TREEB

Introduction

"TREEB" stands for The Real Economics of Ecosystems and Biodiversity.

Why "real"? Because there is already in existence a body of analysis known as "TEEB" (The Economics of Ecosystems & Biodiversity) - but in my view it does not deal with the key issues, and in some respects it even obfuscates them. [1]

In this pamphlet I will set out an alternative view, rejecting both the two currently most prominent viewpoints on biodiversity loss and ecosystem deterioration. One view, represented by TEEB, focuses on the monetary valuation of so-called "natural capital". The natural world is viewed as consisting of "pieces" of "capital", and for each of these a monetary value can be calculated. Doing this will, it is hoped, prove that the destruction of the natural world is costly and wrong. There are many problems with this approach, and I will outline some later on - though this is not my main focus here. Crucially, that approach says nothing about the real economic drivers of biodiversity loss. Its analysis does not help to identify what these are.

The other prominent approach, associated particularly with WWF, but not limited to that organisation nor constituting the whole of its work, is to focus on fundraising for the conservation of what have been called "charismatic megafauna". These are mostly famous zoo animals such as tigers, giraffes and rhinos. The theory is that by appealing to many people's sense of wonder towards these animals, there will come to be a more general understanding of the threats to the natural world. However this more often does not happen: the charismatic species focus tends to identify poaching and the wildlife trade as the key issues, when in fact, although these are significant issues, for most species and whole ecosystems there are other more important factors at work.

Like the valuation approach, the focus on famous species can alert people to the scale and significance of what is happening to species and ecosystems, but it doesn't really get at the causes, and therefore can't get to effective solutions either. And if we are concerned with what is happening to the web of life as a whole, it is often far less glamorous organisms that are crucial: worms, fungi, phytoplankton, etc. Although it would be wrong to see famous mammals as merely "the icing on the cake", they certainly aren't the whole cake.

Partly this is about the scale of the problem of biodiversity decline, and the way in which that has changed. The conservation movement has over the years proved remarkably adaptable and pragmatic at enlisting a variety of sources of support and funding for nature reserves, high-profile species, and some of the most biodiversity-rich areas of habitat. That is an adequate approach if the problem we face is simply about those priority species and the need for enclaves to maintain them. However even nature reserves and safeguarded habitats are subject to climate change, and in fact the problem of biodiversity and ecosystems goes much wider than can be addressed through those forms of conservation on their own. Humans are not simply endangering some of our favourite species and places: the Millenium Ecosystem Assessment, the most thorough study of this question so far, found a great deal of evidence to show that human activity is now causing the deterioration of most of the world's major ecosystems and the "ecosystem services" they provide. [2]

This in turn causes problems for any form of economic activity or way of life that depends on the functioning of the natural world. Most obviously this includes fishing and farming, but also in various ways the consequences feed through into virtually everything human beings do and depend on. We rely, for example, on a relatively stable climate, pollination, the fertility of the soil, and the availability of water. [3]

If we want to identify and try to deal with the causes of biodiversity loss, we need to focus above all on two factors (there are some others which I will mention later):

(1) The economic drivers of land use change

(2) The economic drivers of climate change

There are two parts to the argument here. The first stage is the impact of land use change, climate change, and other factors on biodiversity loss and ecosystem deterioration. There is a very substantial amount of natural science work which has been carried out on all this. The other part of the argument is to look at the economic influences which are causing climate and land use change, and here economists have generally done far less useful work than their natural science counterparts.

I will also briefly look at some appropriate policy conclusions, as well as considering the political and other barriers to acceptance of this type of analysis, and give an outline of the main problems with the "natural capital" approach.

Barriers

Although it may seem fairly obvious that economic factors driving land use and climate change are crucial, this "real economics" approach is far less prominent in public discussion than the other two approaches I have referred to ("natural capital" and "charismatic megafauna"). Why is this? There is a powerful set of reasons -

(1) The real economic drivers of biodiversity loss are politically controversial – they include the role of the oil companies, the workings of the food industry, mining, and so on. Many funders of research and conservation don't like this. "Natural capital" valuation and nature reserves feel politically much safer. This applies generally to the attitudes of trusts, foundations, companies and individual donors themselves, also to the legal limitations created by the charity laws, and often the attitudes of academic research funding bodies. This ensures that what I am describing here as the "real" economics of biodiversity isn't often pursued in any depth or detail. When this approach is articulated at all, it can therefore just look like some sort of "romantic" or "extremist" vague sloganising.

(2) Within academia, there is a great deal of talk about "interdisciplinarity". But in practice, education, career, and institutional structures remain organised on a disciplinary basis. Even where interdisciplinarity is achieved within the natural sciences or the social sciences, it rarely goes sufficiently widely to encompass both those fields, and still less often to include the humanities as well. Yet the economics of biodiversity loss is inherently interdisciplinary: it requires natural science

analysis of what is happening in the natural world, economic analysis of its causes, historical accounts of how things have been unfolding in the long run, and some philosophical sensitivity to the conceptual issues involved. This is interdisciplinary in a way that few academics are ready to attempt. One good reason for this is of course the difficulty of knowing enough: everyone is likely to be an amateur in most of the range of disciplines required to construct a full analysis. There therefore have to be groups of people, from different backgrounds, who listen to each other. Not always easy to arrange.

(3) Even if we can imagine a way to get to this sort of realistic analysis, we might not want to. There is bound to be a suspicion that it would lead to unwelcome conclusions. In particular, we might find that biodiversity loss is caused by the way people live in "advanced" Western economies. We might find we come to the conclusion that we ourselves are "guilty". Although in some respects that might be the right conclusion, we also need to have some compassion for the fact that we are each born into historical and economic circumstances we did not choose, and then within those circumstances the vast majority of people have a limited range of choices as to how to earn a living and live our lives. To see all this as "guilt" or "innocence" is a terrible oversimplification, which has most people rushing away from any conclusion that might be seen as proving their own "guilt". We would rather not hear about that.

(4) As well as the question of "guilt", there are also some other problems familiar from climate change denial: depressing news is simply unwelcome, particularly where it challenges comfortable views of the world. It is comforting to believe that this is just about tigers and rhinos rather than about the decline of the natural world as a whole.

(5) Perhaps less easy to explain is the low priority traditionally given to biodiversity issues on the Left. It might seem that the Left would be the place politically most likely to give a warm welcome to critical accounts of what the current economy is doing to the world. Although there are some exceptions, in general this has not been the case for biodiversity and ecosystems. There remains suspicion because of the association of "nature" with Romanticism and "irrationalism", problems about the association of the defence of the countryside with the aristocracy and conservatism, and difficulty about anything that is "cuddly", "furry", or in some other way a distraction from "bread and butter issues" or the hard realities of political struggle. The Left has taken climate change on board as an issue, and parts of the Left have concerned themselves with the impact of mining on communities in developing countries, for example. But it is unusual to find amongst the Left in Western countries (the situation is very different in most developing countries), a thorough engagement with how the current economy is destroying important parts of the global web of life. This is despite the fact that the web of life is in fact the foundation for our "bread and butter", such as the capacity for making bread in the first place.

(6) The sixth and final problem to mention here is the sheer complexity of the issues involved. The real economics of ecosystems and biodiversity aren't simple. This is a difficult analysis to construct in detail, and in many ways it is difficult to communicate it as well. Saving the tiger looks simple by comparison, and valuing "natural capital" is on the surface a comparatively simple response as well (though in fact very difficult to do in practice).

The apparent causes

Although much of the work of ecologists and conservation biologists is locally specific, that provides the essential foundation for larger scale overviews. In an overview paper, 'Global Biodiversity Scenarios for the Year 2100', O.E. Sala and other authors (2000) presented a summary table showing the extent of the environmental changes they expect in different types of terrestrial environments up to the year 2100, giving in each case an indication of the magnitude of impact of what they identify as the "five major drivers" of biodiversity loss. These drivers are: land use change, climate change, the amount of CO_2 in the atmosphere, biotic exchange (spread of "alien" species), and nitrogen deposition.

The biggest impacts they foresee are: impact of land use change on tropical forests, impact of climate change on the Arctic, impact of biotic exchange on Mediterranean ecosystems, and impact of nitrogen on Northern temperate forests, with the impact of atmospheric CO_2 being spread everywhere. [4]

The Millenium Ecosystem Assessment (2005) gave its own list of five major drivers. These were habitat change, climate change, invasive species, over-exploitation, and pollution from nitrogen & phosphorus.

The most severe impacts according to that analysis were (using their summary of where impact on biodiversity in the 20th Century was high and impact is increasing): impact of habitat change on tropical forest, temperate grassland, inland water, and coastal areas; impact of over-exploitation on marine areas; and impacts of pollution on temperate grassland, inland water, and coastal areas. The impact of climate change, though generally low or moderate in the 20th Century, was found to be increasing very rapidly in all areas. [5] A very similar list of major drivers was identified by the United Nations Environment Programme in its 'GEO5' overview report (2012). [6]

The "planetary boundaries" analysis 2015 update produced by Will Steffen, Johan Rockstrom, and their colleagues, elaborating on their influential 2009 study, saw pressures on biodiversity loss as resulting from pressure on each of the other eight boundaries. They analysed particularly strong impacts on biosphere integrity as coming from land use change, climate change, biogeochemical flows (nitrogen & phosphorus pollution), freshwater use, novel entities (i.e. non-naturally occurring man-made chemicals), and ocean acidification. [7]

A fuller study of these issues would of course need to draw on many more sources and go into much more detail, but it seems reasonable from this very brief overview of overviews to highlight the following key points:

- Land use change directly produces habitat change and is a major factor in changing ecosystems around the world.

- Climate change is already globally impacting biodiversity and ecosystems and is on course to do so far more in the future.

- There are also problems in particular parts of the world which derive from overabundance of nitrogen, ocean acidification, water stress and over-exploitation.

But the next question is: what are the economic drivers involved?

First approximation: population and economic growth

Climate change and land use change, together with a variety of other factors, clearly contribute towards biodiversity loss and ecosystem decline. But what drives those factors? What is going on at a more fundamental underlying level?

In cases where reluctance to go to that next level of analysis is overcome, the "underlying factors" identified tend, perhaps surprisingly, to be quite simple ones - and I will argue that this view has some validity. The factors most commonly identified are population growth and GDP growth. However this explanation has only a partial validity, making a spotlight on these two factors only deserving to be called a "first approximation".

The drawback to identifying them as the underlying factors is essentially the same for each: in reality they combine under their two simple headings a vast variety of different pressures on the biosphere.

Although we can say "population" is a factor, it is obvious that the world's population includes people who put pressures on the biosphere in many different ways and to very different extents. Measurements of per capita carbon emissions, for example, show a very widely unequal distribution across the world. So do measurements of consumption of different natural resources.

However, at the same time it is also the case that the larger the total population, the larger the total environmental impact is likely to be. Both are true. Yet the population debate has become strangely polarised, when it seems very clear that total population is a factor, and at the same time there are enormous differences in the negative impacts caused by different sections within that total world population.

Something similar can be said about GDP growth. There is a correlation between Gross Domestic Product and environmental impact, but at the same time GDP includes the production of many different types of goods and services, each with different types and extents of impact. Size of GDP, and its rate of growth, are factors – but at the same time, the reality is more complex.

Although advocates of "green growth" tend to show an overoptimism not confirmed by the data, the idea of "green growth" is not actually conceptually impossible. It is not a contradiction in terms – even though it would be extremely difficult to achieve in practice and its advocates have still not yet shown how it could be done for whole national economies. [8]

Population growth and GDP economic growth have some validity as explanations, but it is also necessary to look more deeply into what is actually being produced and consumed, and how and where.

Economics of land use change

Although we are all used to seeing the world in terms of a geopolitical competition for territory and influence between major powers and alliances, such as the USA, Russia, and China, there is another competition for territory also taking place today which is potentially far more important for the future: the competition for the use of land, dividing up the finite amount of land which exists. The competition taking place now is principally between three major uses, plus some other less important ones. The three are 'wild land', especially forest; agriculture; and urban uses, such as industry, housing, and transport infrastructure.

The ecosystems and biodiversity which underpin all economic activity depend largely on 'wild land' - very much a poor relation in the competition with agriculture and urbanisation, both of which have massive economic forces in their favour. Agriculture has the economic power of the growing demand for food, growing not only because of rising population, but also because more and more people are wanting to eat meat, and meat generally requires more land than crops do. Urbanisation has the economic power of manufacturing, and the fast drift of economic migrants out of the countryside into towns and cities. Wild land has no such strong purchasing power to defend its position.

Wild land is therefore losing out in the competition and is in decline, and with it the biodiversity and ecosystems it provides space for. The consequences are likely to prove increasingly disastrous.

However it is not essential for land to be left wild: agriculture and urban areas can often be designed in ways which maintain ecosystems and biodiversity. But whether land is left wild or combined with other uses, the survival of the services ecosystems provide - such as genetic resources, good quality soil, available water, pollination - is an essential underpinning of the world economy and people's livelihoods.

A policy response to all this might consist of these five areas -

(1) Changes in agricultural practices and urban design, so as to combine them with thriving ecosystems.

(2) Changes in diet, so that what is eaten takes up less land. This principally means less meat, and it may also mean experimenting with more use of insects, fungi, and synthetic meat as sources of food.

(3) Reductions in the impacts of other commodities – for example, palm oil and the mining of metals.

(4) Reduction in population growth.

(5) Giving “wild land” its own economic power in the global competition, through establishing systems of payments for maintaining it. If taken seriously, this means very large transfers of money from rich temperate countries to poorer tropical countries – not as a form of aid, but as a payment for the services which tropical ecosystems provide. This issue is (often unhelpfully) linked to the debate about “natural capital”, which I will come to later.

Economics of climate change

Although climate change and biodiversity loss are often seen as separate topics in public debate and campaigning, in fact climate change is a major factor making for biodiversity loss. Fossil fuel emissions are destroying biodiversity and ecosystems, not simply destabilising the global climate. [9]

There is also a second connection. Earth mechanisms which absorb carbon – such as forests – often provide other ecosystem services and are homes for biodiversity. Hence some measures to combat climate change, through boosting the capacity to absorb carbon, can also directly benefit biodiversity.

All this implies that what is known about the economic drivers of climate change can be imported into the debate about the drivers of biodiversity loss. They simply need to be seen from a different angle and in this different context.

The economics of energy supply is of course crucial here. Fossil fuel subsidies, such as those maintained by the UK and many other countries, are biodiversity destruction subsidies. Economic dependence on oil is undermining the dependence which exists on a variety of services provided by ecosystems. Failure to invest in the transition to renewable energy is therefore also in practice a failure to invest in ecosystems.

Similarly, there is a close connection in terms of policy. [10] There is a need from a biodiversity and ecosystems perspective to add to the five types of policies mentioned earlier, through policies designed to:

(6) Shift energy supply away from fossil fuels and over to renewables.

(7) Increase energy efficiency in buildings, transport, and manufacturing.

(8) Shift transport systems so they become less energy-intensive, e.g. through greater emphasis on public transport, and the development of renewables-powered electric vehicles.

(9) Plan for an orderly financial transition away from fossil fuels, not only on the part of fossil fuel companies themselves, but particularly also pension funds and other institutional investors.

The economics of planetary boundaries

Most of the other apparent drivers of biodiversity loss – such as water stress and nitrogen pollution - are included in the "planetary boundaries" analysis put forward by Johan Rockstrom, Will Steffen, and others. [11] However that analysis was produced very much from a natural science perspective, and again it does not really address the underlying economic drivers involved.

These drivers clearly include the economics of the food industry, which has a major impact on water consumption and water stress, and on nitrogen use in fertilisers. And once again the drivers also include the economics of energy and fossil fuels, because of the impact carbon emissions have in acidifying the oceans.

The planetary boundaries analysis has however given rise to a very useful overview picture which highlights, along with the ecological boundaries, social issues such as poverty and human need. This is the basis of the "doughnut economics" put forward by Kate Raworth. [12]

There has also been discussion about the need to develop global governance arrangements to correspond to our "planetary boundaries" predicament. [13] For example, it may be that the Climate Change Convention should have an additional protocol on ocean acidification. Perhaps there should also be a strict international agreement to limit the use of nitrogen. However, in order to implement such arrangements in practice, attention will need to be given to the economic implications of doing so as well as to the questions of law, institutional structures and science.

Problems of "natural capital"

Although the main aim of this pamphlet has simply been to put forward a realistic view about the economics of biodiversity and ecosystems, rather than to criticise any other view, it does seem to me useful here to briefly outline the main problems I see with the concept of "natural capital", which is at the moment widely being seen as the key solution to the question of biodiversity loss. [14]

So-called "natural capital" is not at all like capital in the ordinary economic senses of the word (machinery, buildings, money). Discussion based on assuming that it is is likely to lead to an unrealistic analysis. In particular –

(1) There are no "pieces" of natural capital which can each be valued separately (a species, an area of land ...). Money is said to be "infinitely divisible" - but the natural world is not really divisible at all – it is interdependent. That understanding is the basis of the whole idea of ecology.

(2) Capital in the sense of money is interchangeable. Given the existence of exchange rates, it is interchangeable across the globe. The natural world is completely different: it consists of particular places, each with their own character. They are not easily interchangeable. Differences are qualitative as well as quantitative. [15]

(3) Pieces of capital have particular prices in the market. However "valuation studies" attempting to put money values on a "piece" of natural capital often reveal a very wide range of different values placed by different groups of people. There is no shared sense of a "value" unless an actual market is established. Economists' valuation methods do not by themselves create one, and any real market "value" (price) for something depends largely on the relative bargaining and purchasing power of different groups within that market. It is impossible to specify a money value without that process having taken place, and of course if it does it reveals very clearly (in a way theoretical calculations do not) the role of income and wealth inequality in determining market prices.

(4) Theoretical valuation too is generally biased against poorer people when it is based on "willingness to pay", because poorer people don't normally imagine being able to pay out sums as large as richer people do. In that sense, the theoretical market reproduces the bias of the real market.

(5) Valuation is often operated on a "net present value" basis – which involves discounting costs and benefits which occur in the future. The discount rate used is often based on market interest rates – which usually effectively make any costs a generation or more into the future count as near to zero. This guarantees an approach biased against long-term considerations such as sustainability.

(6) Values assigned through valuation studies depend a great deal on consumer preferences which are in constant flux. Things which appear important and valuable to consumers can differ a great deal from one year to the next. The natural world is also in constant flux, but this is for reasons which have a biophysical reality, and don't depend for example on marketing campaigns or changes in media coverage and fashion.

There are two further dangers which are not actually inherent in the concept of "natural capital" but are becoming increasingly important in the way the concept is often being used –

(7) There can be confusion between the "value" to an owner and the value to society as a whole. A firm can claim to have gone beyond the scope of the traditional accounting of profit and loss, assets and liabilities, to consider its "natural capital" – and it might hope to get some "social responsibility" credibility for doing so. However what is a natural capital asset to a firm (e.g. an oil well) might be a cost to society as a whole (e.g. in the form of carbon emissions). Where "natural capital valuation" is used, there will still be a need to make this distinction.

(8) There is something very suspicious about the whole trend to "natural capital". This is because of its almost purely theoretical and rhetorical nature. Money rarely actually changes hands. If the "value" of tropical rainforests was taken seriously, vast amounts of money would be paid from richer countries to tropical countries as a payment for maintaining them. Despite some relatively small-scale schemes, nothing like this is happening. The Indonesian Government, for example, will not be persuaded to stop coal mining and palm oil plantations from encroaching on its forests merely by hearing about the theoretical "value" of this "natural capital". They will want to compare the income from coal and palm oil with the actual income which follows on from this process of valuation – and that may be nothing at all.

The real economics and the real politics

These problems with "natural capital" valuation do not rule out having policies which use economic incentives to conserve biodiversity and protect ecosystem services. Some use of incentives follows from the type of analysis I have put forward too. However this can be done without the unnecessary "metaphysics" of a "true" (monetary) value for each "piece" of "natural capital" – which is a whole string of dubious concepts!

Where does all this lead? There are contexts in which even some use of monetary valuation might be helpful, as a means of communicating with the unfortunate people who regard money as the highest form of reality. And there are most certainly contexts in which fundraising to protect particular species and specific areas of habitat is useful, as is action to combat poaching and the illegal trade in wildlife products.

However, my argument is that those approaches do not really get to the major forces responsible for biodiversity loss and ecosystem decline. These forces are essentially economic and large-scale, which has the consequence that drawing attention to them is unavoidably political. Despite the charity laws, disciplinary boundaries, and the widespread reluctance to believe there is anything really fundamentally wrong with how things are, it seems to me very clear that there is now an urgent need for a radical politics of biodiversity.

Many of the policies this would involve are simply the standard policies of environmentalism, including a greening of energy and food supplies. Putting these policies in the context of the economics of ecosystems and biodiversity adds one more powerful set of reasons for understanding that a green economic transition has now become essential.

For campaign purposes this is generally too wide-ranging a message. It is more useful to tie, as far as possible, specific economic forces, represented by specific companies or government and specific flows of finance and investment, to specific places or species where they are having an impact. My argument is not about abandoning the specifics and just having a general message about the need for overall change. But it is an argument for seeing these specifics in the context of an overall analysis which does more than just scratch the surface in attempts to understand why our current time is one of rapid decline in the natural world.

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NOTES

[1] http://www.teebweb.org/about/the-initiative/
[2] Millenium Ecosystem Assessment: 'Ecosystems and Human Well-being: Synthesis' (Island Press 2005). Page 1.
[3] 'Ecosystems and Human Well-being: Synthesis', page 40.
[4] O.E. Sala et al.: 'Global biodiversity scenarios for the Year 2100', in 'Science' April 2000. http://www.researchgate.net/profile/Rik_Leemans/publication/12606072_Global_biodiversity_scenarios_for_the_year_2100/links/09e41511038475082b000000.pdf
[5] 'Ecosystems and Human Well-being: Synthesis', page 16.
[6] 'Global Environment Outlook 5' (United Nations 2012). Page 159.
[7] Will Steffen et al.: 'Planetary Boundaries: Guiding development on a changing planet', in 'Science' 15.1.15. See the Supplementary Materials for this article: https://www.sciencemag.org/content/suppl/2015/01/14/science.1259855.DC1/Steffen-SM.pdf Page 23.
[8] For a "post-growth" rather than "green growth" argument, see eds. John Blewitt & Ray Cunningham: 'The Post-Growth Project' (Green House 2014).
[9] See Richard Pearson: 'Driven to Extinction: the impact of climate change on biodiversity' (Natural History Museum 2011).
[10] See Victor Anderson: 'Controlling Carbon' (report published by Molly Scott Cato MEP (2015). http://mollymep.org.uk/2015/10/21/controlling-carbon/

[11] Johan Rockstrom et al.: 'Planetary Boundaries: exploring the safe operating space for humanity' (Ecology & Society Vol 14 no 2 2009). http://www.ecologyandsociety.org/vol14/iss2/art32/
For an updated version, see Will Steffen et al. (2015b): 'Planetary Boundaries: guiding human development on a changing planet', in 'Science' vol 347 no. 6223.
http://www.stockholmresilience.org/21/research/research-news/1-15-2015-planetary-boundaries-2.0---new-and-improved.html For a summary of key points in the update, see Victor Anderson: 'What's New About the Planetary Boundaries Update?'
http://planetaryboundariesinitiative.org/2015/02/02/whats-new-about-the-planetary-boundaries-update/
[12] http://www.kateraworth.com/doughnut/
[13] See http://planetaryboundariesinitiative.org/wp-content/uploads/2013/10/UNCSD-submission-01Nov11.pdf
[14] See http://www.teebweb.org/ and http://www.naturalcapitalcoalition.org/ For some useful critical discussion of the concept of "natural capital, see Dario Kenner: 'Who Should Value Nature?' (Institute of Chartered Accountants of England & Wales 2014) http://whygreeneconomy.org/wp-content/uploads/2014/12/Who-should-value-nature.-Why-Green-Economy.pdf Rupert Read & Molly Scott Cato: 'A Price for Everything?', in 'Journal of Human Rights and the Environment' (2014) 5/2 153-167. http://gnhre.org/2014/11/23/price-everything-natural-capital-controversy-r-read-m-scott-cato/
[15] See Mike Hannis & Sian Sullivan: 'Offsetting Nature?' (Green House 2012).
http://www.greenhousethinktank.org/uploads/4/8/3/2/48324387/offsetting_nature_inner_final.pdf