

## NATURAL RESOURCE PERSPECTIVES ON SUSTAINABILITY

**L. Anders Sandberg**

*Faculty of Environmental Studies, York University, Canada*

**Christopher Midgley**

*University of British Columbia, Canada*

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### Summary

Modern natural resource perspectives on sustainability revolve heavily around various versions of the concept of sustained yield. Sustained yield rests on the assumption that the natural environment can produce a continuous flow of resources if managed prudently by resource managers or experts under the institution of private property. Resources are defined as single, multiple, or constituting whole ecosystems.

Adaptive ecosystem management takes into account biodiversity and ecosystem integrity through flexible and participatory strategies. Natural resource management based on common property rights and local traditional knowledge has typically been marginalized. Though such management regimes should not be idealized, they contain elements that can be used to build a more socially and environmentally sustainable use of natural resources.

## 1. Introduction

Natural resources lie at the very foundation of sustainability. The reason for this is two tiered. Firstly, by simply stating the word “resource”, one is committed to contemplating the use of nature as capital. The very concept of *resource* presupposes an assessment of the usefulness of an object or environment for some purpose. Secondly, patterns of human resource use and/or consumption significantly influence the ability of systems to maintain processes and functions, integrity, and productivity over time. This is true for social and economic, as well as ecological systems. It is this combination of human use and subsequent impact that provides the basis for sustainability. The inclusion of ecology in natural resource management is relatively recent and still not embraced completely. Here we trace the concept of sustainability as it has undergone four fundamental iterations when applied to the use of renewable natural resources.

In the early modern era, the idea of “capture” guided human management of natural resources. Central to this concept was the idea of the world as a vast storehouse of goods where natural resources existed for human use and taking. The significant limiting factor to resource extraction and consumption was not natural availability, but the human capacity for removal.

As economics and industry developed, this idea of capture evolved into various forms of sustained yield. Maximum sustained yield was the earliest variant in which single resources were considered for use, and rested on the assumption that such resources can provide a calculable annual yield. Optimum sustained yield worked on similar principles but included multiple resources. Through these evolutions, the belief that all things on Earth existed for the use and benefit of humankind prevailed. This has come to be known in some circles as “resourcism”, the notion that nature exists only to serve humanity. Resourcism also accounts for the dismal failures of the management of natural resources, a fact illustrated by the inequity of resource distribution between peoples and across species.

In response to the social, economic, and ecological problems generated by the dominant resource management paradigm, a new perspective on the sustainable use of natural resources has emerged. It is a perspective rooted in the belief that nature has value for its own sake, and not merely instrumental value for the benefit of people. The limiting factors to human resource management and use are the health, integrity and productivity of the ecosystem whose components we value. Thus local populations of native flora and fauna, and the ongoing viability of characteristic processes and functions (such as nutrient cycling, and photosynthesis) dictate an ecologically sustained yield. In this sense, it is the ecosystem as a whole, rather than its various components that are regarded as a resource. This ecologically based management regime is often referred to as adaptive ecosystem management. It involves the need for experimentation and continuous feedback because we lack sufficient knowledge to predict the impacts of our management intervention and strategies.

## 2. Renewability, Non-Renewability, and Sustainability

Natural resources are generally classified into renewable and non-renewable.

Renewables have tended to include forest, range, water, and wildlife resources (and to a lesser extent wind, solar, and tidal power sources) while the non-renewables (further separable into recyclable and non-recyclable) encompass minerals, soils, and fossil fuels. This is an important distinction for the sustainability debate because it is this division that distinguishes resources that can be managed sustainably from those that cannot.

Minerals, soils, and fossil fuels cannot be depleted at a sustainable rate. This is because the processes that generate them operate on temporal scales well in excess of human resource use. For example, in the time taken to develop layers of rich soil, or oil deposits (millennia to hundreds of millennia), civilizations have blossomed, collapsed, and risen again. This illustrates an interesting property of renewability. It is not the process of regeneration that makes a resource renewable, but whether or not the temporal scale of that process fits within the economic time scale of the humans of the day. Thus, a renewable resource is one that can be restored for reuse after a period that falls within the present economic or social planning time scale, or one which is renewed at a rate that makes investment in its renewal economically attractive. The dichotomy between “renewable” and “non-renewable”, therefore, is not absolute, as one might initially suppose. Rather it is a distinction based on human economy and the cost required for investment in renewal.

The quality and the intensity of a management practice can influence whether or not a renewable resource can be restored (naturally or artificially) to the point of reuse within an attractive time frame. This illustrates the difference between renewability and sustainability. Trees, for example, have long been an archetypal example of a renewable resource, and one that can be managed sustainably. However, if a management strategy degrades a forest ecosystem so profoundly that trees cannot grow until the soils have undergone their lengthy regeneration, or native species cannot return to the area, that renewable forest ecosystem has not been managed sustainably. To be sure, the length of time required for the trees to grow from sapling to maturity has not varied, but the time required to create the circumstances hospitable to the growth of the sapling is what has changed, and this change is a result of human intervention. While renewability centers on whether or not the regenerative capacities of a resource are such that its renewal can be attractive from an economic point of view, sustainability centers on whether or not the management of a renewable resource ensures that the regenerative capacities of the resource remain intact.

### **3. “Capture” and Sustained Yield in Modern Resource Management**

The belief that the Earth was a limitless provider to be dominated does not extend far back in human history. In the centuries characterized by what Adam Smith called the “mercantile system” (1550s to 1700s), the notion of a fixed amount of resources guided colonial conquests. In the relentless pursuit of power and domination in international trade, the one-way flow of goods, such as gold and silver, from the colonies to the mother country was emphasized. Minimal investments were made to improve the yield of natural resources, rather further colonies would be established and more of the available resource lands captured.

In Enlightenment Europe, the objective of colonization shifted from the acquisition of power to the acquisition of wealth. This shift sparked the belief that both local and far off lands possessed immeasurable treasure and their conquest would yield a limitless bounty. Thus emerged the view that the Earth was a limitless storehouse of goods. Owing to this, European powers began to view nature as an object to be subdued, controlled, and manipulated by “experts” whose developing scientific method was rooted in precise quantification and classification. Local use and knowledge that conflicted with the expert notions of resource value and use were deemed inappropriate, and local harvesters outside the modern management regime were regarded as poachers and trespassers. Hence, in many ways modern resource management became an act of imperialism toward both nature and people. This was the pattern in various parts of Europe, as well as in North America and conquered colonies, where aboriginal peoples’ lands were transformed into resource hinterlands harboring plantations, mines and fishing posts. The vast wealth of newly discovered regions was available simply for the taking. The idea that there was a limit to nature’s bounty was inconceivable.

This deeply seated belief was reinforced by John Locke’s theory of property, which rested on the principle that everyone had a right to as much of what nature provided in common as they could use. It was understood that it was labor that put value upon land. Property, then, was derived from mingling labor with nature in a wild or unused state. This notion of property emerged as the moral and legal justification for attributing resources to individual proprietors, a system that was alleged to promote the most efficient use of resources.

Though marred by the large-scale greed of self-interested parties seeking extraordinary wealth, the quantification and classification of natural resources, the control and manipulation of nature, and the desire for the unlimited provision of wealth also led to the concept of sustained yield. Initially, the idea was developed within German forestry. Using biological principles, managers sought to find the answer to sustained yield by determining the exact annual growth increment of a resource. If only this amount was harvested, the resource base would never be depleted. Thus a particular resource, if controlled, managed, and improved, would yield a calculable annual harvest indefinitely without disturbing an assumed constant stock. In this setting, sustained yield became a common tool for promoting rational resource use.

In North America however, the notion of capture dominated over the sustained yield concept in resource management. Once again, it was thought that as long as the user of a resource was assured of their ownership, the resource base would be maintained. Resources were seen as giving a perpetual yield regardless of the management practice implemented. If scarcities developed, it was thought that they would be resolved naturally by the cessation and relocation of resource exploitation. Eventually, however, it became clear that the management strategy of capture was not enough to maintain stocks from an industrial and economic perspective, and the North American Conservation movement embraced the concept of sustained yield.

This evolution spawned the professionalization of resource management, resulting in the formation of schools and universities to train students as foresters, park wardens, wildlife managers, and fisheries officers. On one hand this was a positive development

insofar as serious thought was being given to the wise use of the environment; however human benefit was the absolute guiding principle. Furthermore, the creation of formal academic programs and institutions further consolidated expertise within a scientific elite. Thus sustained yield, dictated by professionals, focused on how to use an infinite resource base wisely for the benefit of all people. The French-trained American forester Gifford Pinchot, pioneer of the concept in North America, reflected this attitude. He referred to forestry as tree farming. The purpose of forestry was to make the forest produce the largest possible amount of whatever crop or service will be most useful for people, and continue producing it in perpetuity.

Given these circumstances, it is not surprising that the limiting factor to resource use was regarded to be the human extractive capacity. For this reason, sustained yield resource management became increasingly connected to maximum economic gain.

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### Biographical Sketches

**L. Anders Sandberg** is Associate Professor and Ph.D. Program and Admissions Coordinator in the Faculty of Environmental Studies at York University. He holds a B.A. Honours in Geography from Simon Fraser University, an M.A. in Geography from the University of Victoria, and a Ph.D. in Geography from McGill University. He joined the Faculty in 1994 and teaches environmental politics and resource management. He has previously held teaching and research positions at Dawson College in Montreal, Trent University in Peterborough, and Dalhousie and Saint Mary's Universities in Halifax. His research focuses on forest, environmental and conservation history, as well as resource conflict in the forest and aggregate industries in Canada and the Nordic countries.

He has written numerous articles in professional journals such as *Acadiensis*, *Antipode*, *Business Strategy and the Environment*, *Canadian Geographer*, *Economic and Industrial Democracy*, *Environmental History*, *Journal of Canadian Studies*, *Labour/Le Travail*, *Prairie Forum*, and *Progress in Human Geography*. He has also edited *Trouble in the Woods: Forest Policy and Social Conflict in Nova Scotia and New Brunswick* (Fredericton: Acadiensis Press, 1992), co-edited (with Sverker Sörlin), *Sustainability – The Challenge: People, Power, and the Environment* (Montreal: Black Rose Books, 1998), and co-authored (with Peter Clancy) *Against the Grain: Foresters and Politics in Nova Scotia* (Vancouver: University of British Columbia Press, 2000).

In 2002, he was awarded a Social Sciences and Humanities Research Council Standard Research Grant entitled “Unlikely Allies: Citizen Planning and Environmentalism on the Oak Ridges Moraine” with Professors Gerda Wekerle and Liette Gilbert. The project's aim is to chronicle the emergence of citizen movements and environmentalism on the Oak Ridges Moraine at the northern edge of Toronto.

He makes his home in downtown Toronto where he enjoys walking and learning about local history.

**Chris Midgley** completed a Master's degree in Environmental Studies at York University, Toronto, Canada, in the fall of 2000. There his focus was on sustainable design and conservation with particular emphasis on adaptive resource management, appropriate technology, and recreation.

Now living in Vancouver, Canada, Chris' attention has turned to designing and developing ecologically healthy, livable urban environments. During 2001, this goal was pursued in the non-profit sector with the International Centre for Sustainable Cities, an organization dedicated to sharing Canada's expertise and technology with cities in the developing world. Now Chris is studying the ecology and aesthetics of urban design while working towards a Master of Landscape Architecture at the University of British Columbia. It is his hope one day to spontaneously realize how we can meet the needs of the present without compromising the ability of future generations to meet their needs.