No.2 (March 1956) pp.81-96 rpt. in George A. Miller, *The psychology of communication: seven essays*, (Harmondsworth, Middlesex: Penguin, 1967) pp.21-50

Various scientific disciplines have a major influence on social, economic, industrial and environmental policy.⁴⁵ However, in a democracy, policy should also reflect the wishes of the people affected by various regulatory measures. Therefore, these disciplines are usually an integral part of a political process. Claims of scientific objectivity are difficult to sustain. Imagining advice being given with complete disinterest in the outcome is naive. The role of science in resource regulation needs to be judged mostly through its ability to express the essences of what people need to know for informed democratic, administrative and legal decision making. Some commentators have suggested an ‘essential tension’,⁴⁶ or an inherent incompatibility between science and democracy.⁴⁷ As Majone observes:

the question is not whether analysts should use persuasion in proposing new policy ideas, but which forms of persuasion may be used effectively and without violating basic principles of professional ethics.⁴⁸

Factors mitigating against interdisciplinary collaboration

The tensions between science and democracy occur largely through the difficulties of translating or popularising science to allow assimilation of scientific ideas by interested communities of lay people. However, this kind of tension is more general and occurs wherever a substantial asymmetry exists between a sender and receiver of information. The asymmetry derives from the way that differences in experience can become embedded in various ways of thinking and expressing ideas in words and symbols of various cultures and learned disciplines. The problem of communication compounds when people are unable to find words to express what they know. In this regard, Polanyi distinguished between ‘tacit’ from ‘articulate’ knowledge.⁴⁹ Accordingly, an inability to articulate knowledge constrains organisation in its regulation, teaching and technology transfer generally because the teacher and the learner need to be in the same place at the same time to show things rather than tell them. Moreover, tacit knowledge can only be kept ‘alive’ within human memory. Some writers identify this as technology transfer ‘on the hoof’ as

45 As an example, J. D. Nyhart and Milton M. Carrow (eds.), *Law and science in collaboration*, (Lexington, Massachusetts: D. C. Heath, 1983) provides a useful overview of the interface between science and law in regulation

46 David Guston, ‘The essential tension in science and democracy’, *Social Epistemology*, Vol.7 No.1 (January-March 1993) pp.3-23 provides a useful analysis

47 Frank Laird, ‘Participating in the tension’, *Social Epistemology*, Vol.7 No.1 (January-March 1993) pp.35-46

48 Giandomenico Majone, ‘Policies as theories’, *Omega: the International Journal of Management Science*, Vol.8 No.2, (1980), rpt. as ‘Policies as theories’, *Policy Studies Review Annual*, Vol.5 ed. by Irving Louis Horowitz, (Beverly Hills, California: Sage, 1981) p.24

49 Michael Polanyi, *Personal knowledge: towards a post-critical philosophy*, (London: Routledge & Kegan Paul, 1962) p.90

distinct from 'on paper'.⁵⁰

Communication depends on a predetermined encoding and decoding convention where both a sender and a receiver attach mutually understood meanings to language symbols. Learning this coding is an intangible investment in the teamwork of an organisation. However, predetermined conventions cannot convey unconventional ideas. Social systems have limited ability to cope with new or creative thoughts. Substantially new thoughts may arise in interdisciplinary or cross-cultural communication, or innovation processes involving new science and technology. Language conventions need to change also to allow adequate description for regulatory purposes. Fromm describes this situation as follows:

every society has its own "social filter" through which only certain ideas and concepts and experience can pass; those that need not necessarily remain unconscious can become conscious when by fundamental changes in the social structure the "social filter" changes accordingly. Thoughts that cannot pass through the social filter of a certain society at a certain time are "unthinkable," and of course also "unspeakable".⁵¹

The ability to access technical information for management purposes is directly influenced by limitations imposed by language. Moreover, everyday experience shows how a trained observer will notice more about a system than an untrained observer. Thus an observer usually limits the variety of things to be observed and admitted as problems. In so far as people take pride in their work, their personal knowledge becomes an irreversible personal investment in psychological and economic well being. Powerful psychological mechanisms defend personal investment because it usually equates to feelings of self worth. Accordingly, substantially new ideas can encounter significant psychological and institutional inertia if it implies disinvestment in existing theory and ideas. Kuhn argues:

as in manufacture so in science - retooling is an extravagance to be reserved for the occasion that demands it.⁵²

Drucker uses the term 'investment in managerial ego' to describe the situation where devotion to a product or idea persists despite the reality of its financial failure.⁵³ This phenomenon seems to apply similarly with political and scientific ideas. Young people, or those new to a field, avoid

50 J. Langrish, M. Gibbons, W. G. Evans and F. R. Galvanise, *Wealth from knowledge: studies of innovation in industry*. (London: Macmillan, 1972) p.43.

51 Erich Fromm, *Greatness and limitations of Freud's thought*, (London: Abacus, 1982) p.2

52 Thomas S. Kuhn, *The structure of scientific revolutions*, 2nd. Edn. (Chicago, Illinois: University of Chicago Press, 1970) p.76.

53 Peter F. Drucker, *Managing for results*, (London: Pan, 1964) pp.77-81

these issues of disinvestment and are often more inventive. ⁵⁴

The problems of trying to establish multi-disciplinary teamwork are legendary yet a holistic view is of vital concern in dealing with many complex issues. As an example, a National Acid Precipitation Assessment Program (NAPAP) was formed in an attempt to integrate scientific disciplines following the *Acid Precipitation Act* 1980 (US). The Program experienced the following problems:

- the management of inter-agency research and development was too decentralised and uncoordinated
- the task force had too few resources for managing such a broadly defined and complex undertaking
- deadlines were overly optimistic
- there was rivalry and contention among member agencies, and general inability to develop a collegial forum and general research plans
- infighting took place over fundamental issues such as the research agenda and the value of pure and applied research. ⁵⁵

Markets as information systems

The price mechanism operates as a complex information system but it is also corruptible. The system signals market forces of supply and demand to allocate goods and services based on costs to producers and perceived benefits to consumers. ⁵⁶ Externalities distort the signalling to produce too much of some and too little of other resources. However, the effects flow over from goods markets into factor markets where they influence the prices of particular resources used in production. Pigovian taxes and subsidies may introduce some correction into the price mechanism when externalities are present. However, taxes and subsidies may also distort the pricing mechanism if externalities are absent. Typically, this occurs in agriculture as a response to lobbying by industry representatives for various forms of protection. Some subsidies directly

54 Kuhn, *The structure of scientific revolutions*, p.90

55 Robert W. Rycroft, 'Environmentalism and science: politics and the pursuit of knowledge', *Knowledge: Creation, Diffusion, Utilization*, Vol.13 No.2 (December 1991) pp.156-7

56 F. Hayek, 'The use of knowledge in society', *American Economic Review*, Vol.35 No.4 (September 1945) pp.519-30

influence output. However, other subsidies may distort production costs,⁵⁷ the economic rent attributable to land, and values attributable to particular resources. In Australia, some subsidies apply differentially to transport and other services to reduce the costs of using pastoral land. The net effect is to give land a value for pastoral purposes that it might not otherwise possess. Politically inspired taxes and subsidies may distort production costs and land values and mitigate against allocating land to its highest and best use.

THE SCOPE AND MEANING OF ‘CADASTRAL ORGANISATION’

Perhaps no issues of greater strategic significance exist than in considering how people use and abuse the resources needed for human survival. People may cooperate or conflict with each other on these issues, depending on the level of mutual understanding they can reach. In coping with complexity in political, administrative and legal decisions, the need is to admit evidence whenever it may materially affect outcomes. Agenda 21 introduces ideas of integrated resource management that call on a considerable range of expertise in considering not only a variety of environmental issues but also social and economic issues related to land development outcomes. The problem now exists of how to assimilate relevant expert advice into political, administrative and legal decision making processes. Experience suggests that inter-disciplinary and inter-departmental rivalry, professional and managerial egos, competition for research funding and the self interest of experts are likely to mitigate against effective collaboration. People may see this as a pessimistic view or one that faces reality, depending on their own attitudes to the problem.

The information processes that influence resource allocation and regulation deserve to be studied holistically to address all areas where improvement may be possible. These processes include:

- the political processes that decide the rules
- the administrative processes that apply the rules
- the judicial processes that resolve conflict
- the monitoring processes that record experience of particular regulatory regimes and provide the rationale for reforming the rules in the light of that experience, and
- the market information that signals the influences of supply and demand

57 M. H. Kolsen, ‘Effective rates of protection and hidden sectoral transfers by public authorities’, *Australian Journal of Agricultural Economics*, Vol.27 No.2 (August 1983) pp.104-15

The overall system producing regulatory information deserves a name to identify it as a worthwhile area of study. Perhaps 'cadastral organisation' may serve as a suitable name. A particular focus for such a study is to understand how quality of information depends on understanding comprehensively the entropic processes that destroy information. This destruction occurs in various communication channels that transmit information, and numerous human and artificial memories that store information for later retrieval. Information quality also depends on understanding observer bias and psychological factors influencing an observer's choice of which issues to explore and which to ignore. The effect of identifying such an area of study would be to extend considerably the scope of conventional cadastral studies. These studies currently deal mainly with technical descriptions of cadastral surveying and mapping, land registration and land taxation systems. However, this limited approach deals inadequately with many of the processes of policy formulation, implementation, assessment and reform.

Regulatory processes involve learning how to behave in a most literal sense. This learning involves not only knowledge of existing organisational arrangements but also knowledge of how to modify the arrangements in the light of experience. Accordingly, efforts to improve regulatory procedures assume a considerable degree of subtlety because they require learning about learning. Moreover, in exhausting appeals to higher intellectual authority on how to achieve effective regulation, the questions involve higher level issues of what regulates the regulators, who polices the policing mechanisms, who audits the auditors, who manages the managers and what governs the governors.⁵⁸

Several disciplines may provide insights into describing information and misinformation production processes. Since efficient learning is central to regulatory processes, learning itself deserves special attention as a productive outcome involving an irreversible investment of scarce resources of time and effort. Again, people may be happy enough that they have learned anything without worrying too much about how they gained their knowledge. However, given the considerable investment involved, some insights into the nature of this investment in social well being deserves more concerted attention by management and government. Unless this occurs, the

58 Heinz von Foerster, 'Cybernetics of cybernetics', in Klaus Krippendorff (ed.), *Communication and control in society*. (New York: Gordon and Breach, 1979) pp.7-8.

basis of management and government is left to chance and that includes the chance of failure. Since the failure is often predictable, leaving things to chance is hardly compatible with good management or government.

Land tenure institutions provide well-documented evidence of learning how to regulate the use of resources through centuries of technological, social and economic change in a variety of cultures. Accordingly, a study focused on 'cadastral organisation' may lend important insight into broader issues of information activity and regulation in society.

CONCLUSIONS

Assuming world population levels out some time next century, the billions of people then alive will depend on a demonstrably fragile ecosystem for their survival. They will also depend on arriving at understandings embodied in institutional arrangements that can preserve their fragile ecosystem as well as themselves. Just as institutional arrangements can produce information for resource regulation and land management purposes, lack of attention to these arrangements may systematically produce misinformation and mismanagement. Increasingly, the quality of land administration will depend on understanding the processes that produce information and misinformation. This area of activity deserves a name to identify it as a worthwhile area of study. Perhaps 'cadastral organisation' is a suitable name.

In many respects, a study of 'cadastral organisation' delves into the foundations of human knowledge about resources that sustain life. People usually overlook these things or take them for granted. However, overlooking these fundamental issues or leaving them to chance seems to be an unnecessary risk that is entirely incompatible with sensible resource management. Ignoring the risk seems inappropriate, given the strategic importance attaching to sensible resource management and the concerns already expressed by an international community.