

# Seeking sustainability

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## Abstract

Sustainability is a complex and subtle objective, the achievement of which will usually not be obvious. It is suggested that it may be better to think of seeking ways to avoid unsustainability.

This could be achieved in terms of the two main measures which characterise sustainability, viz., the shortage of the requisite source materials – which in some instances may be limited by the rate at which they are replaced in natural processes, and the presence of wastes and their serious effects – which might be related to whether they are disposed of directly to the environment or treated locally.

Achieving community-wide sustainability is usually difficult as it involves many decisions at the human level and associated complex decisions at the technical and economic level. While international trade and aid both may assist in promoting sustainability, ultimately the level achieved depends on direct and indirect personal choices which in turn partly depend on the religious and world views of the community.

## Key words

sustainability, resources, materials, wastes

## Sustainability

### Definition

Sustainable life on earth involves the exploitation of some of the earth's resources to live in the present and choosing to conserve some for future use. Sustainability has therefore been defined as an approach which:

... meets the need of the present without compromising the ability of future generations to meet their own needs.

Bruntland 1987

... would seek continuing improvements in the present quality of life at a lower intensity of resource use, thereby leaving for future generations an undiminished stock of productive assets (i.e., manufactured, natural and social capital) that will enhance opportunities for improving their quality of life.

Munasinghe 2001

In technical terms, seeking sustainability is then the 'objective' of an 'optimisation' procedure.

### **Steps in exploitation and conservation**

We can envisage the steps in the exploitation and conservation of earth resources as:

(i) Identification of the needs or wants (the *desires*) by the individual or society. There is a vast range of desires from vital 'needs' (cure for many diseases) to trivial 'wants' ('n' different flavours of ice-cream where 'n' is a large number). The decision that society ought to fulfil any or all of these, usually without consideration of the cost at that stage, is crucial to the process of seeking sustainability. It therefore needs wide-ranging ethical reflection but this is not considered further in this paper.

(ii) Choice of product, output, process or stream (the *product*, which is able to meet the desires) and the market in which they can be sold.

(iii) Identification of the various (or alternative) technological processes and of the associated inputs and outputs to produce the products (the *processes*).

(iv) Evaluation of the direct and indirect costs and benefits of production, ownership and use associated with the products (*costs and benefits*), viz.:

- environmental
- economic
- social

(v) Making a decision on the viability of producing the product and the choice of the most sustainable combination of processes by determining the minimum environmental + economic + social cost. The choice to be placed on these individual costs and benefits is (partly at least) an ethical decision which will be determined by our theological/world view.

### **Sustainability in the technological system**

One way to understand and promote sustainability is first to consider how the lack of sustainability will appear in the technological system and in society.

The two major issues that usually appear, when sustainability is lacking, are associated with:

- source materials - deficiency in quantity and supply rate
- waste materials - their presence and effect

Source materials may of course include products or wastes from previous processes.

### **Source materials**

We can identify a small number of these 'source materials' that are the building blocks of our physical life and inputs to the technological system. These include:

- energy
- minerals
- water
- atmosphere
- organic soil
- vegetation
- animals

It is understood that these materials are themselves combinations of more fundamental source materials, for example,

- organic soil as minerals and plant materials, etc.
- vegetation as minerals, water and light energy etc.

At the most fundamental level the source materials are 'matter' and 'energy'.

### **Quantity**

Life is maintained by the natural or human manipulation of these materials. It is the scarcity of them and their derivatives in place and time, and our inability to find suitable substitutes when needed, that reveals one of the unsustainable aspects of our life.

If it is argued (Hore-Lacy 2006) that source materials (or alternatives) are abundant on a world scale then it follows that, if there is a scarcity, this is either (or both):

- a 'local area' problem that arises because of special local conditions
- a 'temporal' problem that arises because of special temporary or more permanent rate of supply limitations.

It is also usually argued or implied that, if the area of need is large enough, the time period is long enough or the need is severe enough, the problem will reveal itself in economic terms. Hence the free market will eventually come in to meet that need by finding, purchasing, or making more of the traditional material or substitutes. This process may of course be too slow to avoid people / industry / institutions / communities getting hurt financially, physically or emotionally - or all of the foregoing.

### Rate of supply and demand

As suggested above many of the limits in regard to source materials are not limits in total quantity available but in the rate that they are available at the point of use. Their availability at a sufficient rate to meet the demand is, for some materials, related to their natural rate of replacement. These rates for the main source materials are suggested in Table I.

Source materials	Not replaced	Slow replacement	Variable replacement	Cyclical**, unstored
Energy	Hydrocarbons*	Bio-mass	Bio-mass	Solar radiation Light
Minerals	Ores			
Water		Ground water Polar ice caps	Surface water	Rainfall
Atmosphere	Nitrogen	Oxygen Carbon dioxide		
Soil	Minerals	Chemicals	Structure	
Vegetation		Organic matter Trees, etc	Grasses	
Animals		Farmed	Natural (wild)	

**Table I**

\* It is considered that hydrocarbons are not replaced in the present time scale.

\*\*Cyclical may be daily, seasonally, etc.

It should also be emphasised that many of the natural replacement processes are highly variable, particularly where their average value is low. A common example is in low rainfall areas where rainfall is often very variable and hence the resultant replacement of native vegetation and animals will also be highly variable.

The highly variable values are significant where consumption, for at least a period of time, is at a higher rate than the replacement can occur. In effect, we begin to 'mine' the materials in the sense that we are consuming what may only be replaced over long periods. Examples include soil organic matter, ground-water, timber, wild animal and fish stocks, etc.

In general, variability in the supply of materials may also be subject to long-term cycles or 'permanent' changes. Hence the level of sustainable consumption will be difficult to determine, particularly in areas of growing

demand due to increasing population and increasing per capita consumption.

## **Wastes**

Wastes occur because all processes which create a product (and many natural processes) also create undesired but inevitable wastes — representing what is not immediately useful.

Wastes become evidence of unsustainability when they are 'noticed' and their effects are the cause of undesirable:

- sensory or aesthetic 'pollution' (for example, bad smells!);
- actual or potential change or damage to natural processes (for example, solar radiation and global warming).

There may also be other aspects of waste which are not necessarily or immediately noticed but may be highly significant in the long term.

The major significance of the wastes is how and where they are disposed of and how this disposal is costed. For example, they may be

- disposed of at no (apparent or immediate) cost to the producer into 'the environment' (the commons) where the depositories and the resulting 'problem' (if it occurs) may be:
  - confined or local – for relatively immobile wastes in confined depositories – earth or water-ways.
  - unconfined or global – for highly mobile wastes in the two main unconfined depositories – atmosphere or ocean.
- treated, stored or reprocessed locally with the cost included in the price of the product or process.
- by a combination of the above.

Wastes were, in the past, more easily dealt with because they were based on less toxic materials and sources were small and diffuse. As demand for more and more complex products increased, production became more concentrated and local waste disposal became more of a problem particularly for small mobile sources such as motor vehicles.

More formal and technically sophisticated methods of treatment and / or disposal were then necessary and were essential, particularly in the developed world.

In summary then, sustainability will be achieved when, in the long-term, there is a sufficient supply of source materials and a careful management of the wastes. Where source materials which are consumed are finite there will ultimately be the need for replacement of these by alternatives. This in turn will require the timely investment and development of the appropriate technologies. Alternatively, society may decide to forego some products in the interests of conservation of source materials and minimisation of the quantity and danger from the wastes.

## **Change in technological system**

It appears that many of the unsustainable aspects of our technological system are brought about by change and the introduction of new products, by increased consumption and by new processes that are developed to produce existing products. They are also brought about by the increased demand for materials and increased wastes associated with increased consumption due to increased population.

Other, perhaps more desirable, changes are brought about by the desire to reduce human labour and to become more efficient or sustainable in energy or other terms.

It is usually claimed there is enough 'capacity' and 'flexibility' in the technological system and in the community for impending changes and any associated 'problems' to be foreseen and the necessary innovation to take place to overcome or avoid them.

This may, in principle, be true but there are many examples where the technological system does not appear to work in that way or sufficiently quickly to prevent further damage to the local or global environment or suffering to innocent people. This may be because the damage occurs slowly and only becomes obvious after a period of time (for example, soil salination or acid rain).

However these changes are judged, it is certain that the question of sustainability is dependent on human choices that are individually and collectively made and these are determined, partly and perhaps unconsciously, by our theological or world view.

## **Sustainability as an objective**

As change takes place and new products and processes are introduced, seeking sustainability is, as noted above, the process of seeking the maximum benefit from these product choices and the minimum cost of the technical processes which produce them.

Thus sustainability may be spoken of as a single objective

- in a personal ethical sense in which individuals seek to live in what they perceive is a more sustainable manner.
- in a community philosophy in which the community decides (through international agreements, national governments laws, community pressure, etc.) to organise its products, its source materials and technical processes to operate in what it perceives is a more sustainable manner.

## **Personal level**

Any consideration of a community will quickly show that there is a great variation in the way individual people live with respect to sustainability, as seen by the products and the technological processes which they choose. For example, the types and sizes of cars people drive, and more generally

how they travel, will represent a range of sustainabilities, even if the methods are not chosen for those reasons. Notwithstanding the commendable interest in sustainable issues, one only has to look at the advertisements for motor cars, mobile phones or hair shampoo to see how manufacturers use glamour, style and novelty to promote the new model to the consumer.

All of the individual decisions usually have a significant technical component and the sum of the benefits and the costs of these will affect the sustainability of the life of the community.

One or two generations ago there were fewer formal community restrictions on individual actions. There were however many economic limitations but, within these, people were free to live without consideration of the effect of the sum total of every-ones actions on their life styles.

For example, the public relations blurb for a large Australian agricultural machinery factory complex (post WWII) shows it unashamedly belching out black smoke. The unstated message was – this factory is productive, good, busy, building useful and necessary machines (and they were!); so – buy our machines (and we did, the smoke notwithstanding!).

### **Community level**

A community or nation might decide that it will be pro-active and not allow the laissez faire attitude to the technological processes to determine many aspects of society. This is true especially where the dis-benefits are obvious and people suffer pain or economic loss. Hence society may impose limitations on some products and processes, control the form of inputs and require the reprocessing of wastes.

The need for such controls has grown in recent years as both population and the demand for goods and services on a per capita basis has increased and better knowledge of the wider effects of wastes has been obtained. Restrictions range from the prohibition of emissions into the atmosphere and into rivers to the compulsory fitting of seat belts and child restraints in motor cars; from restrictions on water use to the requirement for improved energy consumption in new houses and domestic appliances.

### **Making choices**

Many of the decisions to move to what are more sustainable processes are fairly obvious with positive benefits clearly outweighing the 'costs'. In these situations the extra costs are willingly born because the actual and potential dis-benefits are large and/or severe.

One example was the prohibition of the use of fluorocarbon propellants in spray cans, which destroyed the ozone layer and had potential to cause skin cancers. This prohibition occurred where a suitable alternative was available at little or no extra cost or inconvenience and was adopted without serious dissent.

However, many other choices involve a decision, not between alternatives which are black and white, but between alternatives which are various shades of grey. For these latter there is no clear cut technical reason or moral principle which can be used to provide or perhaps even guide the decision. There might also be conflicting principles.

Many choices are based on personal preference in which people of goodwill may disagree about what should or should not be done. If there is a difference in cost they will maintain this can be justified on the basis of the extra benefit — as seen from their point of view. They claim that they would save in other ways and so justify their 'extravagance'.

An example is the planting of exotic or native trees and gardens in community areas where the need to water the former might be necessary. It is difficult to envisage making general comments about issues such as these – certainly not moral ones – except the obvious desirability of minimising water consumption or on the desirability of giving way to others on the 'do unto others ...' principle.

## **Sustainability in a variable world**

### **Variability**

Where the availability of source materials and their properties vary in time and place, as they frequently do, we may only be able to speak of sustainability over a limited area and/or for a limited time. For example the seasonal and yearly variability in both quantity and timing of rainfall makes decisions on sustainable processes that rely on rainfall, such as agriculture, highly problematic. Also the local variation in time and place of the properties and nutrient status of the soil and of the presence of pests and diseases also requires a constant search for appropriate processes if sustainable production is to be maintained in the long term.

Useful general principles may be developed, for example for water use, including:

- seek alternative sources for the scarce material – use ground water.
- produce alternative products that use less of the materials – grow dry-land crops or use waste water from other processes.
- abide by the conciliator's decision that seeks partial solutions that will meet competing demands. For example, the current Murray-Darling management plan seeks to satisfy ecological, agricultural and township needs.

Where the disposal of wastes impose a limit on sustainable production in one area, alternative production methods or alternative disposal methods may be necessary. Where the sources of the wastes are relatively diffuse and inherently mobile, such as greenhouse gases from humans and animals, disposal to the atmosphere is the default method. Where domestic and industrial production create concentrated sources, alternative depositories or treatment methods may be necessary.



There are also many such conflicts of this type with respect to the many different waste depositories. Useful general principles that may be developed include:

- seek alternative processes that produce less waste;
- recycle wastes to other products;
- avoid highly intense point sources where waste is generated, although these may be more efficient and productive in other terms.

### **Impediments to adoption of sustainable technical processes**

There are a number of reasons why the ideal, rational choice of the most sustainable technological process is not chosen and the process of seeking sustainability does not work perfectly.

At the *human* level, people are not morally perfect and individual and group human greed that benefits from existing systems, prevent the necessary changes for the common good from occurring.

At the *economic* level economic forces that would promote change to more sustainable processes can be circumvented by trading restrictions, price fixing, etc.

At the *technical* level, the development of new sustainable processes may take longer than anticipated and bring unexpected and unacceptable changes.

At the *financial* level, change requires increased capital that may not be available or be too expensive.

At the *social* level, the fear of new, unknown technology mitigates its adoption.

'Risk aversion' is crucial to personal, family and commercial well-being and survival in many developing situations. This may convince people that they should not adopt new processes for fear of future harm if the problems with the new technology cannot be overcome and failure of the new system could be financially threatening. The question of the use of nuclear fuel for the 'sustainable' production of electrical energy is a current illustration of this dilemma.

None of these are, of themselves, sufficient to totally stop technological change but they do distort and limit the process and its rate of adoption. Often a limitation at one level prevents development at other levels. In the modern technological system the problem of variability in source materials (and in product) in both time and place is usually solved in one (or both) of two ways, viz., trade and aid. The point in both is that they make it possible for the two parties to be more sustainable.

## Trade

It is clear that all sectors of society (modern and traditional, personal and corporate) operate on the basis of trade in materials, services or products generally between a willing seller with something to sell and a willing buyer with a desire to buy it.

Trade is therefore a universal and well understood aspect of seeking sustainability because it enables people, communities and countries to exploit their advantages and reduce their disadvantages, ideally to the benefit of both parties. As Grotius writing in the early 17<sup>th</sup>C says:

God Himself says this speaking through the voice of nature; and inasmuch as it is not His will to have Nature supply every place with all the necessaries of life, He ordains that some nations excel in one art and others in another. Why is this His will, except it be that He wished human friendships to be engendered by mutual needs and resources, lest individuals deeming themselves entirely sufficient unto themselves should for that very reason be rendered unsociable? So by the decree of divine justice it was brought about that one people should supply the needs of another...

Grotius 1609

This is not to say that all trade is necessarily good. That will of course depend on the nature and use of the products being traded and their costs and benefits as identified and discussed above.

Further, sustainability is usually not achieved in countries which are 'poor' in source materials or which lack the necessary processes to add value to the materials which they do have. They may however be 'rich' in low paid labour and can produce simple low cost products, although the impediments mentioned above may seriously limit international trade in these and so limit the move to sustainability.

Developed countries can limit trade and moves towards global sustainability by using new industrial materials (e.g. plastics), large capacity machines and sophisticated manufacturing processes (e.g. with robots) that allow them to produce their own products and so reduce their trade in low cost products from developing countries.

However developed countries may also promote sustainability by importing products which can be produced by semi-skilled labour and by themselves producing more highly complex products which can be traded for the former.

The products we trade and the terms we offer therefore have a significant effect on sustainability on an international and global scale. In the traditional sector, trade in the form of barter is a common and obvious way of achieving sustainability without involving the middleman and transport costs associated with a market economy.

This illustrates that part of the problem with trade in the modern world is not so much the cost of the product but the cost of the transport of the

product. Many affluent consumers are prepared to pay part of the cost of transporting products across the country or around the world; the remainder of the cost (for example, the cost of emitting the greenhouse gases to the atmosphere) is externalised by not including it in the price of the product. For others, terms such as 'food miles' are increasingly being used to express a general measure of the environmental cost of trade in food and other consumer goods.

Again our world view and our theology will moderate our own desires and allow us to consider the needs of others.

## **Aid**

In seeking sustainability a common supplement or alternative to 'trade' is 'aid' or a combination of the two. Aid has a long and honourable history arising as it does from the feelings of kinship within and between family, clan, race, religion, national and international members. It is given for various reasons, some of which benefit the donor as well as the recipient and often leads to development that later leads to trade.

Short term aid can be highly beneficial in solving severe material and product shortages that arise due to the variability in natural conditions (e.g. drought, fire, flood) and other human problems such as war. However, if continued in the medium or long term, such aid can have detrimental effects on the local economy by undercutting local traders. This can promote an unhealthy dependence and so reduce local sustainability rather than promoting it.

Giving aid in the form of 'food for work' in lieu of money bypasses corrupt national governments and promotes productive community development and hence sustainability. Longer term aid particularly directed at the development of infrastructure, facilities and education can be targeted at a level and in a way which avoids these problems and leads to more sustainable life styles.

## **Drivers for sustainability**

### **Socioeconomic differences**

Sustainability, as defined above, is an essentially secular, value free objective. One can, ideally at least, seek it without the motivation or the methodology of the search being based on any particular religious or world view.

Generally the reason for a personal interest in 'sustainability' is that we believe that it is somehow in our, or the community's short or long term best interest, that we do so as long as it is informed by good technical, economic, social judgements. In this way we will avoid more dangerous occurrences and expensive solutions for us or for our descendants.

Indeed one can imagine an ideal, tropical island totally isolated from others where a simple nomadic or peasant life has continued in a

sustainable manner for many generations. The overall society would have become sustainable by evolving to live within the prevailing circumstances even though these may have changed from year to year or generation to generation.

However, such a situation is not typical of our modern world where we have a wide range of personal, community and national conditions based on historical, geographical, climatic and anthropological circumstances. Developments over the centuries have reduced some of these differences for some people but have increased them for many others. One of the results is that, unlike the tropical island, our society has within it a vast range of socioeconomic differences, life styles and levels of consumption. There is an equally vast range of sustainabilities within which all of us find ourselves, our community and our country.

However we will not find the imperative for this more sustainable development and for the associated national and personal lifestyle compromises within the secular socioeconomic-technical field. They only answer the question 'How could we be more sustainable?' We need to seek an answer to the question 'Why should we be more sustainable particularly when it affects others on a world scale?'

### **The Christian imperative**

Overlying this complex rational world has also been the revelation (or the development) of a 'religious' view of life. The revelation which has formed the Christian world view informs us that we live in a world rich in resources not of our making and socioeconomic conditions that provide many of us with pleasant and fulfilling lives. It also informs us that in some respect we are stewards of this world and as such we are responsible for its care and maintenance but also for the welfare of our fellow human beings.

If, on the basis of this view, we believe that we ought to live sustainably then we cannot also avoid the conclusion that this search cannot be for sustainability just for 'me', 'our group' or 'my nation'. This search must be within parameters that take account of the poor and needy of the world who will be little helped however successful our search for personal or national sustainability is for me or us.

For the Christian, the authority of the Scriptures in relation to stewardship will (ought to) provide the necessary imperative for us to promote sustainability. Others, who would not necessarily accept their authority, nevertheless argue and work toward a similar end. The ethical issues need to be clarified and the boundaries of our seeking widened to encompass all who live in need and in technically and ethically unsustainable situations.

Having made that assertion, we need to recognise the difficulty of interpreting these ideas and applying them to promote sustainability in a modern, scientific, industrial and largely secular society.

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