



## Restoration of natural capital: A key strategy on the path to sustainability



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### ABSTRACT

Three intertwining braids or strategies to enable transition towards sustainability can be identified, namely: (i) appropriate sustainable technologies, (ii) revising behaviour including reproduction and consumption patterns, and (iii) investment in the restoration of natural capital (RNC). Less explored than the first two, “RNC-thinking” might be the game-changer. Recent evidence suggests that not only is restoration urgently required from a biophysical perspective, but also that it makes eminently good economic sense to make that investment. The alternative to this triple approach is the prevailing paradigm that treats the world as if it were a “business in liquidation”, as pathfinder economist Herman Daly put it. Not only is the restoration of natural capital both ecologically and economically beneficial, as indicated herein with benefit–cost ratios varying between (on average) 0.4 (for coastal systems) and 110 (for coastal wetlands including mangroves) with the majority of ecosystems recording an average of an BC-ratio of about 10, it also holds an important key to unlock future sustainable growth and development trajectories.

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*If we learn to value nature, our real wealth, we will take better care of it.*

*Our economic system works for no one, except maybe the one per cent at the very top.*

*Our system wastes the environment. It wastes people. And, it's very, very expensive.*

*We need a radical change in how we relate to resources and people and the environment.*

(P. Hawken, 1993)

### 1. Introduction

To help reverse the unsustainable pathway human society has embarked on with respect to the utilisation of ecosystem goods and services we suggest that there is a trio of intertwined braids or strategies to help move human society towards sustainability. These are (i) appropriate, sustainable technologies, (ii) revising human behaviour including reproduction and consumption patterns, and (iii) increased investment in the restoration of natural

capital, which we abbreviate to RNC. In this paper we focus mainly on the latter, offering a summary of recent evidence suggesting that not only do we need restoration from a biophysical perspective, i.e. the rapid increase in the demand for ecosystem goods and services and the dwindling stocks of natural capital, but also that it makes eminently good economic sense to invest heavily in restoration.

While not explored further in this paper, the effectiveness of this proposed solution depends to a large extent on the need to change the overall economic system to become more reflective of issues such as thresholds and constraints pertaining to the true scarcity of resources. Without a fundamental change in the way we measure welfare and wellbeing, the effectiveness of all three of these strategies is serious compromised: sustainable technologies will not be able to compete with non-sustainable alternatives, human behaviour will not change even if many individuals see the need for it and are of good will and, finally, ecological restoration of degraded ecosystems, and, more broadly, RNC will remain too expensive if we do not account for the non-market values of what is at stake.

### 2. Why restore: revisiting sustainability

The ongoing debate concerning ways and means to achieve sustainable development is hampered by conflicting definitions and core concepts with respect to the meaning and content of

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sustainability. This does not make matters easy for the policy-maker or the researcher, let alone land managers and other practitioners. However, it does help to focus on the main idea: as expressed by Herman Daly (1991: 248) “. . . it is both morally and economically wrong to treat the world as a business in liquidation.” Instead we need to seek lasting cures for our seemingly relentless “addiction to growth” as well as seek a development pathway that would benefit both people and the rest of our global ecosystem. Here we propose such a pathway, built on three intertwining braids, or strategies, to sustainable development. There are of course myriad policy options and intervention packages – such as taxes, subsidies and regulation – through which policies concerned with trade, industrial development, pollution, etc. can be steered onto this path. First, however, society must *decide* to change the direction and character of its economic development pathway. The three braids are:

- **Sustainability through appropriate technological change** whereby, among other things, the resource and energy intensity of an economy is significantly reduced. This is also called the dematerialisation of economic development (Van den Bergh and Janssen, 2005);
- **Sustainability through behavioural change** whereby society's preferences and value systems revise what is considered to be wealth, the reason or rationale for living, and the way in which we live (Daly, 1991; Costanza, 1991; Hawken, 1993); and,
- **Sustainability through the restoration of natural capital (RNC)**, where RNC is defined as any activity that integrates investment in and replenishment of natural capital stocks to improve the flows of ecosystem goods and services, while enhancing all aspects of human wellbeing (Aronson et al., 2007). The major components of RNC are: (i) ecological restoration of impaired natural ecosystems, *sensu* SER (2004); (ii) ecological improvements and refinements of resource exploitation and production systems, and (iii) development and refinement of educational and awareness-raising programmes addressing the broad topics of natural capital, biodiversity, and ecosystem services.

If a country, region or private company wishes to develop sustainably in the future, it has to embark on an evolutionary process of change that involves political, institutional, financial and behavioural aspects. This means recognising the need for, and then adopting, strategies and actions that would lead to a reduction in resource and energy intensity, an encompassing behavioural change among people, and the restoration and maintenance of degraded ecosystems and landscapes.

The first two ‘braids’ we cited – i.e. technology and behaviour – aim to reduce general and per capita demand for, and pollution and waste of, resources, as well as erosion of natural, cultural and human capital. The third strategy, RNC combined with on-going land use and resource management adjustments after restoration has begun, aims to *increase* stocks of natural capital and, therefore, the flow in resources and ecosystem services that exist if, and only if, we maintain natural capital. This requires recognising that something has gone wrong, and then making the choice – and the investment – to bring it right (Fig. 1). While the first two braids focus on reducing the demand side for resources (or ecosystem goods and services), restoration is arguably the only option that has the potential for increasing the supply of ecosystem goods and services. Not only does it increase the supply, it has also great potential for increasing the social cohesion in a community when restorative actions are taken that reduces such a community's vulnerability and exposure to risks associated with natural disasters.

Note that the three strands or strategies to achieve a transition to sustainability cannot effectively operate independently. Instead

they should ideally be undertaken conjointly, which is why we have depicted them as a three braided rope (Fig. 1). Of course, it may happen depending on new ideas, opportunities and perceptions that occur that two of the strands may move together and reinforce each other or, conversely there may be situations where little mutual reinforcement occurs. What seems crucial is that the three strands be identified and gradually harmonised so that future societies – and our global society – choose the path to sustainability (Planet in Repair), rather than the “dynamics as usual” path that leads us to a Planet in Decay.

When that harmonisation is achieved, we shall reduce or avoid problems such as those noted by the Victorian economist William Stanley Jevons. While conducting a study of coal, Jevons noted that total consumption of a resource could in fact increase, rather than decrease, as improvements in technology increase resource use efficiency (Jevons, 1865). Indeed, introducing improved, energy- and resource-saving technologies without achieving a corresponding – and ideally, encompassing – behavioural change can lead to *increased* resource use, without any offsets required or near-time penalties for consumers. This phenomenon is known as the Jevons paradox and nothing in our current behaviour, legislation, conventions or politics counteracts it; quite the contrary. Extraction and refinement efficiency improvements reduce the relative price of a resource in comparison to its output, which, in turn increases the overall demand for the said resource. This increase in demand can be so significant that it offsets the reduction in the per unit consumption of the resource due to the efficiency improvement. That is why consumption of coal increased so substantially following the invention of an improved and reliable steam engine. Hence the designation also of “appropriate” technological change as technological change that will only increase energy and resource consumption is counterproductive.

Furthermore, technology improvements have to be accompanied by behavioural change – accompanied by, or led by legislative change – in order to achieve an overarching and lasting resource use reduction – or, as stated in Fig. 1, a reduction in the demand for resources and energy per capita. This implies a great deal of investment in environmental education and ethics-building as well as significant reduction in wastefulness and pollution.

Conversely, changing behaviour without technological change – or increased investment in restoration – could also have great effects, but at national and international scales there are very few examples in history of societies voluntarily accepting such change. It does happen in wartime and in times of famine, but few people today seem to accept that we are in a state, globally, comparable to war or famine. Few recognise that we are on a path perilous enough to require that we make a radical change in our collective behaviour, sooner rather than later. This is not the place to speculate on what might prompt such a change, since our purpose in the remainder of this paper is to focus on the third braid in the tripartite path, namely RNC, which we consider essential, and eminently attractive, at least when the benefit–cost relations are well understood, as discussed in more detail below.

Twenty years after Paul Hawken called for an explicit “Ecology of Commerce” (Hawken, 1993), and subsequently, a “natural capitalism” (Hawken et al., 1999), some communities, nations, not-for-profit organisations, and more and more mining, infrastructure and energy corporations are catching on to the fact that natural capital is the basis of our economies. Therefore, the ecological restoration of degraded ecosystems is vital to the search for sustainability and ecological accountability. The corresponding science, restoration ecology, can provide tools and represents a major building block for the development of a transdisciplinary sustainability science (Weinstein and Turner, 2012), and provides a problem-solving toolkit on the road to global, regional, national and

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