

By Tom Barker



The most important consequence of climate change for humans is the loss of ecosystem services.

If such a bold statement is true, what are ecosystem services and what makes them so important?

The term was coined by Ehrlich and Mooney (1983) to describe the useful things human society obtains from natural ecosystems, essentially for free. The Millennium Ecosystem Assessment (MA; [www.maweb.org](http://www.maweb.org)) reviewed the state and fate of ecosystems globally, along with the people who live close to them, and concluded that humans have degraded the Earth's ecology to the extent that it no longer sufficiently functions to fully support human numbers (e.g. MA 2005). This is mostly because of ecosystem mismanagement (e.g. habitat degradation and pollution) by globalised international trading companies, combined with unprecedented pressure from population increases.

### What are ecosystem services?

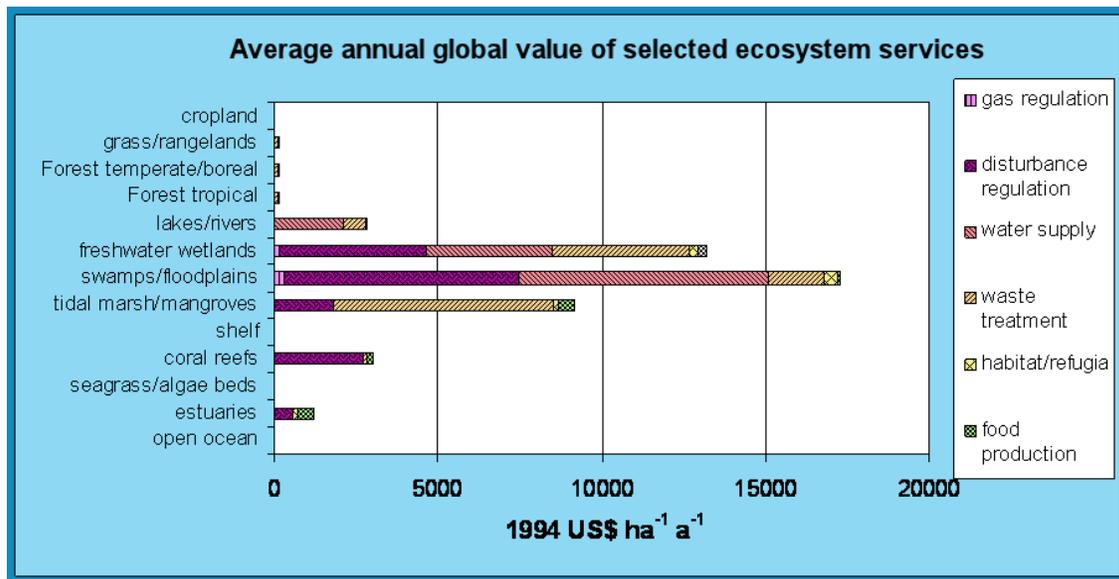
The term is really a redefinition of what we already know but hardly notice, e.g. reduction of wind speeds or maintenance of animal populations, and originates from ecological economists' who want to include environmental

criteria in economic decision-making. Historically, wild nature has been counted as 'wasteland' in economic and government planning except in cases where a particular species or habitat has been identified as in need of preservation. Outside of designations such as habitat reserves or rare plants or animals, species and habitats are fair game to developers, foresters and farmers. By defining lists of ecosystem services, it is hoped that they can be recognised and counted. The MA categorised ecosystem services into *provisioning* (e.g. supplies of timber or fish), *cultural* (such as education and recreation), *regulating* (e.g. cleaning water, maintaining fertility, storing carbon) and *supporting* (e.g. nutrient cycling, pollinating) services. Ultimately, areas of nature provide oxygen to breathe and an equitable global temperature, but in more local terms they provide food and drink and a sense of place, and include controls on air quality, climate, water provision, erosion, water purification, waste treatment, soil quality, disease, pests, pollination and natural hazards (Kumar et al. 2010). They even help keep us sane and sociable, and many people feel they provide a link with who we are and where we came from.

### Is this commodifying the environment?

The environment means different things to different people, and no argument by others, economic or otherwise, will change the personal value a person might feel from, for example, feeling warm summer evening air heavy with fragrance, hearing a blackbird singing, seeing a dragonfly emerge from its brown aquatic skin, or experiencing the evocative sight and sound of a flight of geese over an estuary sunset. In our modern, corporate world, however, everything is seen in the context of economic decision-making. How else could a decision be made sensibly to build on a beautiful tranquil landscape, to grub up a hedge during the breeding season, or pour effluent into an otherwise pristine lake? These decisions are made because they make economic sense in the timeframe of the economic quarter, five-year plan, or political horizon of the next election. Like it or not, this is the economic reality of how society is organised.

Since environmental destruction and degradation follows from a lack of acknowledgement of the true values of nature, ecological economists decided to try to place a formal value on the environment and the goods and services it provides annually, free, to society. The culmination so far of this continuing effort is TEEB (The Economics of Ecosystems and Biodiversity; [www.teebweb.org](http://www.teebweb.org)), which has set out the economic reasoning behind protecting habitat, and the links between habitat, biodiversity, ecosystem functioning (i.e. how ecosystem processes work, for example taking up nutrients from agricultural runoff) and provision of the services that benefit society, and how these things can be incorporated into economic and political decision-making. Without it,



**Figure 1: Contribution (in 1994 US\$) of different habitat categories to the global economy. From Costanza *et al.* (1997).**

there is no sound financial reason for developers and planners to continue to destroy significant areas of natural habitat.

### Valuing the environment

The classic attempt to put a value on ecosystem services globally was made by Costanza *et al.* (1997), who added up estimates of the value to the economy of the best-known ecosystem services and came up with a value of about double total global GDP. This is a value not to be sniffed at, but it was, and not least by Toman (1998) who called it, 'a serious underestimate of infinity'. Failure to invest in protection of 'natural capital' (in economics speak) erodes the basis of our economic, social and environmental security.

### How can ecosystem services be protected?

Ecosystems and biodiversity are mutually dependent, and need freedom from the physical and chemical impacts from human society, such as agriculture, buildings or roads development, sources of exotic invasive species, and the presence of humans and domestic animals. Importantly, they also need ecological connections with the broader landscape so that, e.g. seeds, insects, water flow and migrating species can move in and out. Degraded ecosystems suffer reduced provision of ecosystem services or even have lost the capacity to provide many services. The direct and indirect links between biodiversity, functioning and provision of ecosystem services were made explicit by Elmqvist *et al.* (2010), and the importance of 'functional diversity' by Hooper *et al.* (2005); thus the way to preserve the ecosystem services that are so valuable to society is to protect the physical and functional integrity of ecosystems.

In practice, this means more than leaving ecosystems alone. We need to ensure the existence of a greater number of intact ecosystems, of various types over large areas and at all scales. We must also protect them from exotic species (e.g. originating from garden centres and pet shops), which can catastrophically disrupt native species, even to the point of local or national extinction. A good example of this is the bluebell (*Hyacinthoides non-scripta*), which is currently being eradicated (along with its

spring fragrance) by garden escapes of a Spanish variety. We need frequent wild zones (akin to Marine Conservation Zones) in order to maintain a basic ecological integrity. These should be across scales, i.e. verges, ponds and hedgerows up to expansive woodlands and wetlands, and of course coastal seas, in order to provide security to different species. Thus we need to incorporate this need into spatial planning on national, regional and local (farm and urban) scales.

### Recommendations for ZCB:

- Identify opportunities for creation of areas of 'wild nature' at micro (gardens, verges and fields), mini (local authority and developers plans), meso (regional plans and infrastructure), and major (national parks and wildernesses) scales;
- Design-in areas of natural ecosystems into development plans at all scales;
- Maintain connectivity between sites of wild nature (this helps preserve genetic diversity);
- Allow access and community participation locally, but always keep some areas undisturbed.

### About the author:

An ecosystems scientist at The University of Liverpool, Tom studies the effects of environmental degradation on ecosystem quality, in particular ecological stabilising mechanisms and functional indicators of environmental change in lakes and wetlands. He lectures on sustainability, resource management, biodiversity and ecosystem services at Liverpool and CAT's GSE.

## References

- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruello, J., Raskin, R.G., Sutton, P., van der Belt, M. 1997. The value of the world's ecosystem services and natural capital. *Nature* **387** 253-260.
- Elmqvist T., Maltby E., Barker T., Mortimer M., Perrings C., Aronson J., DeGroot R., Fitter A., Mace G., Norberg J., Sousa Pinto I. and Ring I. (2010). Biodiversity, ecosystems and ecosystem services, Chapter Two in: *TEEB, The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*. Edited by Pushpam Kumar. Earthscan, London and Washington.
- Erhlich PR, Mooney HA. 1983. Extinction, substitution and ecosystem services. *Bioscience* **33** 248-254.
- Hooper, D. U., Chapin III, F. S., Ewel, J. J., Hector, A., Inchausti, P., Lavorel, S., Lawton, J. H., Lodge, D. M., Loreau, M., Naeem, S., Schmid, B., Setälä, H., Symstad, A. J., Vandermeer, J. and Wardle, D. A. (2005) Effects of biodiversity on ecosystem functioning: A consensus of current knowledge, *Ecological Monographs* **75**(1)3–35.
- Kumar P., Verma M., Wood M.D. and Negandhi D. 2010. *Guidance Manual for the Valuation of Regulating Services*. UNEP, Nairobi.
- MA 2005. *Ecosystems and Human Wellbeing: Synthesis*. Millennium Ecosystem Assessment. Island Press, Washington, DC.
- Toman MA. 1998. Why not calculate the value of the world's ecosystem services and natural capital? *Ecological Economics* **25** 57-60.