



Ecosystems matter for development in the Anthropocene

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Brief abstract/summary

Our human past, present and future are deeply intertwined with the state of our ecosystems. For millennia, we have shaped and been shaped by our local and global environments. These connections continue to underpin the wellbeing of all people in all places. The poor are particularly dependent on local ecosystems for maintaining their wellbeing, but often receive a smaller share of the benefits and are the least able to affect change.

Key messages

- Ecosystems are critical for human wellbeing. Even people in modern urbanised societies depend on and impact ecosystems both nearby and in distant places.
- Benefits from ecosystems result from interactions between humans and nature. These relations influence how both societies and ecosystems evolve over time.
- Access to and distribution of benefits from ecosystems are often unequal.
- In an increasingly globalized world, development needs to simultaneously ensure fair and continued benefits for current and future generations, and tackle the local and global impacts on ecosystems.

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At Stockholm Resilience Centre

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Ecosystem services support human wellbeing

The Sustainable Development Goals highlight the critical development challenge of supporting human wellbeing, particularly for the poorest, while maintaining the ecosystems on which society depends. The benefits that people derive from ecosystems include a diverse range of ecosystem services that contribute in different ways to different aspects of human wellbeing and poverty alleviation. Ecosystems can support people directly through, for example, provision of food and protection from floods or indirectly where ecosystem services are sold or provide employment.

Even as lifestyles change with rapid urbanisation and increasing affluence, ecosystems continue to matter for people in material and non-material ways, from pollinating food crops to providing places for recreation and cultural ties that enhance mental wellbeing. At the planetary scale, ecosystems are essential to the wellbeing and development prospects of future generations¹. For example, ecosystems moderate cycles of nutrients like nitrogen and phosphorus and regulate greenhouse gases and the global climate, absorbing up to half our emissions of greenhouse gases. Ecosystems are also a reservoir of biological diversity that may be critical for adapting to shocks and challenges in future years.

People and nature interlinkages within social-ecological systems

Ecosystem services are rarely produced ready-made by ecosystems, but result from the interaction between ecological processes and human actions, desires and agency. Humans have changed the nature of ecosystems throughout history². In some cases, a long history of co-evolution has produced a large diversity of ecosystem services. In other cases, humans have optimised the production of one service (e.g. food) at the expense of others (e.g. pollination, water regulation). Explicitly exploring these social-ecological interactions can help to understand the complex ways that such systems change over time. For example, the image of the Amazon as a pristine wilderness hides a long history of interactions that historical Amazonian societies have had in shaping the Amazon rainforest that exists today with its rich biodiversity and ecosystem services². Successful development or conservation initiatives in the Amazon will need to take account of these interactions and how they are likely to evolve.

The global prioritisation of food production, and loss of other ecosystem services

Because ecosystems produce multiple benefits and are linked in complex ways, managing them for only one ecosystem service (such as food production) risks undermining other services³. Global indicators suggest that human wellbeing has, on average, increased despite degradation of ecosystems⁴, however the evidence is dominated by food production. For example, humans have increased food production by converting forests and land to agriculture and boosted productivity by intensification, crop monocultures, and inputs of fossil-fuel energy, chemical fertilizers, pesticides, and machines. This expansion and industrialisation of agriculture has eroded the capacity of agroecosystems to deliver diverse, resilient flows of multiple ecosystem services, increased their vulnerability to environmental shocks and caused the degradation and loss of other ecosystems and their services.

How the benefits of ecosystem services are shared

The different ecosystem services generated, and the different impacts on wellbeing for different people vary from place to place based on a range of factors. For example, linkages between ecosystem services and human wellbeing in South Africa are mediated by property ownership, while the most vulnerable are generally most dependent on ecosystem services⁵. The social processes governing who has access to and benefits from ecosystem services are highly contextual and dependent on geography, seasonality, governance, power and politics, human agency and the history of resource use and relationships between different segments of society⁶.

Humans and ecosystems entangled in space and time

In an increasingly connected world, economic growth, consumption and development all impact ecosystems, often in distant locations and unexpected ways¹. For example, one-third of all tropical deforestation and resulting carbon emissions from 2000–2009 were due to global supply-chains of beef, soy, palm oil and wood products produced in eight

1 Steffen, Will, Katherine Richardson, Johan Rockström, Sarah E. Cornell, Ingo Fetzer, Elena M. Bennett, Reinette Biggs, et al. 2015. "Planetary Boundaries: Guiding Human Development on a Changing Planet." *Science* 347 (6223):1259855. <https://doi.org/10.1126/science.1259855>.

2 Comberti, C., Thornton, T.F., de Echeverria, V.W. and Patterson, T. 2015. Ecosystem services or services to ecosystems? Valuing cultivation and reciprocal relationships between humans and ecosystems. *Global Environmental Change*, 34, pp.247–262.

3 Reyers, B., Biggs, R., Cumming, G.S., Elmqvist, T., Hejnowicz, A.P. and Polasky, S. 2013. Getting the measure of ecosystem services: a social-ecological approach. *Frontiers in Ecology and the Environment*, 11(5), pp.268–273.

4 Raudsepp-Hearne, C., Peterson, G.D., Tengö, M., Bennett, E.M., Holland, T., Benessaiah, K., MacDonald, G.K. and Pfeifer, L. 2010. Untangling the environmentalist's paradox: Why is human well-being increasing as ecosystem services degrade? *BioScience*, 60(8), pp.576–589.

5 Hamann, M., Biggs, R. and Reyers, B. 2016. An exploration of human well-being bundles as identifiers of ecosystem service use patterns. *PLoS one*, 11(10), p.e0163476.

6 Berbés-Blázquez, M., González, J.A. and Pascual, U. 2016. Towards an ecosystem services approach that addresses social power relations. *Current Opinion in Environmental Sustainability*, 19, pp.134–143.

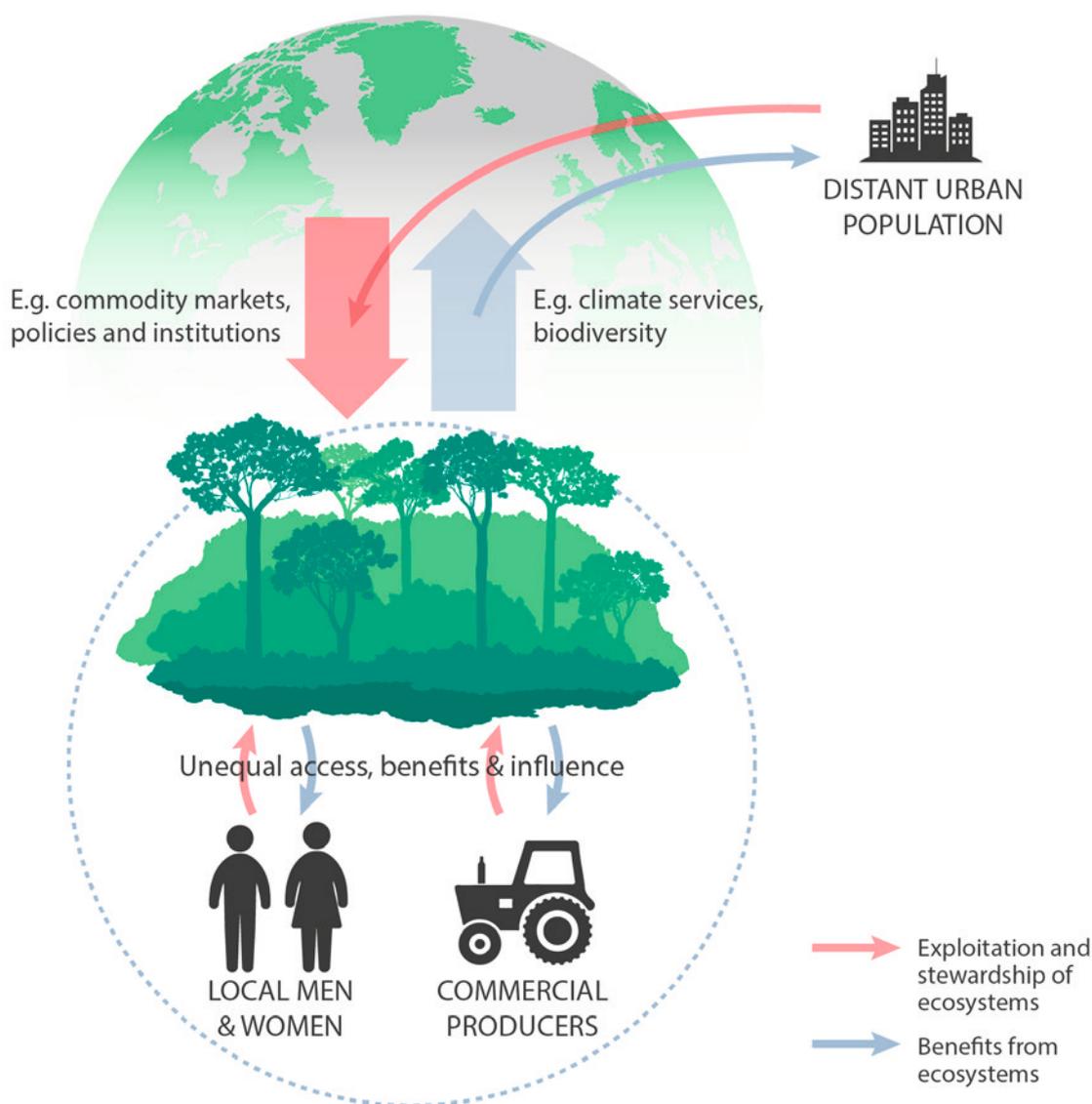


Figure legend:

People are dependent on ecosystems both locally and globally. Within a local social-ecological system people benefit from and have control over ecosystems to different degrees due to e.g. gender, capital and power relations. At the same time local ecosystems contribute benefits on a global scale and are affected by global processes. In this way even distant urban populations are interconnected with ecosystems across the globe. Illustration: J. Lokrantz/Azote

countries⁷. The impacts are not limited to where deforestation occurs. The associated carbon emissions and loss of climate regulation processes have regional and global consequences over the mid to long term.

Why is the role of ecosystems critical to development?

Sustainable development has to tackle the linked problems of rich and poor and their relationships to the Earth's ecosystems. Economic development has the potential to degrade ecosystems or to enhance their sustainable management and the benefits from them. Interventions can also contribute

to redistribution of benefits which may affect the wellbeing of poor people positively or negatively. Development can achieve its potential to support resilient social-ecological systems by:

- Planning and evaluating development strategies to consider their impact on ecosystems, their local, regional and global effects, and the knock on impacts on wellbeing of all people.
- Maintaining access and creating agency for the poor to manage and co-produce essential ecosystem services, while recognizing the broader political economy of use and appropriation of ecosystem services
- Seeking development options that enhance human wellbeing and reduce the environmental footprint while building the 'natural capital' of ecosystems (see case study)

⁷ Persson, U. M., Henders, S., & Cederberg, C. 2014. A method for calculating a land-use change carbon footprint (LUC-CFP) for agricultural commodities-applications to Brazilian beef and soy, Indonesian palm oil. *Global change biology*, 20(11), 3482-3491.

Case study: Working for water in South Africa – meeting the multiple goals of building natural capital, alleviating poverty alleviation and addressing equity

The water supply to South African cities and rural populations is underpinned by the natural ecosystems in water catchments; a 'regulating service' that can be easily undervalued until moments of crisis such as the 2018 water crisis in Cape Town (pictured). These water catchments have been degraded over time due to invasive alien plants from Australia that reduce water provision. The Working for Water (WfW) programme in South Africa was started to restore these ecosystems address this problem while generating employment for rural poor who remain marginalised in post-apartheid South Africa. The programme has utilised labour intensive interventions to clear over 1 million hectares of invasive alien plants, and has successfully improved stream flow⁸. The success is illustrated by its growth from six projects with a budget of around \$2,5 million in 1995, to over 300 projects across the country with a budget of \$150 million in 2016⁹.



PHOTO: BLOOMBERG

Although initially focusing on water supply, it has expanded to support a suite of other valuable ecosystem services, including rangeland productivity and biodiversity as underlying the provision of more ecosystem services.

The programme explicitly recognized issues of social differentiation – a strong emphasis on gender equity saw 52% of employment going to women and efforts to spread the benefits widely included maximizing the number of people employed through low paying short-term contracts. This provides an example of addressing sustainable development by balance the resilience of ecosystems to deliver multiple ecosystem services, while investing in long-term asset and capacity building of the poor.

South Africa's 'working for' programme: <https://www.environment.gov.za/projectsprogrammes#workingfor>

- 8 Turpie, J. K., Marais, C. and Blignaut, J. N. 2008. 'The working for water programme: Evolution of a payments for ecosystem services mechanism that addresses both poverty and ecosystem service delivery in South Africa', *Ecological Economics*. Elsevier, 65(4), pp. 788–798. doi: 10.1016/j.ecolecon.2007.12.024.
- 9 van Wilgen, B. W. and Wannenburgh, A. 2016. 'Co-facilitating invasive species control, water conservation and poverty relief: achievements and challenges in South Africa's Working for Water programme', *Current Opinion in Environmental Sustainability*. Elsevier, 19, pp. 7–17. doi: 10.1016/J.COSUST.2015.08.012.

Further reading

Ecosystems matter

Why a biosphere-based world view is an important part of development

Rethink article, March 2018

www.rethink.earth/ecosystems-matter

Running out of reef resilience?

The world's coral reefs are increasingly threatened by climate change and other human pressures. But it's not too late to save them – and the livelihoods of the many communities that depend on them

Rethink article, March 2017

www.rethink.earth/running-out-of-reef-resilience/

GRAID insight briefs

This brief is part of a series which introduce key insights from social-ecological resilience research, and how they relate to challenges of development in the Anthropocene. Human actions increasingly dominate the biosphere, the thin living surface of the earth on which people depend. The complex feedbacks between social and ecological processes and interconnections and between different places can lead to surprising sudden changes, as well as inertia in undesirable states. Awareness of the Anthropocene challenge and the complex behaviours of social-ecological systems highlights the need to embrace uncertainty, explore how stewardship can be supported at different scales, and for transformational change for a sustainable and just development.

For the full text of all briefs in this series visit www.graid.earth



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