Shaping the future: indicators of need in the third millennium

John Peet

Department of Chemical & Process Engineering,
University of Canterbury, Private Bag 4800,
Christchurch 1, New Zealand
Fax: +64 3 384 6281 E-mail: john.peet@canterbury.ac.nz

Abstract: In this paper, the issue of sustainability and sustainable development is addressed through the assumed goal of sustainable living. That goal implies that humanity consciously decides to adjust its collective behaviour in order to change present unsustainable practices towards those that reduce and eventually eliminate unsustainable impacts on the natural environment, while at the same time attempting to ensure that the reasonable needs of people are satisfied. In order to steer change from unsustainable to more sustainable practices, social control systems need to be in place, using key behavioural criteria to indicate the necessity (or otherwise) of fiscal, legal or other policies.

Starting from an overall philosophy that acknowledges the reality of systemic complexity, this paper describes Max-Neef's taxonomy of human needs, and Bossel's more generic orientor framework for systems in general. These two, used together, enable one to evaluate the basic needs of both human, natural, economic and social systems, so that policies can be identified to address critical deficiencies.

Keywords: sustainable development; satisfaction; needs; society; policies; complex systems.

Reference to this paper should be made as follows: Peet, J. (2004) 'Shaping the future: indicators of need in the third millennium', *Int. J. Environment and Sustainable Development*, Vol. 3, Nos. 3/4, pp.353–368.

Biographical notes: Dr. John Peet is a Retired Senior Lecturer at the Department of Chemical and Process Engineering, University of Canterbury, New Zealand. John was born in the UK and has been living in New Zealand for the last 40 years. A chemical engineer whose main focus in recent years has been sustainable development, Peet is the author of a book on Energy and the Ecological Economics of Sustainability as well as papers on systems, sustainability, and the ethical requirements of stakeholder involvement.

1 Introduction

Poverty, hunger, disease and militarism threaten the social fabric of societies everywhere. Environmental damage and resource depletion, worldwide, threaten people's health and endanger the ecosystems upon which we are critically dependent. There is also deep

Copyright © 2004 Inderscience Enterprises Ltd.

concern in our own and many other countries at the human misery caused by many of the so-called economic 'reforms'.

Being fully human is a condition which I believe is the desire of all people. It requires that the personal, social, economic and environmental systems upon which we depend jointly remain healthy and viable into the long term future. Unfortunately, however, the sheer complexity of what we are dealing with is far beyond the power of conventional approaches, in science, medicine, economics or politics, to tell us whether they are indeed healthy and viable. We need better tools.

In response to these concerns, I believe it is of critical importance to examine the issue of Need. But needs are not just for people. Communities, economies, societies, and the entire world of humanity and nature also have needs, which are very real and are also interconnected, each to each other. While an ethically based socio-economic response to the needs of people is urgently needed, at the same time we must acknowledge the equally important, but often less obvious, needs of the ecosystems of our country and of the earth as a whole.

My goal – which might be called 'sustainable living' – often referred to as sustainable development – implies an agenda for change, since few of its attributes are obviously satisfied today, in most societies. In order for it to happen, however, people and communities first need to know where they are. This means the need for 'indicators' to show whether or not we are making progress towards where we want to go – the goal. The indicators we use must be selected in accordance with the goal, and also be consistent with a community-based ethic of how best to move towards that goal.

2 Indicators

All of us use indicators, of one form or another, to help us understand the complex world around us and control our responses to it, necessary for everyday life. Familiar examples are the temperature of the skin on one's face; the level of one's bank balance; and the facial expression of one's neighbour. The more complex the system in which we live, and within which we need to control our activities (choice of personal clothing to wear, family monthly expenditure, attitude towards others), the more we rely on indicators. But to avoid information overload, we must also avoid watching more indicators than are strictly necessary. In practice, the ones to which we pay most attention are the 'red light' indicators that indicate the need for urgent action; the car horn when one steps into the road without looking; the 'OD' that indicates overdraft in the bank balance; the hungry baby's cry. In this paper, I describe a framework that assists in identifying those 'red light' indicators in any complex system, since they are the ones which need the greatest attention in order to ensure the sustainability of the system under examination.

There is a voluminous literature on indicators of sustainable development, but in my opinion it is generally fragmented, often parochial, missing vital information and lacking an overall organising framework. In this context, I am reminded of Lord Rutherford's famous dictum: "All science is either physics or stamp collecting". In my opinion, indicators are, similarly, either physics or stamp collecting. We are faced, daily, with a plethora of indicators, usually representing a collection of people's 'favourite' criteria, with little or no coherent, whole-system understanding of their place and relevance in our complex system. The common Pressure-State-Response (PSR) system, for example, is

widely used, but is known to suffer from an inability to account for system relationships and dynamics.

In this context, I believe it is useful to be reminded of Ashby's Law of Requisite Variety, coming from General Systems Theory: "Only variety can cope with variety". Put in other words, in order to control a complex system (such as a society), the design and operation of the control system must fully reflect that system's complexity. It cannot be expected that complex questions such as those inevitably involved in the development of policy for sustainable development can be answered simplistically, no matter how strong the (often political or time) pressures to do so may be.

So is the whole issue just too complex for ordinary mortals? Perhaps we should leave it to the experts! After all, most leaders of government and commerce have been telling us for some time that if we only free up markets and generate more economic growth, we will be able to create a marvellous future ('sustainable growth') for ourselves and everyone else.

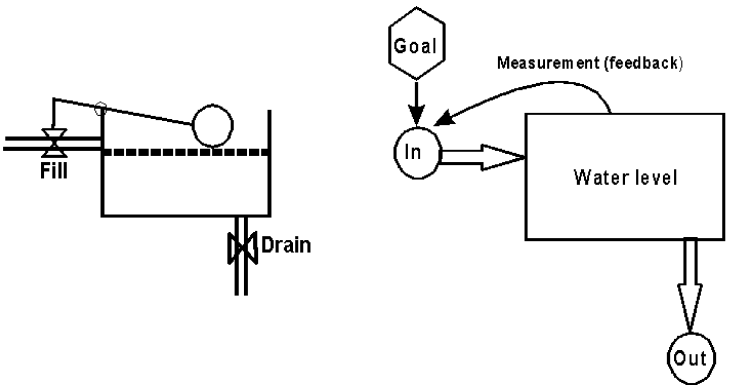
I do not think those ideas hang together economically, let alone socially, scientifically or environmentally. That is why I want to discuss some ideas about Complexity, and describe a framework which may be able to help us identify key aspects of the health and viability of any system. I do this in order to encourage people to see that reality is *not* too difficult for them to do something about it. Complexity is part of everyday experience, and does not need to be 'left to the experts'. How we *respond* to a complex systems' understanding of reality is a separate issue from developing that understanding in the first place.

3 Control of systems

How does one ensure that identification of a community need is linked with the means for its satisfaction? Simply identifying an indicator is not enough to ensure that – for example – people's needs are being satisfied.

Figure 1 is a response to this question via the illustration of a simple, self-regulating system, a household water tank. The left hand side of the figure shows how the ballcock and float mechanism ensures that the water in the tank is automatically refilled after being drained, so it always returns to the 'correct' level.

Figure 1 Household water tank – a simple, self-regulating system

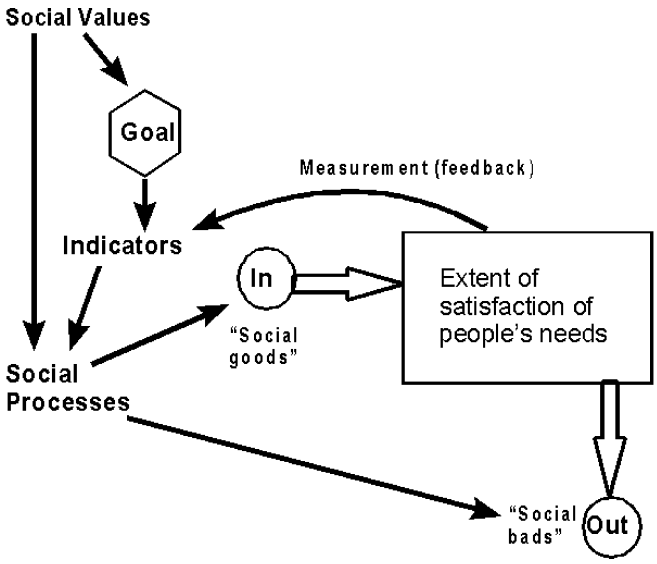


The more generic right hand side of the diagram shows that this process is dependent upon a 'goal' being set – namely the 'correct' water level – and this goal is achieved in practice by design of the mechanism whereby the ballcock moves in order to open or close the fill ('In') valve. Measurement alone is not enough, nor is action alone; both are needed, simultaneously, for the system to function properly.

In this context, selection of an appropriate measurement is only the first step towards an indicator. Unless the measurement is able to be compared with a realistic and achievable goal, it cannot be used to enable that corrective action to be taken which will fill the tank back to its correct level.

If we use this insight to address the questions implicit in our aim to determine whether people's needs are being satisfied, we find ourselves with a situation of the type sketched in Figure 2. Measurement of the extent to which people's needs are being satisfied provides the feedback measurement which, linked with a Goal determined using Social Values, enables Indicators to be identified.

Figure 2 Satisfying people's needs as a social process



Social Processes – which will obviously include policy at local or central government level – may then be invoked to achieve outcomes which 'close the loop' and improve the level of satisfaction of people's needs – and hence community wellbeing. The outcomes may be achieved by input of social goods and/or by reduction of social bads.

The whole process is 'driven' by the Social Values which determine the nature of the Goal. These values are essentially moral. How they are determined is, of course, a key question in the overall process, because it is those values that determine which social criteria are chosen to represent the state of satisfaction of people's needs. In my opinion, they must come out of community processes that resource and are resourced by the local and central government bodies involved.

Let us now examine some of the issues that come out of this illustration.

4 Complex systems

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.*

To explain this point, one can take a bike to bits, clean and oil it, inspect and service the parts and reassemble it, confident that it will work as well as before. Frogs cannot be treated that way – the moment you take away any part, both it and the rest of the frog are irreversibly affected.

A bike is a 'stand-alone' system, which can exist without any connection to its surroundings. All its parts exist independently, yet are interrelated and simultaneously necessary for a reliable machine that is safe to ride. All the parts of a frog are interrelated, too, and all are simultaneously necessary for the frog to survive and breed. A frog, however, can be either alive or dead, depending upon the relationships between its parts. It can never 'stand alone'; it is at all times intimately connected to, dependent on and in dynamic relationships with the environment which gives it life.

In this analogy, Nature and Society – and the Economy – are frogs, not bicycles. They are very complex, living wholes, with interdependent parts and relations between the parts that even now, with centuries of scientific understanding behind us, we still barely understand.

According to Hinterberger et al. [1], even if some well-known basic principles of sustainability are accepted, complexity gives rise to two problems that are often overlooked:

- From the viewpoint of natural sciences, it is impossible to measure if, or to what extent, the principles are observed. (This is due to the complexity of nature.)
- From the viewpoint of social sciences, it is impossible to implement, accomplish and control the observance of those principles. (This is due to the complexity of societies.)

Potentially the most useful response to these problems comes from the coevolutionary approach of Norgaard [2]. On the one hand, he describes the conventional, 'linear' view, of knowledge giving rise to new techniques and new forms of social organisation which, by the use of natural resources, are assumed to lead to an economic output. A coevolutionary perspective, on the other hand, stresses the interdependence of various 'variables' in the societal process of development [1].

From the linear viewpoint, norms and the environment are exogenous, or independent of economic development. From the coevolutionary viewpoint, values, knowledge, social organisation, technologies and the natural environment influence each other, in such a way that development is coevolution of the total system. From the latter perspective, "everything is symmetrically related to everything else. Nothing is exogenous" [2, p.35]. In such a situation, SD is no longer a simple concept and cannot be mechanistically operationalised.

The policies and understandings that guide our decision makers today, however, are still based predominantly on what I have described as the 'bike' principle, where society is divided up into neat parts each of which is assigned to some or other policy box, to be dealt with independently. A more valid view is to see society as an evolving, living entity

(a frog), dynamically and organically connected to, and dependent on, everything else, at all times. Our choice of, and use of, indicators should therefore reflect this 'frog' model.

5 Human needs

As a start towards addressing this issue, let me assert that an understanding of the needs of people must come through a process rooted in the Third Sector – Civil Society. Civil Society has existed for tens of thousands of years but is usually less well represented in policy groups and processes than the other two sectors, Government and Commerce. It is crucial that Civil Society be directly involved under its own terms, and not be treated as if it is either invisible or else required to follow the rules of the market.

In recent years, social development workers in Central and South American countries have produced some important ideas, directly relevant to the issues we are addressing. For example, Manfred A Max-Neef [3] has asserted that *Development is about ... allowing people the greatest improvement in ... Quality of Life,* [which in turn] *depends on the possibilities people have to adequately satisfy their fundamental human needs.* Further to this:

- Fundamental human needs are finite, few and classifiable.
- Fundamental human needs are the same in all cultures and in all historical periods. What changes, both over time and through cultures, is the way or the means by which the needs are satisfied.

Max-Neef has classified Human Needs into nine fundamental categories [4]: Subsistence, Protection, Affection, Understanding, Participation, Idleness, Creation, Identity, and Freedom.

- the Needs are all necessary, all equal
- any human need that is not adequately satisfied reveals a human Poverty
- there are multiple poverties, not just one kind of poverty ... every poverty, if extended beyond a threshold, leads to a Pathology, a sickness.

Examples of poverties include:

- the poverty of Subsistence (due to insufficient income, food, shelter etc)
- the poverty of Protection (due to inadequate health systems, violence, arms race etc)
- the poverty of Affection (due to authoritarian government, oppression, exploitative relationships etc)
- the poverty of Understanding (due to poor quality of education etc)
- the poverty of Participation (due to marginalisation and discrimination against women, children and minorities etc)
- the poverty of Identity (due to imposition of alien values on local/regional cultures etc).

Every poverty, if extended beyond a threshold, leads to a Pathology, a sickness.

This analysis leads to a classification of different kinds of satisfiers of fundamental needs. For example:

- *Destroyers* are satisfiers that address one need but end up destroying that need and others as well. As examples, the arms race, bureaucracy and authoritarianism promise Protection, but also stifle Subsistence, Affection, Participation and Freedom, while they increase insecurity.
- *Pseudo-satisfiers* are appealing, but they only promise to fill needs; they do not actually do so. Examples include advertising, chauvinistic nationalism, prostitution, charity, and aggregate economic indicators such as GDP.
- *Inhibitors* satisfy one need but inhibit another. For example, an overprotective family provides Protection but inhibits Affection, Understanding, Participation, Identity and Freedom. Obsessive economic competitiveness provides a form of Freedom, but stifles Subsistence, Protection, Affection, Participation and Idleness.
- *Singular Satisfiers* satisfy one need while steadfastly ignoring others. Insurance, guided tours, professional armies, curative medicine are examples.
- *Synergic Satisfiers* meet several different needs at once. Breast-feeding, popular education, barefoot doctors, democratic trade unions, educational games, preventive medicine, music, art, cooking and ornamentation are examples.

Max-Neef and coworkers have worked in many of the countries of South and Central America, as well as Britain, Sweden and Australia, running workshops on fundamental needs. First, people are asked to list what they feel inhibits their satisfaction of the various needs (rich countries come up with a lot of fear and guilt, typically). Then the exercise is repeated to construct the ideal situation, where every need is satisfied at every level.

The aim is to move from the negatives – the destroyers, pseudo-satisfiers and inhibitors – to the positives, especially the Synergic, Satisfiers. By this process, a structured understanding of the underlying Fundamental Needs and Satisfiers, relevant to each society, is developed. Ideally, that result would feed through into that government's economic and social policy development processes, but as yet there is little evidence of this superseding the more traditional economic understanding of human need as reflected in preference-driven 'demand' in the marketplace.

Max-Neef's approach has the great strength of linking the most basic of human needs – most easily understood at the individual level – with the needs of the social system within which the individual lives and interacts with others.

6 The ethical basis of an approach to human needs

The key element in finding out if people's needs are being satisfied is prior determination of an ethical principle against which the nature and extent of satisfaction of fundamental or basic needs can be evaluated. That evaluation can then be done by identifying *Indicators* which must measure not only quantity of possessions or of income, but complex aspects of the quality of life.

The things that really matter cannot usually be counted. The NZ writer Anne Else [5] has made some trenchant comments in this context:

> "Without families and communities, the economy means nothing. It has no life of its own. Its only purpose is to enable us to live, to care for one another and to raise our children to take our place. If we lose the power to do that, no matter how fast the GDP rises or how much the budget surplus grows, we will have no future worth working for."

According to Steve Hatfield Dodds [6, p.7], needs of humans cannot be separated from those of the total system of life on earth:

> "The truly good society is one which combines justice and the highest human freedoms to promote the well-being of all of its members, both present and future, while protecting the integrity and beauty of the earth and all its life. This implies that 'the good society' and 'sustainable development' are effectively interchangeable terms, but raises other questions about the nature and interpretation of freedom and justice."

The Maori of Aotearoa New Zealand, as with other indigenous peoples, have a unique holistic approach. This stems from the reality that it was their language and cultural understandings that first named this place – and hence all of the system is included. Their understanding is therefore a vital part of a full understanding of our 'system' [7].

Indicators, then, must reflect the state of satisfaction of each basic need, according to the requirements of an ethical principle. As a working base, I put forward an ethical principle which has been found to be acceptable to several community groups with which we are involved. It has been developed out of extended discussions and summarises the consensus reached. The ethic reads:

> "All people have their basic needs satisfied, so they can live in dignity, in healthy communities, while ensuring the minimum adverse impact on natural systems, now and in the future."

If we are to attempt to change the direction of a system such as our society towards sustainable living, we must first identify and understand both the overall direction that the system is currently following, and that which we wish it to follow. The goal will be an expression of overarching values which we, as a society, choose to guide us as we journey into the future. Whether the values that guide us are democratically chosen or imposed by a powerful elite will drastically affect both the ends and the means – the goal destination and the journey.

Once we know in what direction we are going, we will want to be sure that we travel well and reach our goal. This means – if we are serious about the goal of sustainable living – that we have to ensure that the system as a whole – society in its natural environment – is healthy and viable for the long term. We must also make sure that all of the parts – the subsystems such as people, families and communities, economy and so on – are in themselves healthy and viable for the long term, and all contribute to the health and viability of the whole. The criteria that we use to tell us whether we are making progress towards our goal are the indicators. How we select those indicators will govern the ways in which we make our journey towards our goal.

7 The needs of complex systems

I now move on from human needs, to address the needs of complex systems in general. This uses a technique developed by Bossel [8,9], independent of, but with remarkable generic similarities to, that of Max-Neef. It involves an analytical framework that does two main things [10]:

- relates the use or abuse of natural resources to ultimate human wellbeing through technology, economy, politics, and ethics
- allows people to order and see the relationships between the structures that can be identified in the natural, economic, human, and social systems.

Every system has a number of fundamental properties which are a direct reflection of the properties of the environment – the context – within which it exists. As Max-Neef showed, there are fundamental human needs which are the same everywhere. The same thing applies to systems in general. If one generalises this idea, as Bossel has done, one can show that every system – whether living or manufactured – has entirely general properties that Bossel calls *Orientors*. These properties influence not just the structure and function of the system itself, but also influence *(orient)* that system's behaviour towards its surrounding environment. A *Basic Orientor* is more fundamental, and relates to the system's overriding goal or driver – in this paper, that of sustainability.

Figure 3 shows a generalised System within its Environment or Context, incorporating Bossel's list of fundamental properties of system environments. The Basic Orientors ('inside' the System) that relate to the Fundamental Properties of the System's Environment ('outside' the System), are described in Table 1. Each of them has a direct relationship to the corresponding Fundamental Properties of the System Environment. *Each basic orientor reflects a fundamental need of the system*, in that a lack of satisfaction of any of them may render the entire system unviable (unsustainable).

Figure 3 Generalised system within its context or environment

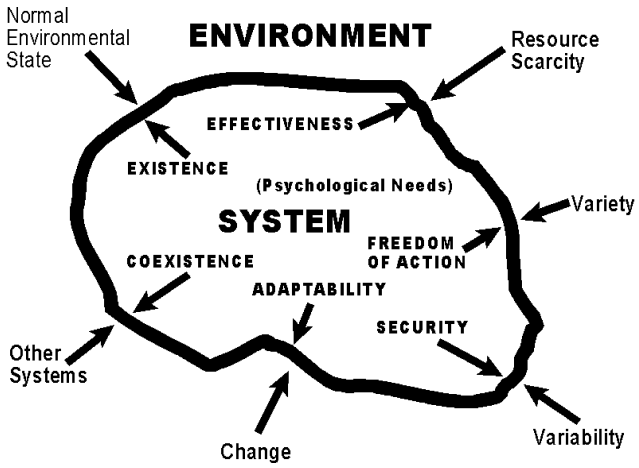


Table 1 Basic system orientors and fundamental properties of the system's environment

Existence: Ensure the immediate survival and subsistence of the system in the *normal environmental state*.
Effectiveness: Over the long term be effective (not necessarily efficient) in securing *scarce resources* from, and exerting influence on, its environment.
Freedom of action: Have the ability to cope in different ways with the challenges posed by environmental *variety*.
Security: Be able to protect against the detrimental effects of environmental *variability*, such as fluctuating and unpredictable conditions outside the normal environmental state.
Adaptability: Be able to change parameters and/or structure in order to generate more appropriate responses to challenges posed by *change.*
Coexistence: Be able to modify behaviour to account for behaviour and orientors of *other systems* (i.e. actor systems) in the environment.

Three Additional Basic Orientors may be needed in some situations involving living creatures:

Reproduction:	Self-replicating systems must have the opportunity to reproduce.
Psychological needs:	Sentient beings (which can feel pain) have psychological needs.
Responsibility:	Conscious actors – humans – are responsible for their actions and must comply with an ethical reference.

To ensure the viability and sustainability of the system, a sufficiency of each basic orientor must be ensured. This point is virtually identical to that of Max-Neef, where there are multiple needs, each one of which must be satisfied for the person to be free of poverty. In Bossel's framework, unsatisfied basic orientors indicate the most important needs of a system.

Let us illustrate the approach by relating it to the earlier examples of the frog and the bicycle. This requires that we go through the list in Table 1, to ensure that all six Basic Orientors are independently satisfied. Table 2 puts the basic orientors side-by-side, and lists a number of questions that correspond to the basic orientors. Note that the Reproduction basic orientor for the frog has not been included, since (for comparative purposes) no obvious equivalent exists for the bike.

Table 2 Basic orientors for a bicycle and a frog

Basic orientor	*Bicycle*	*Frog*
Existence	Are the frame and all the parts properly welded and/or bolted together?	Can it survive and breed in its normal environment?
Effectiveness	Do all moving parts work smoothly?	Can it see, eat food, mate, identify danger?
Freedom of action	Can the rider go where he/she wants to go, starting and stopping when needed?	Can it physically move around to find food, a mate or evade predators?
Security	Will it work well in all weather?	Does it have the ability to survive cold, heat, drought or flood?
Adaptability	Can it be used by other people, in different places?	If its surrounding environment changes, can it modify its behaviour in order to survive?
Coexistence	Can it be seen and avoided by other road users?	Does it live in a stable relationship with other living things in its natural environment?

This table helps us appreciate that looking at any part in isolation, whether it is of a bicycle or a frog, is not good enough. We must focus on the whole system in its entirety. But in doing so, if we want to ensure viability or sustainability, we must also prioritise our actions. Clearly, we should concentrate our attention on those orientors which show the most pressing needs.

This approach is actually valid much more widely, and has been applied in a number of different situations, including the viability of a critically endangered NZ bird species, a motor vehicle, a family and a nation (NZ) [10].

8 Critical needs of a system

To illustrate what it means to concentrate on the most pressing needs, let me give an everyday example, learnt in first-aid classes. In the event of discovering someone injured as the result of an accident, the first priority is to determine whether their life is in danger, and if so, take immediate action to preserve it. The three primary items on the first-aider's checklist are, in order, something like: *Stop the bleeding; start the breathing; and treat for shock* [11].

Only after these items of critical need have been taken care of should one's attention be directed at other areas of concern. In other words, our first concern is with those parts where a person's (i.e. the system's) viability is under the most severe threat. By fixing up those things that are in deficit first, one ensures that the rest of the system will be better able to recover and improve its health and viability. As a simple example, a single, small loose screw on a bike may render the whole machine very dangerous (unviable) for the user, and is therefore a high priority for attention. While having connotations that may appear to some to be rather negative, this approach has the advantage of fixing up problems first, and then enabling attention to be given to other factors. One does not worry about the accident victim's appearance until essential first-aid needs have been met.

9 More complex systems

The requirements for viability of a family are understandably more complex than those for a frog, let alone a bicycle. When we turn our attention to even more complex systems, the number of factors to be taken into account increases substantially. This is because such systems often have a considerable direct effect on their environment. For example, human settlements have effects that are often highly polluting. If a system can only survive in the short term by severely depleting or fouling the resources of its surrounding environment, then clearly the long term sustainability of both is questionable.

In situations such as these – which are common when we address issues of sustainability of societies – we need two sets of indicators, one for the system itself and another for its effects on the surrounding environment. It is not good enough to consider only the human system.

This immediately brings us back to the question of the ethical understandings and values we apply in pursuit of that relationship with our environment, to ensure the system in which we live (including other people) is as sustainable as our own parts in it. Long term factors and preservation of options for future generations are essential parts of our

ethical position. Given our lack of deep scientific understanding of the ecosystems, societies and economies which sustain us, I believe we should adopt the Precautionary Principle when developing policies likely to have significant environmental or social consequences.

From the description of approaches used by Max-Neef and Bossel, it will be apparent that there is a remarkable similarity between Bossel's Basic System Orientors and Max-Neef's Human Needs. Bossel has mapped Max-Neef's nine Human Needs onto his seven Basic Orientors (Table 3). In doing so, he has combined two pairs of Max-Neef's Needs [12].

Table 3 System orientors and human needs

Bossel's basic system orientors	*Max-Neef's human needs*
Existence	Subsistence
Effectiveness	Understanding, Idleness
Freedom of Action	Freedom
Security	Protection
Adaptability	Creation
Coexistence	Participation
Psychological needs	Affection, Identity

10 When is a need 'satisfied'?

Yet another question is – what does it take to satisfy a deficit in a Basic Need or Orientor? Probably the best answer is to use the analogy that, if one is starving, one does not need or want a gourmet meal. A simple dish of nutritious staple food is entirely appropriate. In other words, Sufficiency is the appropriate response to Deficiency. To achieve one's full humanity, a sufficiency of everything important is necessary; a surfeit of any one thing is no substitute for a basic deficit of another. The same applies to deficits affecting the viability of any system, from a family to a community to a society and up to and including the whole Earth system.

But how does one evaluate 'sufficiency' to the satisfaction of those involved? This involves a number of tricky questions, but I believe a participatory process is the foundation of any such outcome.

11 Stakeholder involvement

How can, for example, local knowledge and accumulated wisdom of settler and indigenous peoples alike be incorporated into the process of determining whether a system is viable, and whether it is making progress towards its goal? Expert scientific knowledge will influence the process of search and selection of indicators that can appropriately reflect basic need satisfaction. The process should, however, actually be *shaped* by the values of a much wider community than that of experts. In the context of

the proposed approach, their values would, I feel, be most appropriately summarised through the ethics of the process used to select indicators.

12 Putting these ideas into practice

The process of constructing a system of indicators for assessing the viability of systems, and in particular progress towards sustainable development, can be broken down into five main tasks:

- Identify the overarching goal. In my view, 'sustainable living' is appropriate.
- Adopt an ethical framework that provides an inclusive approach to guide our relationship with other, living and nonliving, human and nonhuman systems on which we depend or whose fate we influence in one way or another, now and in the future.
- Identify and develop sufficient knowledge about the participating sector subsystems we have to include within the 'total system' boundary, and their role and function in the sustainability of the total system.
- For each participating sector subsystem, find indicators to answer the questions:
  - what is the viability (i.e. level of satisfaction of each basic need or orientor) of the sector subsystem itself?
  - how does each sector subsystem contribute to the viability of the total system within which that subsystem exists?
- Define the indicators clearly and unambiguously, quantitatively or qualitatively as appropriate.

I remind the reader at this point, that the task is to define indicators that are representative of the *weakest* features of the system, with respect to the particular need or orientor question being addressed. To use a well-known analogy, a chain is only as strong as its weakest link; there is no point in strengthening links that are already strong enough, when one or more of the other links is obviously in a weak state.

13 Being fully human

Putting this framework together reiterates the importance of addressing the key question – *What is it all for*? When we have answered that question (through identifying our moral position and creating an ethical statement that reflects it), our measures of physical and other resource flows will help tell us, for example, what it 'costs' Nature, for Society to maintain an appropriate level of economic activity, and the extent to which the structures are viable and sustainable.

Once this has been done, we will be able to integrate the Framework and answer the important question of sustainable development, enunciated earlier, namely whether *all people have their basic needs satisfied, so they can live in dignity, while ensuring the minimum adverse impact on the natural world, now and in the future?*

If we use the framework described here as a guide, we can examine the needs of each subsystem, to determine which are in deficit and needing improvement. By doing so, we would have found out about those issues that prevent people from being fully human, or families and communities from realising their potential. All that is needed – at the start, anyway – is to identify those deficits and satisfy them. As noted above, when someone is injured, the priorities to maintain life are to "stop the bleeding, start the breathing, and treat for shock". Only after these are done should one turn one's attention to improving the injured person's quality of life.

14 Addressing critical deficiencies

Having identified 'red light' indicators in the analysis framework, the next step is to decide how to start the process of turning the red lights into amber or, better still, green lights. At the same time, it is essential to at least maintain the state of the other indicators. All this is, of course, in pursuit of the goal enunciated at the start, of improving overall sustainability, via satisfying the most pressing needs of each significant part of the total system.

So how does one start to reduce poverty and inequity, while at the same time keep as much as possible of the infrastructure and economy of the nation under some degree of social control, as well as reduce fossil fuel use by converting to renewable energy sources? Clearly, this is a tall order! However, without it, I believe society will remain hooked into perpetually searching for the political-economic 'magic bullet' that will ensure poverty alleviation, not realising that the key to poverty alleviation requires attention to the system in its entirety.

To solve the problems of the whole system requires very careful design and testing of the means of satisfying basic orientor deficiencies without causing deterioration in others. With so many interconnections, an action in one part of the system may have ramifications that go far beyond its immediate subsector boundaries. Clearly, Max-Neef's 'Synergic Satisfiers', which meet several different needs at once, are ideal in this situation. However, with the help of Bossel's framework described here, we can identify the areas where there is evidence of 'bleeding', and concentrate attention on them as a matter of priority.

Policy development in these areas will require the best of transdisciplinary cooperation between specialists, carefully guided by, and accountable to, the general public. It is not enough to use only one approach, such as the currently fashionable mainstream economic theory and its derivatives. A multiplicity of perspectives is required, to ensure that as much as possible of the full complexity of the whole system of which we are part is taken into account in our policymaking. In this context, Norgaard's coevolutionary approach, described above, has a lot to offer.

15 Conclusions

What I am suggesting is closely related to calls that have been made over recent years, in many countries, to change the ways in which society organises its priorities. To many, including myself [13], it means using the values determined through community-based processes to design a new economics - an ecological economics of sustainability [14–18].

In my opinion, it is only when the political economy is guided by a clear goal and firm ethical principles that it can go beyond narrow economic theory or simple expediency. Only when it is guided by an understanding of the interdependence of all parts of the total system of people, society, economy, and environment will sustainable outcomes be achievable. I believe this requires a move to a new democracy – from the politics of self-interest to the politics of generosity, where there is understanding of 'enough' and commitment to satisfaction of the *needs* of all (human and nonhuman) before satisfying the *greeds* of a few [19].

Acknowledgement

I warmly record debts of gratitude to my friend and colleague Bossel [20], the source of much of the theoretical material presented here, and to my wife and helpmeet, Katherine Peet, for continually helping me understand the Big Picture.

References and Notes

1 Hinterberger, F., Luks, F., Stewen, M. and Van der Straaten, J. (2000) *Int. J. Sustainable Development*, Vol. 3, No. 3, pp.276–296.

2 Norgaard, R.B. (1994) *Development Betrayed: The End of Progress and a Coevolutionary Revisioning of the Future*, Routledge, London.

3 Max-Neef, M.A. (1991) *Human Scale Development: Conception, Application and Further Reflections*, The Apex Press, New York and London.

4 Each Need occurs at four different levels of activity: *Being, Having, Doing* and *Interacting*.

5 Else, A. (1996) *False Economy*, Tandem Press, Auckland.

6 Hatfield Dodds, S. (1999) 'Paradigms for sustainability: consumerism, well-being, and the social space, in Grounding the Paradigm: *ANZSEE National Conference*, Griffith University, Brisbane, 5–7 July.

7 Rev Maurice Manawaroa Gray, Upoko, Te Runaka ki Otautahi o Kai Tahu, private communication.

8 Bossel, H. (1998) *Earth at a Crossroads: Paths to a Sustainable Future*, Cambridge University Press, Cambridge, UK.

9 Bossel, H. (1999) *Indicators for Sustainable Development: Theory, Method, Applications. A Report to the Balaton Group*, International Institute for Sustainable Development (IISD), 161 Portage Avenue East, 6th floor, Winnipeg, Manitoba, Canada R3B 0Y4. (ISBN 1-895536-13-8).

10 Peet, J. and Bossel, H. (2000) 'An ethics-based system approach to indicators of sustainable development', *International Journal of Sustainable Development*, Vol. 3, No. 3, pp.221–238.

11 Note that these refer, respectively, to the Existence, Effectiveness and Security basic orientors. If life itself is severely at risk, even the fundamental Basic Orientors have a priority ranking, in order to preserve the system. Normally when dealing with complex systems, things are not quite so critical, and the requirement is to satisfy all basic orientors simultaneously, with priority given to those that are in deficit.

12 This process has been examined in more detail in Chittenden, D.M. (2000) *System and Human Needs: Comparative Analysis of a Systems Framework for Finding Indicators for Sustainable Development with a Theory of Fundamental Human Need*, ME Thesis, University of Canterbury, Christchurch, New Zealand.

13 Peet, J. (1992) *Energy and the Ecological Economics of Sustainability*, Island Press, Washington DC.

14 Costanza, R., Cumberland, J., Daly, N., Goodland, R. and Norgaard, R. (1997) *An Introduction to Ecological Economics*, CRC Press (St Lucie Press), Boca Raton, Fla. USA.

15 Robertson, J. (1997) *The New Economics of Sustainable Development: A Briefing for Policy Makers*, A Report for the European Commission, May. (Downloadable from the Turning Point 2000 website www.the-commons.org/tp2000)

16 Diesendorf, M. and Hamilton, C. (Eds.) *Human Ecology, Human Economy. Ideas for an Ecologically Sustainable Future*, Allen & Unwin, Australia.

17 Edwards-Jones, G., Davies, B. and Hussain, S. (2000) *Ecological Economics: An Introduction*, Blackwell Science, UK.

18 Daly, H. and Farley, J. (2003) *Ecological Economics: Principles and Applications*, Island Press, US.

19 Peet, K. and Peet, J. (2002) 'Stolen from future generations? The need to move to a political economy of generosity', *ANZTSR (Australia and New Zealand Third Sector Research) Conference*, Unitec, Auckland, 27–29 November.

20 Bossel, Prof em Dr Hartmut, Center for Environmental Systems Research, University of Kassel, Kurt-Wolters-Straße 3, D-34109 Kassel, Germany. Corresponding address: Am Galgenkoeppel 6B, D34289 Zierenberg, Germany. E-mail: h.bossel@t-online.de.