



Ecosystem Services and Human Health

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Introduction and 'State-of-the-art'

Concerns about the links between health and the natural environment are of increasing scientific and public interest, and the connections between biodiversity (its conservation, loss and sustainable use) and human health receive significant political attention. The agenda is chiefly driven by intergovernmental, non-governmental and academic groups, and there remain significant gaps in policy at local, national and regional levels. In the European Union, whilst the connections between health and biodiversity have frequently been recognised in policy discussions and have been highlighted in recent research calls (see, for example, ten Brink et al., 2016), it is not yet specifically addressed in the EU biodiversity strategy (though arguably it is implicitly considered under targets and actions relating to securing and enhancing ecosystem services) (see EC, 2011). The issue is likely to become more prominent in the coming years, following on from decisions at the 12th Conference of the Parties to the Convention on Biological Diversity (CBD COP 12) in October 2014, which encouraged Parties to “consider biodiversity and health linkages in the preparation of national biodiversity strategies and action plans, development plans and national health strategies” (UNEP, 2014). This and other recommendations on health were endorsed at the COP by the EU and several of its Member States, and have begun to inform research priorities in environmental sciences.

In international dialogues and across much of the scientific literature, discussions on the relationships between health and the natural environment tend to focus on biodiversity (BD), rather than ecosystem services (ES) or natural capital (NC), as the critical infrastructure for human health and health systems (see, for example, CBD & WHO 2015; also UNEP, 2014). Whilst there are several reasons for this, the main considerations are (1) many health benefits or concerns are related to the conservation, management or use of specific elements of biodiversity (e.g. species or genetic resources), (2) for many communities the relationships between the natural environment and health are mediated by locally distinct cultural associations with species or habitats (e.g. sacred natural sites or species used locally for food or medicine), and (3) several health concerns are negatively associated with elements of biodiversity but not necessarily related to ecosystems or their services (e.g. the current Ebola outbreak in West Africa). Bearing this policy focus in mind, one might ask what added value can the ES / NC concepts bring to the understanding of links between BD and health? Is it necessary to broaden the understanding of these relationships into a wider ES context? It can be argued that the broad concepts of ES and NC, as understood by OpenNESS, already capture the health benefits of BD (e.g. BD underpinning provisioning and regulating services). There may be scope for OpenNESS to demonstrate a benefit of the ES and NC concepts in shaping a more systemic understanding of how BD supports health aspects of well-being.

Why consider health?

It is reasonable to ask why assessments of ES and NC should consider health separately from other aspects of well-being. Apart from the many recognised connections between ecosystems and health, one reason is that health is a major element of self-reported assessments of personal (subjective) and population (objective) measures of well-being, with health status also affecting personal perceptions of other aspects of well-being (including quality of life, livelihood security and freedom of action). Health issues are also a major public concern, frequently motivating public action and protest, and often representing a significant portion of household budgets. Health and health care delivery are also some of the most significant areas of national, regional and local government activity and expenditure, with national primary and secondary care services typically commanding on average 9% of GDP in EU states (OECD, 2012). Health is also recognised as a key component and indicator of sustainable development (McMichael 2009), and an

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important aspect of the post-2015 sustainable development agenda (Gostin and Friedman, 2015; Kickbusch and Brindley, 2013; see also Langlois et al., 2012).

Ecosystems may be viewed as “settings” in which health is determined (e.g. Horwitz and Finlayson, 2011), in line with the Ottawa Charter on Health Promotion (WHO, 1986). BD and ES have been connected to virtually all areas of health science and policy and the delivery of health services, and are relevant to health risk prevention, health promotion the three core areas of public health intervention: trauma (relating to injury and violence, including effects of natural disasters), infectious disease (caused by pathogens such as bacteria, viruses and parasites), and non-communicable disease (including physical and mental health, systemic illnesses, and toxicity). Some key connections between BD / ES and health are: links with nutrition and dietary health, mental health, emerging infectious diseases, bioprospecting (drug discovery from BD) and traditional medicines, disaster risk and recovery, use of BD in medical research, and the use of sentinel species in health risk assessments, (see Chivian and Bernstein, 2008; CBD & WHO, 2015; Keune et al., 2013). There is also interest in how experience and interaction with BD and ES can, in some circumstances and for some groups of people, have broader benefits for social well-being and quality of life that can boost health status.

Current scientific and policy issues

Whilst the evidence supporting linkages in some of these areas is clear (e.g. the value of BD to nutrition and drug research), other areas (particularly links with infectious disease risk and mental health) are uncertain and subject to ongoing debate. Globally, BD loss is increasingly seen as a threat to human health (Keesing et al., 2010; Myers *et al.*, 2013); however, the scalability of these relationships is often problematic; i.e. at local scales the causal relationships between health and BD/ES are often unclear: socio-economic and cultural factors and local governance structures are frequently the primary drivers of health status, determining not only the degree to which ecosystems influence health outcomes, but also how various groups of people within a given population access, utilise and value local BD and ES associated with health (see Fig. 1). This complexity leads to difficulties interpreting ES-health relationships; for example, although several studies indicate that experiences in greenspace can have mental and physical benefits for some urban populations (e.g. through “green care” activities), causative relationships relating to BD or ES are often not evident, and there is difficulty separating ecological effects from socio-economic and cultural factors (CBD and WHO, 2015). Other research gaps include: how multiple ecosystem changes (positive or negative) can interact to affect health outcomes, how the health of different groups in society are affected by particular ecosystem changes, and the degree to which human adaptation can overcome potential ecosystem-related health risks (Myers et al., 2013).

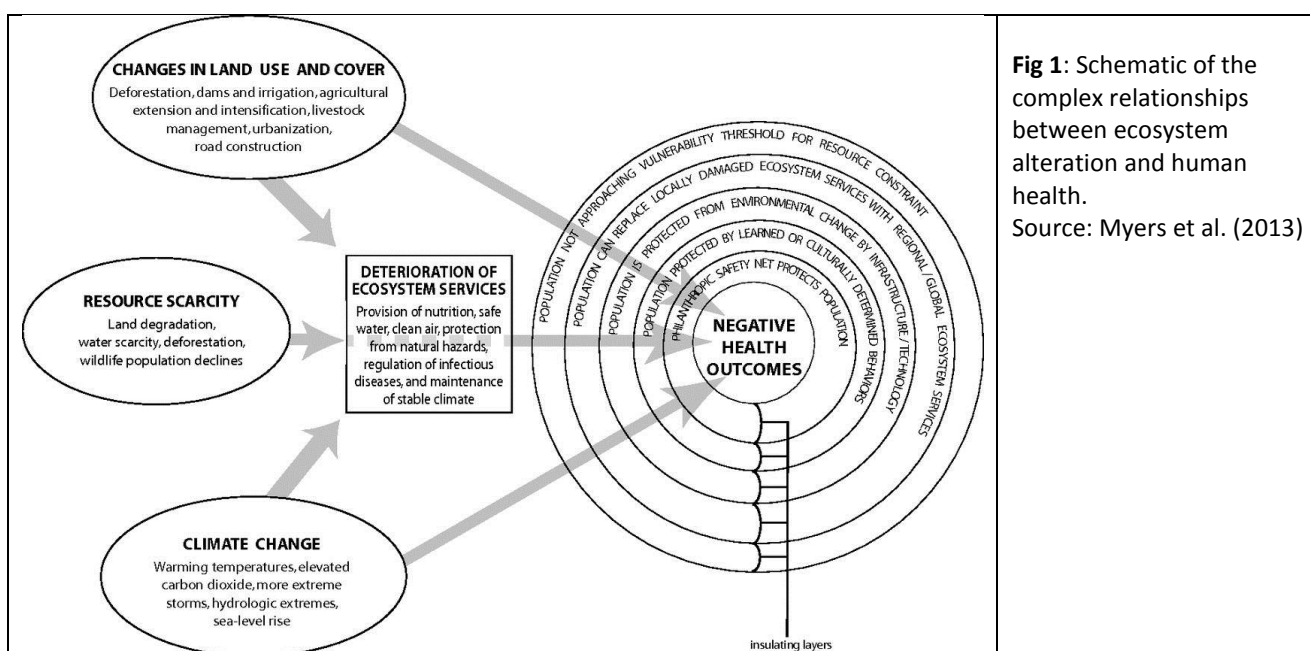


Fig 1: Schematic of the complex relationships between ecosystem alteration and human health. Source: Myers et al. (2013)

Despite these uncertainties, sustainable ecosystem management is increasingly promoted as a means of increasing health resilience (i.e. ability of people or health systems to adapt to or recover from health challenges) and reducing health risk. At the same time, there is evidence that certain vulnerable groups, including vulnerable stakeholders whose health is most at risk from loss of ecosystem services, may also be at risk from negative distributive impacts of BD conservation policies, such as strict regimes for protected area management (Bagnoli et al., 2008). Related to this, it is important to note that there can be a marked difference between the health and environment sectors (including BD and ecosystem sciences) in terms of the type and strength of evidence required to mandate an intervention or to take precautionary action (e.g. health practice is often predicated on strict epidemiological approaches including Randomised Controlled Trials, whilst sustainable ecosystem management (SEM) may be based on more indirect risk assessment; a useful summary of health research methods relevant to BD / ES is provided in IPBES, 2014 p.26). This presents a challenge to development of a robust evidence base for linking health and BD / ES across sectors, and a barrier to the development of conceptual frameworks to facilitate mainstreaming the concepts of ES and NC in the health sector. The challenge for operationalisation of ES / NC is to understand the different institutional perspectives and barriers to mainstreaming ES and NC in health policies, as well as the role which SEM and conservation may have on health outcomes. Considering its public and political importance, health represents an important opportunity to develop alternative valuation methods, focusing on non-monetary measurement of disease burden and health outcomes.

Open Problems/Issues to be discussed

1. Human health may be seen as a cross-cutting theme for ES / NC-related policy and planning, as it links with several social and economic aspects of BD and ES and to other societal challenges (e.g. climate change, competitiveness). Where is there most benefit in addressing health separately from broader perspectives of well-being? How might this affect valuation methods? Can health statistics be used directly in non-monetary valuation? What opportunities and challenges does it present for use of multi-criteria decision analysis, ES mapping and indicator development?
2. Much of the evidence base for BD/ES links to health are narrowly focussed on single health outcomes (e.g. a single physical or mental illness), however ecosystem change may result in several concurrent impacts on health. How can OpenNESS assist the development of more comprehensive assessments of health outcomes?
3. How do we tease out the differentials in health outcomes across different groups in society resulting from ecosystem change or ecosystem management options? For example, if health impacts are linked to socio-economic status, what indicators should we use to accurately assess the effects of management options?
4. The standard of evidence required to initiate an intervention in public health is often said to be far stricter than that required in ecosystem management. How do we overcome this? Can outputs from OpenNESS strengthen the evidence base, e.g. of green care and restorative benefits of nature experience?

Significance to OpenNESS and specific Work Packages²

A recent report for the European Commission (ten Brink et al., 2016) suggests strategies to promote integration of health and ES agendas should include “mapping, modelling and assessments of ecosystem condition in relation to health and social needs, increased research into health-social-nature synergies and risks, the communication of the evidence of success, and engagement with communities to help facilitate access and use of the natural environment”. OpenNESS is well placed to support these aims.

WP1 (Key challenges and conceptual frameworks) will have to unpack the dimensions of human health – in terms of health status, health risks, and public health systems – and identify evidence for linkages with BD / ES / NC, and from the use of Sustainable Ecosystem Management in promoting health and reducing health risk. This should be placed in the wider context of well-being (linking to SP “Human Well-being”). WP1 should consider whether the project outputs lend any support to recent

² For a brief description of the OpenNESS Work Packages see: <http://openness-project.eu/about/work-packages>

arguments (e.g. Huber *et al.*, 2011) that the notion that the definition of health should be expanded, particularly in the context of risk and resilience. WP1 should also consider whether the issue of “ecosystem disservices” to health and well-being could be better addressed in conceptual frameworks.

- WP2 (Regulatory frameworks and drivers of change)** will need to understand the key policy drivers in the health and BD / ES sectors, and other cross-cutting policy drivers (such as in agriculture and food, tourism, trade, climate change etc.) that support, mandate or confound efforts to link health and ES / NC.
- WP3 (Biophysical control of ecosystem services):** The influence of culture and socio-economic status on health outcomes, and on the way in which BD / ES / NC influence health, will be a particular challenge for the development of ES mapping tools.
- WP4 (Valuation of the demand for ecosystem services):** While economic valuation of health issues are important (e.g. costs of work absences, value of medicines from nature etc.), the challenge of non-monetary and integrated ES valuation is particularly relevant for health. Selection of non-monetary metrics may offer opportunities to examine health dependence on ES; health may also be factored into multi-criteria decision analysis tools. WP4 could also explore how existing health sector indicators can be incorporated into operationalising ES / NC concepts for the health sector, and how they might be implemented more widely as indicators for nature-based solutions and competitiveness. Might methods of social epidemiology and ethnography be useful?
- WP5 (Place-based exploration of ES and NC concepts):** Case studies should consider evidence for links between ES / NC / SEM and health within their geographic and thematic research areas. Is ES / NC a key determinant of health status? Does it support resilience and competitiveness through health effects?
- WP6 (Integration: Synthesis and Menu of Multiscale Solutions):** To ensure coherence, development of policy recommendations should consider mainstreaming in both directions – i.e. not only how ES / NC can be of benefit to health policy, but how health aspects should be factored into biodiversity strategies and action plans.

Relationship to four challenges³

<p>Human well-being: Health is a major factor in measures / reports of subjective and objective well-being. Health is closely linked with economic well-being – i.e. the ability of an individual to manage or care for their health, or that of their family or wider community, is strongly linked with economic security.</p>	<p>Sustainable Ecosystem Management (SEM): If ecosystems are viewed as settings for health, then SEM has many potential positive and negative impacts on health. e.g. habitat creation, conservation and restoration can improve health outcomes & resilience against future health risks, however potential negative impacts of nature conservation policies on health may arise as distributive impacts. Diseases from nature affecting humans, crops and livestock represent a further challenge for SEM.</p>
<p>Governance: ES and health links provide multiple opportunities for cross-sector, cross-government partnerships in policy development – e.g. all areas related to use, development or management of land and natural resources, including those regulating or influencing public access. Also scope for integration where policy-driven changes in BD or ES can affect health outcomes.</p>	<p>Competitiveness: Public health is an important element in social competitiveness (i.e. relating to social cohesion, justice and well-being of a population), particularly in the context of health equity. Also relates to economic competitiveness - in terms of direct benefits to private sector health companies. Links with environmental competitiveness (i.e. relating to how natural capital is recognised, utilised and secured) in context of maintaining the flow and sustainability of ES related to health.</p>

³ There are certainly more societal challenges; the reduced number presented here is due to the four major challenges mentioned in the work programme of FP7 to which OpenNESS responded.

Recommendations for the OpenNESS consortium

- We propose the following definition for Ecosystem Approaches to Health: “Systemic, transdisciplinary approaches, engaging with the health sciences, and health policy and practice, that take account of the intimate and complex linkages between biodiversity, ecosystems and human health”.
- It would be good to develop a model for the ecological determinants of health in Europe, and explore the potential for use of ES / NC concepts in the framework of environmental determinants of health.
- The consortium should aim to explore the linkages between BD / ES / NC / SEM and resilience in health systems, and resilience in the health of populations. This will be particularly relevant in the contexts of well-being (see SP “Human Well-being”) and competitiveness (see SP “Competitiveness”).

Three Key Papers

Horwitz, P. & C.M. Finlayson (2011): Wetlands as settings for human health: incorporating ecosystem services and health impact assessment into water resource management. *BioScience* **61(9)**: 678-688.

Myers, S.S. *et al.* (2013): Human health impacts of ecosystem alteration. *Proceedings of the National Academy of Sciences* **110(47)**: 18753-18760.

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Further Literature or cited References

Bagnoli, P.; Goeschl, T. & E. Kovács (2008): *People and Biodiversity Policies Impacts, Issues and Strategies for Policy Action: Impacts, Issues and Strategies for Policy Action*. OECD Publishing.

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McMichael, A.J. (2009): Human population health: sentinel criterion of environmental sustainability. *Curr. Opin. Environ. Sustain* **1**: 101–6.

OECD (2012): *Health at a Glance: Europe 2012*, OECD Publishing.

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ten Brink P. *et al.* (2016) *The Health and Social Benefits of Nature and Biodiversity Protection – Executive summary*. A report for the EC (ENV.B.3/ETU/2014/0039), Institute for European Environmental Policy, London / Brussels.

UNEP (2014): *Biodiversity and Health*. Draft decision submitted by the chair of Working Group 1 at the 12th Meeting of the Conference of the Parties to the UN Convention on Biological Diversity, Pyeongchang, Republic of Korea, 6-17 October 2014. Available at <http://www.cbd.int/cop12/insession> (accessed 14/11/2014)

WHO (1986): *The Ottawa Charter for Health Promotion: Declaration from the First International Conference on Health Promotion, Ottawa, 21 November 1986*. WHO, Geneva.

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