



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

ECONOMICS, ECOLOGY AND THE ENVIRONMENT

Working Paper No. 187

**Sustaining Economic Development and the
Value of Economic Production: Different Views
and Difficult Problems**

by

Clem Tisdell

December 2012



ISSN 1327-8231

**WORKING PAPERS ON
ECONOMICS, ECOLOGY AND THE ENVIRONMENT**

Working Paper No. 187

**Sustaining Economic Development and the Value of
Economic Production: Different Views and Difficult
Problems¹**

by

Clem Tisdell²

December 2012

© All rights reserved

¹ This is the revised notes for the second of five guest lectures given in the School of Life and Environmental Science at Minzu University of China, Beijing in October, 2012. I wish to thank Professor Dayuan Xue for inviting me to give these lectures.

² School of Economics, The University of Queensland, St. Lucia Campus, Brisbane QLD 4072, Australia
Email: c.tisdell@economics.uq.edu.au

The *Economics, Environment and Ecology* set of working papers addresses issues involving environmental and ecological economics. It was preceded by a similar set of papers on *Biodiversity Conservation* and for a time, there was also a parallel series on *Animal Health Economics*, both of which were related to projects funded by ACIAR, the Australian Centre for International Agricultural Research. Working papers in *Economics, Environment and Ecology* are produced in the School of Economics at The University of Queensland and since 2011, have become associated with the Risk and Sustainable Management Group in this school.

Production of the *Economics Ecology and Environment* series and two additional sets were initiated by Professor Clem Tisdell. The other two sets are *Economic Theory, Applications and Issues* and *Social Economics, Policy and Development*. A full list of all papers in each set can be accessed at the following website: http://www.uq.edu.au/economics/PDF/staff/Clem_Tisdell_WorkingPapers.pdf

For further information about the above, contact Clem Tisdell, Email: c.tisdell@economics.uq.edu.au

In addition, the following working papers are produced with the Risk and Sustainable Management Group and are available at the website indicated. *Murray-Darling Basin Program, Risk and Uncertainty Program, Australian Public Policy Program, Climate Change Program* :<http://www.uq.edu.au/rsmg/working-papers-rsmg>

For further information about these papers, contact Professor John Quiggin, Email: j.quiggin@uq.edu.au

Sustaining Economic Development and the Value of Economic Production: Different Views and Difficult Problems

ABSTRACT

Indicates some of the different concepts of sustainable economic development and raises queries about how much present generations are concerned with future generations. A variety of conditions (ranging from very weak to very strong) have been suggested for achieving sustainable development. These are outlined. The prospect that the accumulation of man-made capital may result in unsustainable economic development is discussed and the welfare consequences of the conversion of natural capital are considered in a historical context. This leads on to a discussion of different types of capital: man-made and natural. Division of the total stock of capital into these categories is now common. However, there appears to be a gap because heritage capital (for example, varieties of crops and animals developed by human interference in nature) do not fit well into this framework. Some reasons why economic production may not be maintained or maximised are considered. They include the presence of externalities, open access to resources and the presence of public goods and bads. It is pointed out that it is undesirable to sustain everything, including all industries. While it might seem appealing to seek sustainable strategies that satisfy multiple criteria (such as economic viability, political and social acceptability and ecological sustainability), it is possible that such strategies rarely exist, if at all.

Keywords: Concern for future generations, externalities; heritage capital, human capital, man-made physical capital, multiple objectives for sustainability, open-access resources, public goods and bads, sustainable development, sustainable economic activities.

JEL Code: Q01

Sustaining Economic Development and the Value of Economic Production: Different Views and Difficult Problems

1. Introduction

The question of whether continuing economic growth can be sustained and how it can be made to last has become an international political issue and a subject for scholarly debate (see Tisdell, 2012b). The purpose of the first part of this article is to discuss some of the concepts of sustainable development, outline different views of scholars about how it might be achieved and to specify the types of resources (especially the types of capital) which are needed for its realization. The second part of the paper identifies and discusses phenomena that can reduce the sustainability of economic activities; considers whether it is desirable to sustain all industries and economic activities; and examines the view that the sustainability of economic activities requires multiple criteria (objectives) to be satisfied, for example, the simultaneous achievement of economic viability, social (and political) acceptability as well as ecological sustainability.

2. Some Concepts of Sustainable Economic Development

There are many different concepts of sustainable development, including sustainable economic development. Basically, however, sustainable economic growth is economic growth that lasts. The World Commission on Environment and Development (1987, p. 43) suggested that sustainable economic development is development that meets the needs of present generations without compromising the ability of future generations to meet their needs. However, it is not exactly clear what this means because there is no specification of what needs are to be met.

Another point of view is that sustainable economic development is development that ensures that the per capita income (or welfare) of each succeeding generation is not less than that of its predecessor (Pearce *et al.*, 1989). A further idea is that sustainable development is development that maximises the possible span of existence of mankind. Whatever view is adopted, it involves some value judgments about what is desirable, for example, to what extent the immediate economic interests of present generations should be sacrificed to benefit future generations. Furthermore, should only the interests of human beings count in deciding

what types of economic development are desirable? Some scholars believe that humans have a duty to try to conserve biodiversity independently of what individual human beings want.

No matter what view of sustainable economic development is adopted, all imply that mankind needs to be mindful of the **future** economic and other consequences of today's economic decisions. This includes the implications for **future** economic growth and welfare of increasing current economic growth. This is probably the main message from the debate about sustainable development.

It is often said that current generations should be careful not to impoverish future generations by their decisions about economic growth. This raises the question of how concerned current generations **should be** for the welfare of future generations. Further issues include

- (1) The extent to which current generations are **actually** concerned about the welfare of future generations and
- (2) The extent to which it is practical (given knowledge limitations) to be concerned about the welfare of far-off generations.

David Pearce(1998, pp. 70-71) has suggested that each generation is basically only concerned with its own welfare, that of its children and possibly its grandchildren. Probably the actual span of concern of an individual for the future is about 80-100 years and no longer. Each generation, however, will have a similar concern. Therefore, there is some ongoing (serial) concern for maintaining the welfare of future generations. However, it is by no means clear that decisions by individual families to sustain the welfare of their offspring will result in the best collective outcome. Families are generally only in a direct position to supply private goods to their offspring but the welfare of future generations also depends on the availability of collective goods (public and mixed goods), the supply of which must be assured by the state.

The co-efficient of concern of each generation appears to be highest for itself, still quite high for the next generation, somewhat lower for the subsequent generation, and for additional generations probably approaches zero quite quickly. However, we do not have enough empirical evidence about this. In addition, current generations may also have concerns for the

welfare of previous generations, in particular their parents and grandparents. This may, for example, be important in Asian societies influenced by Confucian philosophy. However, these concerns may now be weakening as a result of economic change. Concern for preceding generations complicates the way in which the welfare of different generations is interdependent.

3. Conditions Required for Sustainable Development

A variety of opinions exist about what conditions are required to ensure sustainable development. These range from very weak conditions on the need to conserve natural resources and environments to extremely strong conditions. Very weak conditions are associated with economic growth optimists. They believe that there is no need to restrain the accumulation of man-made capital and that increased accumulation of this capital will benefit future generations. They support 'business as usual'. This accords with the perspective of Karl Marx and the implications of economic growth theories developed in the 1950s. A slightly weaker form of this view suggests that it is desirable to develop technologies for supplying energy from non-fossil sources, for example, solar power, wind power etc. However, it still remains supportive of accumulating man-made capital in order to benefit future generations.

On the other hand, those who advocate strong conditions for achieving sustainable development want to limit the accumulation of man-made capital in order to conserve natural capital (resources) to benefit future generations. According to this point of view, man-made capital 'destroys' natural capital because it converts natural resources into man-made commodities. If this continuing conversion continues unabated, natural resources will become scarce and economic production and welfare will suffer.

The range of these differing views is summarised to some extent in Figure 1. In this illustration, dark green conservationists are at the opposite end of the spectrum to growth optimists. Basically, dark green conservationists want no interference with nature. Neo-Malthusians support a strong position in relation to the need to conserve natural resources in order to ensure sustainable development but usually not the extreme position of dark green conservationists.

At least up to the present, the accumulation of man-made capital and the reduction in natural resource stocks appears to have added to the welfare of mankind. However, if this transformation process continues, the worry is that the dwindling stocks of natural resources might reduce human welfare and result in the reduced ability to accumulate more man-made capital. The latter can be expected because the natural resources required for conversion to man-made capital become increasingly scarce.

This relationship is indicated in Figure 2. On the left-hand scale, the quantity of available natural resources is shown and on the right-hand scale economic welfare per capita is measured. Assuming that capital accumulation (and economic production) is a continuous process, the availability of natural resources declines with the passage of time and might follow a path like ABC. Starting from early civilisations, the economic welfare of human beings tends to increase initially and appears to have done so until now. But is this process sustainable? Is it possible that human welfare will be reduced in the future as a result of this economic transformation or conversion process? For example, the welfare relationship shown by curve DEFG in Figure 2 might apply. From early times until now (t_n), economic welfare has tended to increase as a result of the accumulation of man-made capital. However, at some time, in the future (for example, t_f), the process may no longer be capable of raising human welfare, and economic welfare might start to decline.

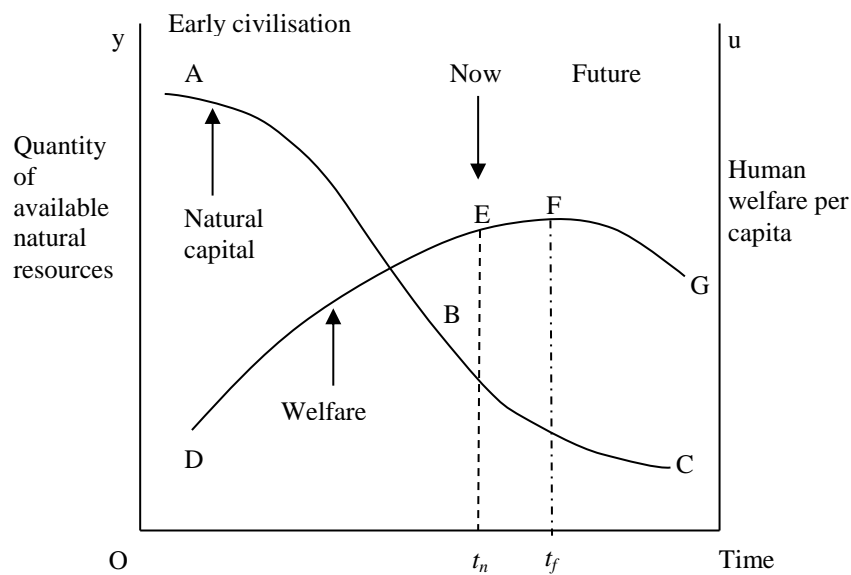


Fig. 2 Depletion of natural resources as a result of the accumulation of man-made capital and associated economic production may eventually make it impossible to sustain human welfare.

5. Different Types of Capital Contribute to Economic Production

Figure 3 provides an overview of different types of capital which together with labour make an important contribution to economic production. Three types of man-made capital are identified.

- (1) Man-made physical capital. This is mainly what I had in mind in discussing the transformation of natural capital into man-made capital.
- (2) Human capital. It incorporates measures of the knowledge, education and the health of a population.
- (3) Social capital. This includes investments in governance and institutions that help societies to function well.

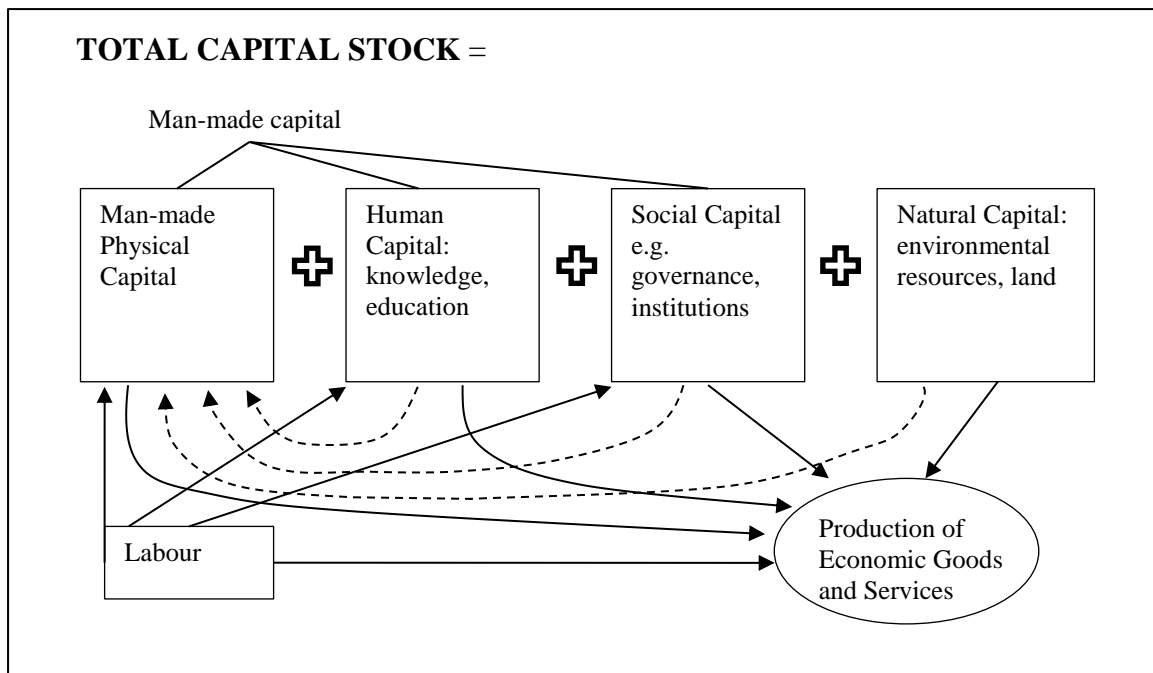


Fig. 3 Different types of capital which together with labour contribute to economic production.

Although the classification of the stock of capital shown in Figure 3 is usual in the current literature, it is not exhaustive because it does not include heritage-type capital. I have argued elsewhere (Tisdell, 2012a) that some components of biodiversity are heritage rather than natural capital. In this particular case, these valuable assets have been developed as a result of human intervention with nature. They are not natural in the sense that their existence required human interference with natural processes. They would (in all probability) not have existed in the absence of this intervention.

Natural capital consists of all natural and environmental resources and is drawn on in producing man-made capital, especially man-made physical capital. Labour is required for the production of man-made capital and to produce economic goods and services. An appropriate balance between all these forms of capital is needed if economic production is to be sustained. Neoclassical growth economists did not pay enough attention to the importance of sustaining natural capital in order to maintain economic production.

Some countries rely very heavily on the economic exploitation of their natural capital to achieve growth in their GDP. This is particularly so of some oil rich states. However, in the

very long run, this type of dependence is not sustainable. This is because these states are depending on the use of depletable and non-renewable natural resources for their economic growth. These countries need to develop more sustainable industries to ensure that their incomes are maintained.

Countries that rely on natural renewable resources face the same issue if they exploit these at a faster rate than their natural rate of renewal. Such resources can include forests and fisheries.

Some countries appear to have been very successful in utilising their natural resources to develop a more sustainable economy. Sweden seems to be a case in point. It used its iron ore sales and timber sales to add to its human and social capital and it practices sustainable forestry. It is not clear that all oil rich Middle Eastern countries will be able to achieve a similar outcome.

It should be noted that growth in Gross Domestic Product (GDP) is not a reliable indicator of increases in the level of economic welfare nor of its sustainability. Among other things, such growth may be based on unsustainable resource use. For example, if the economic growth of a country is highly dependant on the extraction and sale of non-renewable resources or if it relies heavily on the use of renewable resources but exploits these at a faster rate than their rate of renewal, the stocks of these resources will decline and could result in falling GDP in the future, unless alternative sources of income are found.

6. Reasons Why Some Economic Activities Result in the Value of Economic Production not Being Maintained

Various types of phenomena can cause the value of economic production to be lower than it could be given the resources used in the production process. In some cases, these factors can actually cause a decline in the value of economic production after a period of time. In the Western economic literature, these problematic phenomena are often said to be due to market failures. However, they are not confined to market economies and basically arise when some groups in society follow their own self-interest, ignoring the consequences of their behaviour for others. Unfortunately, such selfishness is quite common.

In this context, we shall consider how the following factors can become a problem for sustaining economic growth and maximising economic welfare. These are:

- (1) Unfavourable externalities, particularly unfavourable environmental spillovers from economic activities.
- (2) Open access to common property and failure to take adequate account of the user costs of resources.
- (3) The presence of pure public goods or public bads. This presence results in a fundamental conflict between personal self-interest and social self-interest.

Let us briefly consider each of these factors in turn.

7. Environmental Externalities or Spillovers

In Tisdell (2012b), I gave an example of an unfavourable environmental externality or spillover. In that case the run-off of nutrient-enriched water from the land into marine areas had a detrimental effect on fisheries production and some negative consequences for the recreational value of marine areas.

Environmental externalities from an economic activity may be favourable (positive) or unfavourable (negative). Those who engage in an economic activity that has favourable externalities confer an economic benefit on others for which they receive no economic payment or rewards. In most cases, they have no incentive to maximise the social economic benefit from their activity and it is under supplied from a social economic point of view.

By contrast, an unfavourable spillover occurs when an economic activity engaged in by one set of persons imposes a cost on others who are forced to bear this cost without payment from those causing the spillover. Hence, those responsible for these negative spillover costs do not take these into account in their decisions. Consequently, the level of their economic activity is usually greater than is socially desirable.

This can be illustrated by Figure 4. Assume that there are two groups in society, namely polluters and the victims of polluters. Line ABC indicates the marginal (added) economic

benefit that polluters obtain from being able to engage in the production of a product X which causes pollution. The amount of pollution rises as the quantity of X, x , increases. The marginal spillover costs imposed on those who are damaged by the pollution is shown by relationship ODBF. Until the level of production of X reaches x_0 , there are no spillover costs but after that, they rise at an increasing rate. Polluters have an economic incentive to increase their activity to level x_2 because they obtain increased economic benefits by expanding their production to this level. However, once they begin to produce more than x_1 of x , the total value of economic production falls because the extra costs imposed on victims exceed the extra economic benefits obtained by polluters. If production by polluters expands from x_1 to x_2 , the total reduction in the value of economic production is equal to the area of the hatched triangle BCE.

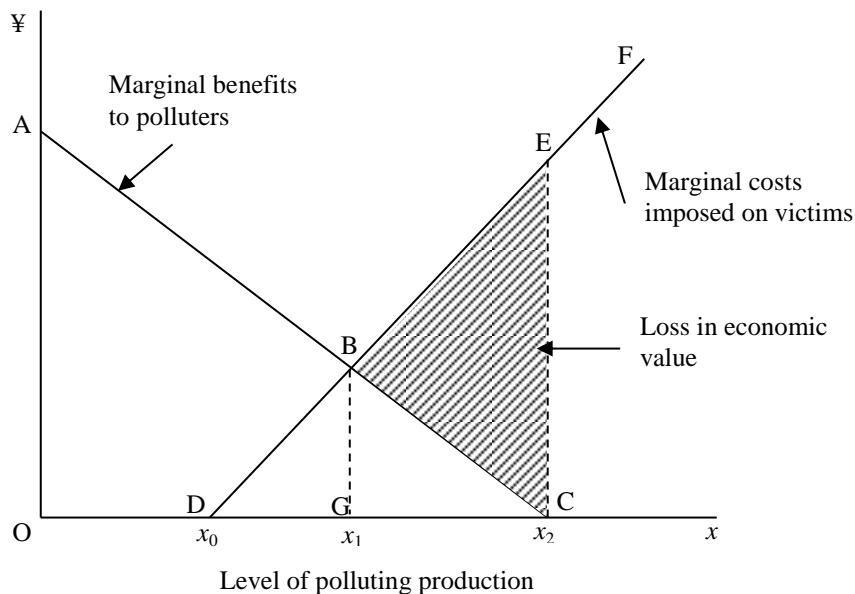


Fig. 4 An illustration that unfavourable environmental spillovers may reduce the economic value of production and result in a decline in the value of production.

It may be easier to grasp this problem by reference to Figure 5. There, curve OHJKL represents the total value of economic production associated with the production of X when its adverse externalities are taken into account. Point J corresponds to the value x_1 in Figure 4

and point K corresponds to x_2 in Figure 4. Clearly, the value of production is reduced if x_2 of X is produced. This problem can also be illustrated using the differential calculus.

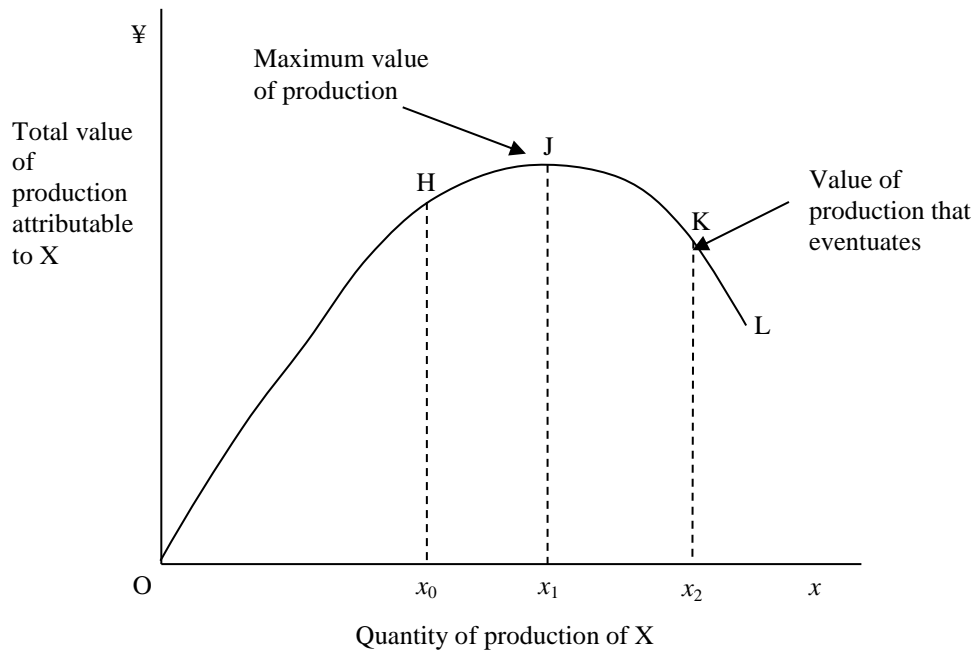


Fig. 5 A figure corresponding to Fig. 4 to illustrate that a negative economic spillover usually reduces the value of economic production to a level lower than that which is achievable.

It is estimated that China’s GDP is reduced each year by 4.5 to 18% by environmental damage according to the China Statistics Bureau (2010) as reported by Luo *et al.* (2012). Luo *et al.* (2012) report that in China “water pollution alone is estimated to cost between 0.6 and 4.5% of GDP, with estimates averaging around 1.7% and the cost of air pollution is similar (China Statistics Bureau, 2010)”. Therefore, the reported economic costs of pollution in China are considerable.

An interesting example of a positive environmental externality involves the planting of trees on heavily sloping land. China’s Department of Forestry subsidises the planting of trees by farmers on such land via its ‘Grain for Green’ Programme. It provides grain and cash to farmers who participate in the programme which also helps to relieve poverty. Some positive environmental spillovers from the programme include less erosion of hilly areas, less

sediment in streams and rivers with reduced sedimentation of dams, and some reduction in the likelihood of flooding because forest cover tends to reduce the rate of run-off of rain water.

8. Open-access or Common Pool Resources

When access to natural resources is open or relatively open, they tend to be used unsustainably if their use is profitable or if they yield a net benefit to their users. Consider the following examples:

- (1) Underground water supplies. If several users are able to access the same underground water and if its use results in a net economic benefit, they increase their use of this water. If it is being used for irrigation, the value of economic production rises. However, eventually the rate of use is liable to exceed the rate of replenishment of the water and production declines. This has become an important problem in China.
- (2) Open-access to fishing grounds results in greater effort to catch fish than is economic. At first with increased effort, yields are likely to rise but eventually yields fall below maximum sustainable yields and exceed maximum (sustainable) economic yields.
- (3) Open-access (unregulated access) to grazing lands can result in similar problems.

An additional problem that arises in the case of open-access resources is that each user takes no account of the consequences of their actions today for the supply of the resource tomorrow. They fail to take into account **user costs**.

Once users are allowed to use open-access resources to excess, it is very difficult for governments to impose policies to reduce their use of these resources because the incomes of their users may be low. Asking them to reduce their use will initially depress their already low incomes and is likely to result in political protest. For example, in the recent past, the Thai Government tried to increase the size of the mesh on fishing nets in coastal waters. Fishers protested by various actions, such as keeping their children away from school. The Thai Government could not proceed with the regulation.

Ostrom (1990) has pointed out that social or collective rules in some communities help to offset or avoid the negative consequences of open-access. However, as socio-economic conditions change and new technologies become available, such rules can become weakened or inappropriate because of altered circumstances (Tisdell, 2005, Ch. 6).

9. Problems Arising in the Case of Pure Public Goods and Bads

Public goods are goods that valued by all and which if supplied are available to all without individuals paying for them. Public bads affect all and no one can be excluded from their adverse consequences. For example, nearly everyone in China may enjoy knowing that many types of wild animals in China continue to exist. Their existence is a public good. However, climate change might be regarded by all Chinese as a public bad.

In the absence of government action, public goods are either not supplied at all or are under supplied when individuals or groups act according to their own individual self-interest. Public bads are insufficiently controlled or may not be controlled at all in the absence of government action.

This can be illustrated for public bads by using a simple matrix (see Table 1) of the type commonly used in the theory of games. Suppose that the members of a society can be divided into two groups, Group I and Group II. Each group has the choice of two alternative actions or strategies: (1) to engage in positive social behaviour or (2) to engage in anti-social behaviour. If both groups engage in positive social behaviour (e.g. do not litter, do not steal) each has a benefit of 10 units. On the other hand, if Group I adopts positive social behaviour and Group II opts for negative social behaviour, Group I gains a benefit equivalent to 4 units and Group II obtains 12 units. The outcome is reversed if Group I adopts anti-social behaviour and Group II adopts positive social behaviour. Whatever the other group does, the second group always gains more by adopting anti-social behaviour. But if each group follows its own self-interest in this way, each group only has a benefit of 3. Consequently, collective or social benefit is not maximised in situations like this if groups or individuals follow their own self-interest. In order to bring about the best social outcome, governments need to penalise those who adopt anti-social environmental behaviours.

Table 1 A matrix to illustrate a case of conflict between self-interest and collective interest.

		Strategies of Group II	
		β_1 Positive Social Behaviour	β_2 Anti-social Behaviour
Strategies of Group I	α_1 , Positive Social Behaviour	(10,10) [†]	(4,12)
	α_2 , Negative Social Behaviour	(12,4)	(3,3) [*]

† Optimal social outcome

* Equilibrium outcome if all follow their own self-interest

While the pursuit of self-interest does not always result in a negative social outcome, it does in situations like the above, which in the literature has been described as involving a prisoners' dilemma problem. In cases, like this, adequate social capital (e.g. governance, law and order) is needed to ensure a socially desirable outcome and sustain the value of economic production. While this can usually be achieved at the national level, it is more difficult to achieve at the international level because each nation guards its own sovereignty and its ability to act in its own self-interest. Consequently, many international environmental problems (such as global warming) are difficult to solve collectively.

10. It is Undesirable to Sustain Everything, Including All Existing Industries

Some writers seem to suggest that sustainability is always desirable. However, this is clearly not so. Value judgements have to be made about what it is desirable to sustain and what it is undesirable to sustain. Most would agree that it is undesirable to sustain germs that cause diseases in humans, for example, smallpox. It is undesirable to maintain poverty and the abuse of children and so on.

Furthermore, it is undesirable to sustain all industries. Depending upon technological progress and changes in demand, industries rise and fall. Social choices therefore, may be necessary about which industries to sustain and which should be allowed to be replaced by others.

11. Multiple Objectives for the Sustainability of Economic Activities

Several authors have suggested that multiple objectives have to be met if economic activities are to be sustainable. A common set of such objectives is

- (1) Economic viability
- (2) Social and political acceptability
- (3) Ecological sustainability

For example, growing millet in parts of Africa (and even China) might be ecologically more sustainable than growing corn (maize). However, consumers may prefer maize to millet and the growing of millet may not be economically viable. Only some of these objectives are met by growing millet.

While this approach brings attention to important issues, a problem is that none of the available alternative economic activities might be economically and ecologically viable forever and there may be differences of opinion about their social and political acceptability. The real world is very complex.

To be more specific, let A represent the set of strategies that are economically viable and sustainable, the set B delineate the set of strategies that are socially and politically acceptable and let C indicate the set of strategies that are ecologically sustainable. It could be that one or more of these sets are empty. Consequently, it is impossible to achieve the prescribed objective. Or one or more of these sets might be disjoint in which case the objective cannot be met. The situation illustrated in Figure 6 where all these sets overlap to some extent might be rare. Those strategies in the hatched area satisfy all the objectives.

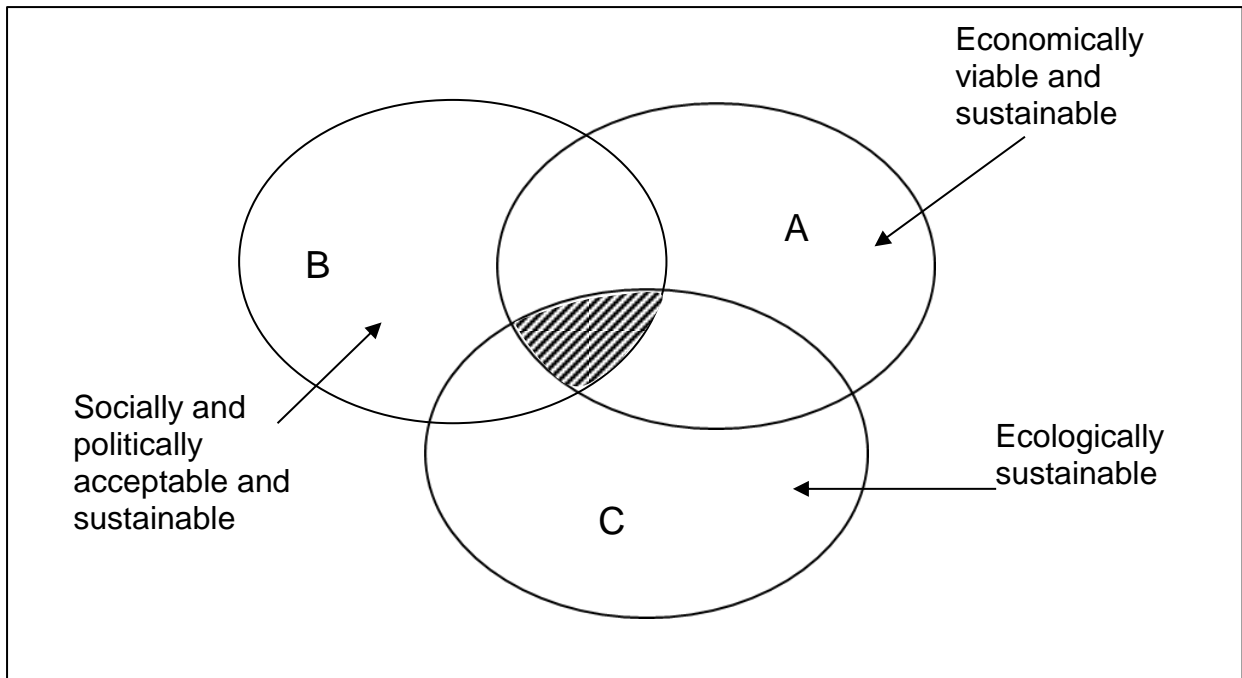


Fig. 6 It may be difficult or impossible to find strategies that satisfy multiple sustainability objectives. Pursuing this approach can be unworkable because of the absence of solutions.

12. Concluding Comments

In this paper I have explored broad views about what sustainable economic development is and different views about what is needed to achieve it. This enabled us to consider the types of resources which make an important contribution to economic production and its sustainability, for example, the role of man-made capital (physical, human and social) and natural capital in this process. The problem for sustainable development of the conversion of natural capital into man-made capital was given particular attention. In the second part of this article the effects which environmental spillovers or externalities can have on the level of production and its sustainability were covered. In addition, open-access to natural resources and the presence of public goods and bads were shown to potentially have negative effects on the sustainability of the value of economic activity.

It was also pointed out that it is not desirable to sustain everything. Furthermore, multiple objectives may need to be satisfied to ensure the sustainability of economic activity. It may however, be impossible to satisfy all of these objectives fully and none may be satisfied forever. Therefore, compromises seem to be unavoidable.

References

- China Statistics Bureau (2010). *Statistical Yearbook of China*. Beijing, China: Statistics Press.
- Luo, C., H. Liu, C. Lin and Y. Gao (2012). Challenges and prospects of socioeconomic development and environmental problems in China. *International Journal of Environmental Research and Public Health*, **9** (In press).
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.
- Pearce, D. (1993). *Blueprint 3: Measuring Sustainable Development*. London: Earthscan Publications.
- Pearce, D., A. Markandya and E.B. Barbier (1989). *Blueprint for a Green Economy*. London: Earthscan Publications.
- Pearce, D.W. (1998). *Economics and Environment: Essays on Ecological Economics and Sustainable Development*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar.
- Tisdell, C.A. (2005). *Economics of Environmental Conservation*. 2nd ed. Cheltenham, UK and Northampton, MA, USA.: Edward Elgar.
- Tisdell, C.A. (2012a). Biodiversity Conservation: Concepts and Economic Issues with Chinese Examples, *Economics, Ecology and the Environment*. 185. Brisbane: School of Economics, The University of Queensland,
- Tisdell, C.A. (2012b). The Nature of Ecological and Environmental Economics and its Growing Importance, *Economics, Ecology and the Environment*. 186. Brisbane: School of Economics, The University of Queensland,

WCED World Commission on Environment and Development (1987). *Our Common Future*.
Oxford: Oxford University Press.

PREVIOUS WORKING PAPERS IN THE SERIES ECONOMICS, ECOLOGY AND ENVIRONMENT

For a list of working papers 1-100 in this series, visit the following website:

http://www.uq.edu.au/economics/PDF/staff/Clem_Tisdell_WorkingPapers.pdf or see lists in papers 101 on.

101. Knowledge and Willingness to Pay for the Conservation of Wildlife Species: Experimental Results Evaluating Australian Tropical Species, by Clem Tisdell and Clevo Wilson, May 2004.
102. Antarctic Tourists, Wildlife and the Environment: Attractions and Reactions to Antarctica, by Clem Tisdell, May 2004.
103. Birds in an Australian Rainforest: Their Attraction for Visitors and Visitors' Ecological Impacts, by Clem Tisdell and Clevo Wilson, May 2004.
104. Nature-Based Tourism and the Valuation of its Environmental Resources: Economic and Other Aspects by Clem Tisdell, May 2004.
105. Glow Worms as a Tourist Attraction in Springbrook National Park: Visitor Attitudes and Economic Issues, by Clem Tisdell, Clevo Wilson and David Merritt, July 2004.
106. Australian Tropical Reptile Species: Ecological Status, Public Valuation and Attitudes to their Conservation and Commercial Use, by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, August 2004.
107. Information and Wildlife Valuation: Experiments and Policy, by Clem Tisdell and Clevo Wilson, August 2004.
108. What are the Economic Prospects of Developing Aquaculture in Queensland to Supply the Low Price White Fillet Market? Lessons from the US Channel Catfish Industry, by Thorbjorn Lyster and Clem Tisdell, October 2004.
109. Comparative Public Support for Conserving Reptile Species is High: Australian Evidence and its Implications, by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, October 2004.
110. Dependence of public support for survival of wildlife species on their likeability by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, October 2004.
111. Dynamic Processes in Contingent Valuation: A Case Study Involving the Mahogany Glider by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, November 2004.
112. Economics, Wildlife Tourism and Conservation: Three Case Studies by Clem Tisdell and Clevo Wilson, November 2004.
113. What Role Does Knowledge of Wildlife Play in Providing Support for Species' Conservation by Clevo Wilson and Clem Tisdell, December 2004.
114. Public Support for Sustainable Commercial Harvesting of Wildlife: An Australian Case Study by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, December 2004.
115. Endangerment and Likeability of Wildlife Species: How Important are they for Proposed Payments for Conservation by Clem Tisdell, Hemanath Swarna Nantha and Clevo Wilson, December 2004.
116. How Knowledge Affects Payment to Conserve and Endangered Bird by Clevo Wilson and Clem Tisdell, February 2005.
117. Public Choice of Species for the Ark: Phylogenetic Similarity and Preferred Wildlife Species for Survival by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, March 2005.
118. Economic Incentives for Global Conservation of Wildlife: New International Policy Directions by Clem Tisdell, March 2005.
119. Resource Entitlements of Indigenous Minorities, Their Poverty and Conservation of Nature: Status of Australian Aborigines, Comparisons with India's Tribals, Theory and Changing Policies Globally by Clem Tisdell, March 2005.
120. Elephants and Polity in Ancient India as Exemplified by Kautilya's *Arthashastra* (Science of Polity) by Clem Tisdell, March 2005.
121. Sustainable Agriculture by Clem Tisdell, April 2005.

122. Dynamic Processes in the Contingent Valuation of an Endangered Mammal Species by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, April 2005.
123. Knowledge about a Species' Conservation Status and Funding for its Preservation: Analysis by Clem Tisdell, June 2005.
124. Public Valuation of and Attitudes towards the Conservation and Use of the Hawksbill Turtle: An Australian Case Study by Clem Tisdell, Hemanath Swarna Nantha and Clevo Wilson, June 2005.
125. Comparison of Funding and Demand for the Conservation of the Charismatic Koala with those for the Critically Endangered Wombat *Lasiorhinus krefftii* by Clem Tisdell and Hemanath Swarna Nantha, June 2005.
126. Management, Conservation and Farming of Saltwater Crocodiles: An Australian Case Study of Sustainable Commercial Use by Clem Tisdell and Hemanath Swarna Nantha, August 2005.
127. Public Attitudes to the Use of Wildlife by Aboriginal Australians: Marketing of Wildlife and its Conservation by Clem Tisdell and Hemanath Swarna Nantha, August 2005.
128. Linking Policies for Biodiversity Conservation with Advances in Behavioral Economics by Clem Tisdell, August 2005.
129. Knowledge about a Species' Conservation Status and Funding for its Preservation: Analysis by Clem Tisdell, August 2005.
130. A Report on the Management of Saltwater Crocodiles (*Crocodylus porosus*) in the Northern Territory: Results of a Survey of Pastoralists by Clem Tisdell, Clevo Wilson and Hemanath Swarna Nantha, September 2005.
131. Crocodile Farms and Management of Saltwater Crocodiles in Northern Territory: Results of a Survey of NT Crocodile Farmers Plus Analysis of Secondary Information by Clem Tisdell, September 2005.
132. The Environment and the Selection of Aquaculture Species and Systems: An Economic Analysis by Clem Tisdell, October 2005.
133. The History and Value of the Elephant in Sri Lankan Society by Ranjith Bandara and Clem Tisdell, November 2005.
134. Economics of Controlling Livestock Diseases: Basic Theory by Clem Tisdell, November 2006.
135. Poverty, Political Failure and the Use of Open Access Resources in Developing Countries by Clem Tisdell, November 2006.
136. Global Property Rights in Genetic Resources: An Economic Assessment by Clem Tisdell, November 2006.
137. Notes on the Economics of Fish Biodiversity: Linkages between Aquaculture and Fisheries by Clem Tisdell, November 2006.
138. Conservation of the Proboscis Monkey and the Orangutan in Borneo: Comparative Issues and Economic Considerations by Clem Tisdell and Hemanath Swarna Nantha, March 2007.
139. Economic Change and Environmental Issues: Policy Reforms and Concerns in Australian Agriculture, by Clem Tisdell, April 2007.
140. Institutional Economics and the Behaviour of Conservation Organizations: Implications for Biodiversity Conservation by Clem Tisdell, March 2007
141. Poverty, Policy Reforms for Resource-use and Economic Efficiency: Neglected Issues by Clem Tisdell, May 2007.
142. The State of the Environment and the Availability of Natural Resources by Clem Tisdell, May 2007.
143. Economics of Pearl Oyster Culture by Clem Tisdell and Bernard Poirine, July 2007.
144. The Economic Importance of Wildlife Conservation on the Otago Peninsula – 20 Years on by Clem Tisdell, November, 2007.
145. Valuing the Otago Peninsula: The Economic Benefits of Conservation by Clem Tisdell, November 2007.
146. Policy Choices about Agricultural Externalities and Sustainability: Diverse Approaches, Options and Issues by Clem Tisdell, November, 2007.
147. Global Warming and the Future of Pacific Island Countries by Clem Tisdell, November 2007.

148. Complex Policy Choices about Agricultural Externalities: Efficiency, Equity and Acceptability by Clem Tisdell, June 2008.
149. Wildlife Conservation and the Value of New Zealand's Otago Peninsula: Economic Impacts and Other Considerations by Clem Tisdell, June 2008.
150. Global Property Rights in Genetic Resources: Do They Involve Sound Economics? Will They Conserve Nature and Biodiversity? By Clem Tisdell, August 2008.
151. Supply-side Policies to Conserve Biodiversity and Save the Orangutan from Oil Palm Expansion: An Economic Assessment. By Clem Tisdell and Hemanath Swarna Nantha, September, 2008.
152. The Orangutan-Oil Palm Conflict: Economic Constraints and Opportunities for Conservation by Hemanath Swarna Nantha and Clem Tisdell, October 2008.
153. Economics, Ecology and the Development and Use of GMOs: General Considerations and Biosafety Issues by Clem Tisdell, October 2008.
154. Agricultural Sustainability and the Introduction of Genetically Modified Organisms (GMOs) by Clem Tisdell, February, 2009.
155. Notes on Biodiversity Conservation, The Rate of Interest and Discounting by Clem Tisdell, April, 2009.
156. Is Posner's Principle of Justice an Adequate Basis for Environmental Law? by Clem Tisdell, June 2009.
157. The Sustainability of Cotton Production in China and Australia: Comparative Economic and Environmental Issues By Xufu Zhao and Clem Tisdell, June 2009.
158. The Precautionary Principle Revisited: Its Interpretations and their Conservation Consequences by Clem Tisdell, September, 2009.
159. The Production of Biofuels: Welfare and Environmental Consequence for Asia by Clem Tisdell, September, 2009.
160. Environmental Governance, Globalisation and Economic Performance by Clem Tisdell, November 2009.
161. Managing Forests for Sustainable Economic Development: Optimal Use and Conservation of Forests by Clem Tisdell, February 2010.
162. Comparative Costs and Conservation Policies for the Survival of the Orangutan and Other Species: Includes an Example by Clem Tisdell and Hemanath Swarna Nantha, May 2010.
163. Notes on the Economics of Control of Wildlife Pests by Clem Tisdell, May 2010
164. Are tourists rational? Destination decisions and other results from a survey of visitors to a North Queensland natural site – Jourama Falls by Clem Tisdell, June 2010.
165. Conservation Value by Clem Tisdell, June 2010.
166. The Influence of Public Attitudes on Policies for Conserving Reptiles by Clem Tisdell, July 2010.
167. Core Issues in the Economics of Biodiversity Conservation by Clem Tisdell, July 2010.
168. The Survival of a Forest-Dependent Species and the Economics of Intensity of Logging: A Note by Clem Tisdell, August 2010.
169. A Case Study of an NGOs Ecotourism Efforts: Findings Based on a Survey of Visitors to its Tropical Nature Reserve by Clem Tisdell, August, 2010.
170. Sharing Nature's Wealth through Wildlife Tourism: Its Economic, Sustainability and Conservation Benefits by Clem Tisdell, August, 2010
171. Economic Growth and Transition in Vietnam and China and its Consequences for their Agricultural Sectors: Policy and Agricultural Adjustment Issues by Clem Tisdell, September, 2010.
172. World Heritage Listing of Australian Natural Sites: Effects on Tourism, Economic Value and Conservation by Clem Tisdell, October, 2010.
173. Antarctic tourism: Environmental concerns and the importance of Antarctica's natural attractions for tourists by Clem Tisdell, October 2010.
174. Sustainable Development and Intergenerational Equity: Issues Relevant to India and Globally by Clem Tisdell, November 2010
175. Selective Logging and the Economics of Conserving Forest Wildlife Species e.g. Orangutans by Clem Tisdell, September 2011.

176. Economics, Ecology and GMOs: Sustainability, Precaution and Related Issues by Clem Tisdell, September 2011.
177. Economics of Controlling Vertebrate Wildlife: The Pest-Asset Dichotomy and Environmental Conflict by Clem Tisdell. September 2011
178. Ecotourism Experiences Promoting Conservation and Changing Economic Values: The Case of Mon Repos Turtles by Clem Tisdell, June 2012.
179. Sustainable Development Planning: Allowing for Future Generations, Time and Uncertainty by Clem Tisdell, June 2012.
180. Biodiversity Change and Sustainable Development: New Perspectives by Clem Tisdell, June 2012.
181. Economic Benefits, Conservation and Wildlife Tourism by Clem Tisdell, June 2012.
182. Conserving Forest Wildlife and other Ecosystem Services: Opportunity Costs and the Valuation of Alternative Logging Regimes by Clem Tisdell, June 2012.
183. Sustainable Agriculture – An Update by Clem Tisdell, December, 2012.
184. Ecosystem Services: A Re-examination of Some Procedures for Determining their Economic Value by Clem Tisdell, December 2012.
185. Biodiversity Conservation: Concepts and Economic Issues with Chinese Examples by Clem Tisdell, December 2012.
186. The Nature of Ecological and Environmental Economics and its Growing Importance by Clem Tisdell, December 2012