

SYSTEMS THINKING AND COMMON GROUND

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ABSTRACT

The author - a professional engineer - has for many years been concerned about an apparently-dysfunctional relationship between the (mainly British-origin) **Pakeha** settler population of **Aotearoa / New Zealand** and the indigenous **Maori** (who currently comprise around 15% of the population). This has been particularly marked in the case of issues of sustainability in the use of land and resources for human development. Both sides have worked to address the problem, but a consensus position has yet to be reached. In this paper, it is pointed out that if the outcomes of modern systems-based transdisciplinary scientific thinking on sustainability are carefully compared to the outcomes of indigenous traditional thinking on the topic, a remarkable degree of agreement becomes evident, and that this could provide a basis for policy development.

Note to the reader: It is in many cases difficult, and in some cases virtually impossible, to translate words accurately from the Maori language into English. Accordingly, I have left Maori words intact, wherever relevant, and have included what I believe to be a reasonably accurate translation. I believe this is preferable to using only English, to describe situations and images that did not originate in and do not belong in that language.

1. Background

In a leaflet announcing a seminar on this topic some years ago, in New Zealand, the statement was made:

"Humanity is now faced with a compelling need to reassess its relationship with the planet; the effective functioning of the biosphere is under threat. We have to look to our rich cultural traditions - Maori and Western - for values that can lead us to a sustainable future."

This paper addresses two main issues relevant to the statement. One is that of attempting to identify some important principles behind humankind's relationship with the environment that surrounds us and sustains us, both Maori and **Tauīwi** (the general term used to describe all those who came to this land after the Maori, including both *Pakeha* and other ethnic groups). The other is that of examining the social and cultural values that can either help us or hinder us - as engineers or otherwise - in addressing problems caused by the

current dysfunctioning of that relationship.

In doing so, I take it for granted that where a sustainable future is concerned, it is the global environment that is the first priority for developing new directions for decision-making (Peet, 1992). Damage to the ozone layer and human-induced accelerated climate change are two obvious manifestations. They require us to develop policies for our own country, in a context of their likely effect on the sustainability of other countries.

I argue that the time-honoured classical Western, particularly British, way of dealing with such problems is likely to make them worse. New ways of thinking, based on understanding of complex systems behaviour and thermodynamics, must permeate all levels of our environmental, engineering and economic policymaking. In my opinion, the perspectives and policies which we obtain from these ways of thinking are closer to those of the **Tangata Whenua** (literally, "people of the land", which is what Maori call themselves) than to those of mainstream politically-sourced economics. It is time we engineers listened at least as much to the wisdom of people who have lived here and evolved environmental policies for a millennium, as to those whose understanding comes predominantly from political and economic ideologies developed in Europe over the last couple of centuries ago.

2. Sustainable Development

In my opinion, policies for sustainable futures should be democratically enunciated by people in society, not only by members of a powerful or influential elite (although members of that elite should always, and properly, be involved in resourcing the learning process that precedes policy development). For this reason, I will not spend time addressing the multiplicity of possible academic definitions of the terms "sustainability" or "sustainable development" and will restrict myself to a broad-brush review of what I see as some of the salient points.

The "Brundtland Report" (WCED, 1987) described sustainable development as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*. This ideal can be met via several (probably mutually-exclusive) alternative strategies, so there is a real danger that sustainability as a goal will lose its credibility.

Daly (1989) has made a brave attempt at definition, in which he clearly distinguishes between sustainable development and sustainable growth. The first is concerned with quality, the second with quantity. Nevertheless, the criticisms remain; sustainability is too vague, too general; it cannot be defined. One response is to turn the criticisms back on the critics, by pointing out that words such as efficiency and equity are equally hard to define, but are also used widely. Another is to point out that in most societies, people appear to be more clear about the things that they see as *unsustainable*, than about those that are sustainable.

For the present, I feel sustainability should be seen as a dialectical, rather than an absolute, thing. We can move towards more sustainable or less sustainable situations. (To know unambiguously in which direction we are moving, indicators will be needed; that is an

issue that I do not address in this paper. But see such sources as Peet & Bossel, 2000; Peet, 2004))

I like de Vries' assertion, that "*Sustainability is not something to be defined, but to be declared. It is an ethical guiding principle*". This guiding principle (de Vries, 1989 p 68) should be enough to give us a good start in developing policies for sustainable development.

3. The Maori Reality of the Natural Environment¹

The central concept underlying the Maori relationship with the natural environment (Gray, 1988; Gray et al, 1988) is **whanaungatanga** - *being related to the natural world*. Maori ancestry is genealogically traced back to the primal parents **Ranginui**, the Sky Father, and **Papatuanuku**, the Earth Mother.

The total created reality possessed **mauri** - *the physical life principle*. In humans it was of a higher order called **mauri-ora**, which carries with it conditions of responsibility, giving humans place and purpose within the total created world. Through *mauri*, all things cohered in Nature. As all things are descended from common ancestors, so all elements of the natural world possessed life, a universal living spirit.² Preservation of the *mauri* was all important. In everyday life use was made of the environment, so there was constant risk of limiting or affecting the *mauri*. To guard against this a set of rules governing conduct and behaviour consistent with their spiritual tribal (ancestral) beliefs had to be followed.

Mana is *spiritual power and authority* delegated by the **Atua** (God) to chosen representatives to perform their revealed will in the natural, physical world. It is a term which incorporates the English equivalents of power, prestige, authority, influence and control. It also carries with it the notion of covenantal relationships with the *Atua* and their chosen human delegates.

The preservation of *mauri* was associated with practices of **tapu**. Tapu is the notion of *being in the presence of one's Atua*, which means that the person or object was set aside for restricted use by the *Atua*. A thing or a person were made *tapu* by dedicatory and consecratory ritual. There are different forms of *tapu* - the temporary state, the permanent state, and the seasonal state. Specific forms of the temporary state of *tapu* were known as **rahui**. Imposed by someone possessing *mana*, *rahui* consisted of establishing the *mauri*, *a sign or mark which restricted access to an area or resource*.

Belief in the *mauri* of the natural world and their protection exerted a real influence over economic affairs. It fostered an atmosphere of respect and fear obviating deliberate destruction of essential resources. *Through these concepts, regulation of the conduct of people toward their natural environment was achieved*. Essential to the functioning of the whole system (social, physical and spiritual) was the drive to maintain and increase *mana*.

The English language version of the **Treaty of Waitangi** (signed between the British Crown and many Maori chiefs in 1840, a few years after British settlement began) described natural resources as "... *their Lands and Estates, Forest, Fisheries and other properties which*

they may collectively or individually possess ...". The Maori text of the Treaty (signed by the vast majority of chiefs)³ described the same resources as **taonga**, usually translated as "... their lands, their villages and everything that is held precious." This phrase is an approximate translation of the word *taonga*, but the English translation falls short of the significance the word has in the Maori language. To Maori, *taonga* encompasses not just the material aspects of a resource but intangible elements of spiritual significance. It is linked with the Maori approach to the natural environment, and the belief that all elements of the natural world possess *mauri*.

The term *taonga* includes values that are peculiar to Maori belief and in many respects are outside a conventional Western *economic* perception. This does not mean, however, that the term has no relevance to Western thought and attitudes to resource use. *Taonga* embraces the concept of a resource - an anthropocentric term which, by definition, contains an aspect of utility. It incorporates the familiar notion of the wise use of resources and the maintenance of the health of a resource. Sustainability and the need to preserve options for future generations are also recognised in the term.

Taonga, furthermore, refers not just to the usefulness of natural resources to humankind, but ascribes value to the environment because it exists for its own sake. Incorporating a spiritual component extends the concept of a resource beyond that encompassed by conventional Western economic understanding. The term is consistent with "intrinsic values" - values inherent within the environment but outside the human condition. *Taonga* can possess material and non-material elements, to be used and maintained both for today and tomorrow. Many *Pakeha* share these ways of thinking about resources, while using different language and imagery to express their feelings.

I now briefly examine some aspects of mainstream Government economic thinking, to show the contrast with Maori approaches. I do so to draw attention to the influence of different ways of thinking on the *outcomes* of different policy analyses.

4. The Role of Economic Thinking in Environmental-Social Policy

In conventional (mainly neoclassical) utilitarian political-economic thinking, dominant among present-day *Pakeha* institutional structures, people are seen as independent, rational, self-interested, utility-maximising individuals. These assumptions accurately represent the feelings of many economic advisors in government (in our own and in most other Western countries) involved in development of environmental (and other) policy options.

Despite their influence, it must be made clear that the models that result from them are largely unsupported by evidence from the empirically-based social and behavioural sciences. They are known to be seriously misleading, when applied to *social relationships* of people, especially activities *in their physical and social environment*. Seeing people as caricatures whose interests revolve around the accumulation of as much personal wealth and power for as little actual work as possible is a spectacularly unhelpful starting point for designing social control systems in contexts as complex as that of the natural environment.⁴

This is not to criticise the use of economic instruments in achieving policy goals, *when appropriate and democratically determined*. My criticisms are directed at the elevation of the market ideology to a position where it effectively excludes the collective and spiritual dimensions of people's lives, and *drives* policy development. This process inverts the democratic process - the ideological tail wags the democratic dog.

The economist Wallace (1988) in a review which is highly critical of some mainstream economic thinking on environmental matters, suggests that the intellectual background to the then recent reforms of resource use statutes and to New Zealand government thinking must be understood, if we are to participate in the review process:

The role of government in resource management is the most fundamental issue in the reform of these statutes. The usual view is that governments carry out the wishes of society, but the present reformers do not accept this as self evident. There is a fundamental pessimism, first about how politicians can gauge the wishes of society, and second about the ability of the government to deliver on these wishes even if they are clearly known.

These and other problems make it extremely difficult to determine the views of society. Indeed the present reformers doubt that society can be treated as a whole, but view it rather as a collection of self-interested individuals.

Contrary to the views of the "present reformers" summarised by Wallace, there are strong arguments that there is no scientifically-justifiable evidence to support the idea that society is only "... a collection of self-interested individuals". Indeed, it is more credible to propose that it is *only* when society is "... treated as a whole ...", or as a system of dynamically-interacting communities and groups, that some idea of its views can be obtained. I accept that determination of "... the views of society ..." may often be "... extremely difficult ...", but that is no reason not to make the attempt. In my experience, however, views thus determined are often very different from those of politicians and their (often economic, not social or spiritual) advisors; cynics would see that as a good enough reason not to make any serious attempt to determine society's real wishes.

5. Ethical Issues

The models of mainstream economics reflect, in many ways, a *code of behaviour* that is being imposed on people, largely without their knowledge or consent. It is a code which treats people as (utility-maximizing) individuals, without acknowledging that much of their identity and strength actually arises from a social dimension that is inherent in their membership of communities and groups. The code fails to recognise that for many people, ideas and ideals they hold in common with others are often of primary importance in their lives and have a substantial influence on their socio-economic decisions.

The social structures of Maori, for example, are built upon a network of shared, collective (tribal or sub-tribal) responsibilities for resources such as land. They owe little to behaviour patterns such as individualistic ownership of land, of the type promoted by *Pakeha*

economic structures. Many *Pakeha* regard the Maori perspective as exposing valuable options for 21st century policies, especially in the context of stewardship of the resources of the total environment.

Resources (*taonga*) - especially, in this context, environmental resources - are gifts from the past with both physical and spiritual significance (also see Hyde, 1983). The present generation has a responsibility to preserve them, and pass them on to the future, unharmed. In Maori terms, this involves a process of **kaitiakitanga**, which may be loosely translated as guardianship or stewardship, although the translation does not encompass the full meaning of the term. As I understand it, the concept of *taonga* does not exist meaningfully outside a collective context. *Kaitiakitanga* is totally different from individualistic ownership of property such as land, the keystone of dominant Western legal and economic systems (especially land tenure). That fact alone raises important questions about the ability of policies derived from a market economic perception to satisfy the requirements of the Treaty of Waitangi, without creating conflicts. Under normal circumstances, **one may not sell taonga - they are sacred**. This is because all *taonga* possess the *mauri* - the ethos of the Creator Being. This point is central to an understanding of their meaning.

I have come across relatively few situations where it is acknowledged that the policy-related questions that face all of us are, primarily, about the **values** we hold to, as a society. Gray (1988) points out that in Maori tradition, conservation has everything to do with values:

Values are the practice of belief. For example, if you believe that the earth is your mother, then you will treat the earth accordingly.

Conservation ... was the belief in the universal soul of nature, i.e. the Mauri; the total created reality possessed Mauri, including humans (this was Mauri-ora). Through Mauri, all things cohered in nature; in humans it was of a higher order. The mauri of all living things had to be preserved and protected - without it, death would be imminent.

An important response of this type came from a Maori woman, at a seminar I attended some time ago (Williams, 1988). Her concern was that the seminar appeared to lack a vision for the future, in that it was involved in addressing only human concerns and issues without looking at the problem in the total context of the Earth Mother (*Papatuanuku*) and her values.

The Maori perspective on a desirable vision for the future is to restore and maintain the integrity (mana) and strength (mauri) of all the natural treasures (taonga) from the sky to the core of the Earth. This vision arises from the Maori spiritual philosophy that we are part of the Universe, and that our survival is dependent upon maintaining the mana and mauri of the natural creation. Man has caused disintegration of the life-energy force or mauri of the taonga, which includes all natural resources such as the atmosphere and the atmospheric gases.

In Maori terms, natural taonga can regenerate or correct any disintegration or imbalance of its mauri, given the chance. This can be achieved by rahui, that is, the imposition of prohibitions on the production and use of all those man-made things that have disintegrated the mauri. Instigating rahui will involve the entire community

determining the policies and guidelines for the prohibition.

That policy proposal came out of the wisdom of the indigenous people. It was warmly welcomed by the majority of *Pakeha* at that meeting, irrespective of whether they shared the imagery in which it was described. In my opinion, the policy is what is needed by the whole of the population of Planet Earth, not only because it is scientifically sensible (in that it is based upon reducing a source of damaging stress on the environment), but also because it "... will involve the entire community determining the policies and guidelines ...".

Where the Environment is concerned, Nature's laws are paramount. But in the Western cultural tradition of the last century or two, Man has seen Himself⁵ as paramount, and Nature has been relegated to a back seat. It is one of the signs of our times, in Western societies, that men (strongly led, in many cases, by women) are now beginning to see the need for a new way of thinking about our place in the global ecosystem. But the tendency to hold on to the old Western ways of thinking is still strong. If we wish to change society in a direction which reflects the goal of sustainable development, those ways of thinking must be critically and openly examined.

The group context, and the concept of Gifting⁶ (Titmuss, 1971; Hyde, 1983), also allow consideration of environmental and inter-generational issues, largely excluded or trivialised by the individualistic approach. Such an approach is, I believe, essential, not only for the (politically and economically) dominant *Pakeha* in my country, but also to honour the commitment the Government made to the Treaty of Waitangi, all those years ago.

The world view of the *Tangata Whenua* is, I believe, very much in sympathy with modern "Systems" scientific views on the total environment, which I now describe briefly. In this context, I would also mention that while the traditional Western Scientific world view appears to be in conflict with traditional Maori world views, engineering practice has always required a system world view. For that reason, I believe the engineering profession has both the potential and the responsibility to act as a link between the two. I would also make the point that Maori learned many techniques of sustainable management of resources as a result of more than a thousand years of trial-and-error.

6. The "Thermophysical Systems" Perspective on Environment and Society

The classical scientific ("reductionist") method has one major drawback, namely that it is very easy to forget that the sum of parts is seldom the same as the whole thing. The Systems Approach has helped us understand that most complex systems show *emergent properties*, that may be studied directly but are not predictable from the sum of their parts. These emergent properties arise at higher levels of organisation, or *hierarchy*, in systems.

In modern scientific thinking, the world is an incredibly complex thermo-biophysical system, with a vast number of complex (and interrelated) subsystems. Systems open to the inflow of energy and/or information have certain characteristics, whether they be a plant, a worm, a human being, an economy or a galaxy. Unlike isolated systems, which can only tend towards a uniform end state, closed systems (also known as dissipative structures) are not in

equilibrium with their surroundings, and tend to maintain a metastable state, often called *dynamic instability*. All living organisms and natural systems (including social and economic systems) come within this description.

Within these systems, there is an uneasy balance between two processes. One is familiar to us as adaptation to the environment, or *self-regulation*. The other is characterised by occasional fluctuations in which some aspect of the normal functioning of the system is intensified and accelerated, driving the whole system into states of disorder. This is known as *self-organisation*. Until the crucial moment (a "bifurcation point") is reached, it is impossible to determine in advance, the direction in which change will occur. Each system is thus simultaneously engaged, *both* in maintaining the status quo *and* in being oriented towards (evolutionary) change and transformation.

Planet Earth and her ecological and other subsystems have a considerable ability to regulate their own functions, but they can also react to changing circumstances by rapidly altering their internal structure and organisation. The early (classical mathematical) idea that the world is in some sense, no matter how complex, at centre a linear, reversible deterministic machine, has been replaced by the knowledge that all such large complex systems are in fact nonlinear, irreversible and indeterminate in their behaviour. No matter how much is known about their past, their future behaviour can never be predicted accurately, although in some cases it may be possible within very broad limits.

In other words, from the systems perspective, I believe "reality" must be seen as fundamentally a collective, not an individual, phenomenon. The whole of any complex living system is always more than the sum of its constituent parts. I therefore conclude that the place of a living individual (whether human, animal or plant) can only be evaluated meaningfully, when seen in an integrative, collective context.⁷

As a means of illustrating this situation, the writer Alistair Mant has introduced an instructive analogy, as a means of understanding complex systems: "*Complex systems such as governments and large institutions are more like frogs than bicycles.*" One can take a bike to bits, clean and oil it, inspect and service the parts and reassemble it, confident that it will work even better than before. Frogs can't be treated that way - the moment one takes away any part, both it and the rest of the frog are irreversibly affected, usually for the worse.

The systems perspective can aid understanding in many areas in which humans interact with their physical environment. Its advantage is in the insights one gains from thinking and analysing issues in a "systems" manner. Its major disadvantage (in policy matters) is that many of the perceptions gained from its use are rather general. It is not possible, for example, to determine a unique "value" for environmental resources, or evaluate an "optimum depletion profile" for their use. This is inevitable, in that it reflects the chaotic, nonlinear reality of the world in which we live, rather than the well-ordered, 19th century frictionless linear (and imaginary) world of neoclassical economics.

To some, this is a profoundly disturbing conclusion. It brings into question many of our beliefs, particularly those which depend upon confidence in the stability of the world around us. The fact that what humans look upon as stability is in fact *metastable*, or

dynamically unstable, suggests that we cannot depend upon anything anymore. While in one sense this is correct, and can be seen as threatening to our values base, I believe it is also encouraging, and indeed, liberating. As the economist Daly (1980, p 12) pointed out, "... *it is better to deal incompletely with the whole than to deal wholly with the incomplete.*" It can also be better to be approximately right than precisely wrong.

7. Policies for Sustainable Futures

It is an inevitable consequence of the Thermo-biophysical Systems approach, that in order to ensure long-term sustainability of an economy in its environmental surroundings, pollution and waste flows across the environment-economy boundary must be kept below some critical level at which damage will be avoided. Since these flows all arise from material inputs to the economy, all economies must therefore approach a quasi steady state (*in terms of physical throughput*).

Growth in the total material flows involved in current economic activity must therefore stop - and preferably be reversed. This in no way implies that the *value* and *quality* of economic activity need be so constrained. What it does mean is that the *quantity* of energy and materials used in that activity must not rise above a threshold level.

At the global scale, and in most countries, including our own, it is virtually certain that the threshold was crossed, some time ago. Human-induced flows of matter and energy across the economy-environment boundary are now sufficient to cause severe disruption to natural cycles.

In the past, the limiting factor in economic development was the rate of accumulation of (human-created) capital. We have entered an era in which the limiting factor is the declining "natural capital" of the environment. That natural capital must be at least maintained, and preferably increased, e.g. by expanding carbon sinks such as forests, at the same time as reducing the throughput of energy and materials.

The primary policy question is thus a scientific one. It is, whether maintenance of current ways of behaviour will cause unsustainable outcomes (e.g. in world climate) in the near future. I believe the answer to this question is overwhelmingly in the affirmative. It is a direct consequence, then, that pollution emissions must be substantially reduced. I therefore repeat the point I made above, that *material growth must stop*.

We then have to determine by how much, as the basis for environmental policy. This is the *secondary question*, and the answers to it hinge upon the values base of society. The optimum quantity of throughput cannot be determined by prices. It must be determined by ecological, moral and ethical considerations, including sustainability and intergenerational justice. **Ethical and ecological principles are price-determining, not price-determined.** The critical political questions are, not how much of the matter-energy of the environment *can* be converted into people and artifacts, but how much of it *should* be so converted, **and at what rates**, in a sustainable world.

8. Conclusions – The Search for Common Ground

In my opinion, sustainable development policies are primarily about *efficiency* and *sufficiency*.

Efficiency is a technical matter, and relates to the extent to which societies can *do more with less* (or, better, *do the same with much less!*).

Sufficiency is an ethical and moral matter, and relates to questions such as: how much is enough? and: am I my brother's/sister's/grand-children's keeper?

I see both as value-laden questions, which I believe are best addressed by a participatory democratic political process, resourced by the best knowledge available from western and indigenous sources together. Once they are resolved (and not before), we can address ourselves to the *tertiary question*, which is how to construct social instruments (such as *rahui* and legal or economic incentives/disincentives) to put policies into effect. This is where economics comes into the discussion.

It is imperative that these questions are neither preempted nor answered on our behalf, by the political or economic elite. They are for the population as a whole to answer, working in a participatory learning process. In such a process, the wisdom of the *Tangata Whenua* must take its place alongside that of "ordinary" *Tauwiwi*. The task is complex, requiring a combination of people's wisdom and the best of modern systems thinking and thermodynamic understanding. I believe it can be done through a programme of participatory adult education (Peet and Peet, 1996). As a first step, what is needed is recognition of the existence of people's wisdom (in both indigenous and settler cultures), plus a commitment of resources to enable the job to be done.

At this time in our country's history, I see it as exciting that engineers are getting together with *Tangata Whenua* to develop our mutual understanding. I believe we have three important functions to fulfil:

- good engineering, assisted by good science, including Systems approaches
- an urgently needed interdisciplinary project of public education, especially of decision-makers and policy advisers who were brought up in the old western scientific tradition
- a recognition of the resource we have in our land, of the wisdom and understanding developed by Maori over more than a thousand years. They have doggedly held to their traditions in spite of events since 1840, and we need to recognise, honour and treasure them. We need them now, more than ever.

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Notes

1. I am indebted to *Upoko* Rev Maurice Manawaroa Gray, *Te Runanga ki Otautahi o Kai Tahu* (Gray (1988), Gray et al (1988)) for some of the material in this section, used with his explicit permission.)
2. Here, I contrast the Maori model of humans in their environment (in which God, people and nature are intimately linked in a complex, integrated *systems* relationship), with that of the classical western *hierarchical, linear* tradition, derived from Greek origins, in which God stands above people ("Man"), who in turn have dominion over (women and) nature.
3. Network Waitangi Otautahi, August 2005 reprint of the Treaty of Waitangi and related material, 141 Hereford Street, Christchurch, New Zealand.
4. Nevertheless, I have to acknowledge that this caricature probably applies accurately to many of the people who are at the forefront of its promotion, often in organisations such as business roundtables and chambers of commerce.
5. I use gender-specific language here, to draw attention to its dominant place in *Pakeha* culture.
6. The (sociological/anthropological) idea of the *Gift* reflects some very complex aspects of group human behaviour. It should not be confused with the much more narrow economist's idea of *altruism*, which relates to individuals, generally in a neoclassical behavioural model.
7. In the sense of political theories of society, I note that Individualism requires the whole to be seen as simply the sum of its parts, whereas Collectivism requires the whole to have no parts. Both models are absurd caricatures of human social behaviour, but were the basis of the two dominant world political ideologies of the 20th Century. Much of modern social science passed these simple models by, a long time ago. The Systems approach helps us understand that while Truth may have some elements of both, it also has a great deal more besides, including emergent properties that are not visible from either perspective.