Biodiversity and Health

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Training session on SBSTTA 26 substantive agenda items April 2nd 2024 Online

Funded by the European Union

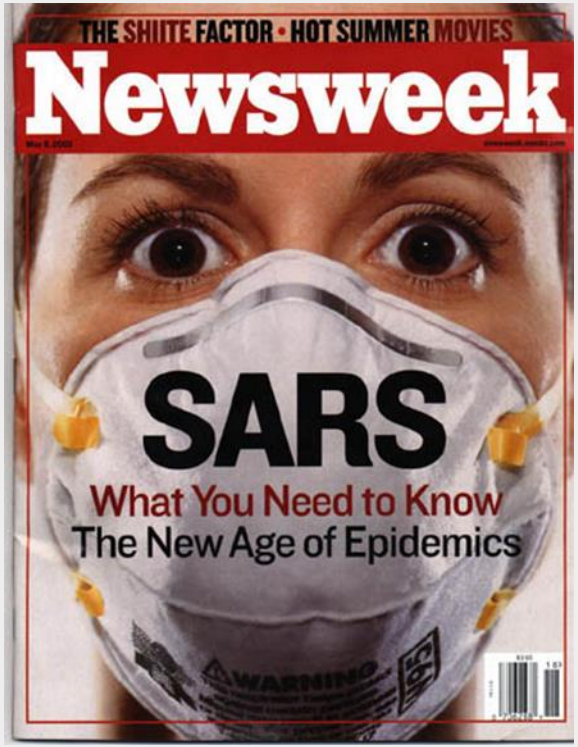
Background for the presentation

- **Basic information** to understand the history and context of biodiversity and health and issues, identified by COOP4CBD*, focused on technical aspects and with political context
- **Gaps in knowledge** on the topic
- **Key targeted narratives** to drive negotiations on mainstreaming biodiversity for the health sector
- Support to draft **Global Action Plan** to mainstream biodiversity and health linkages into national policies, strategies, programmes and accounts

*CBD/COP/DEC/15/29 19 December 2022 using: the IPBES REPORT, narratives from COVID 19 (pandemic origin & risk), contemporary One Health developments (quadripartite), calls for sustainable consumption/production in human economy, humancentric view on natural resources and medicines value, and opportunity to use traditional knowledge to reexamine human development pathways in the context of environment.

Wildlife Disease

Biodiversity & Health Evidence



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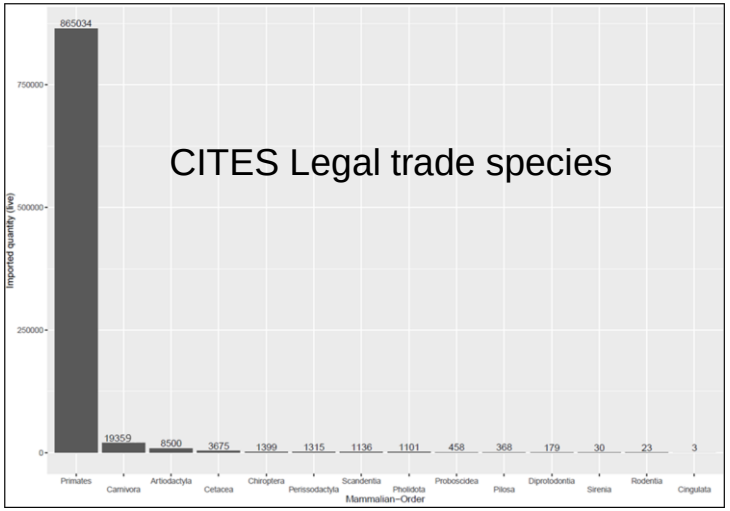
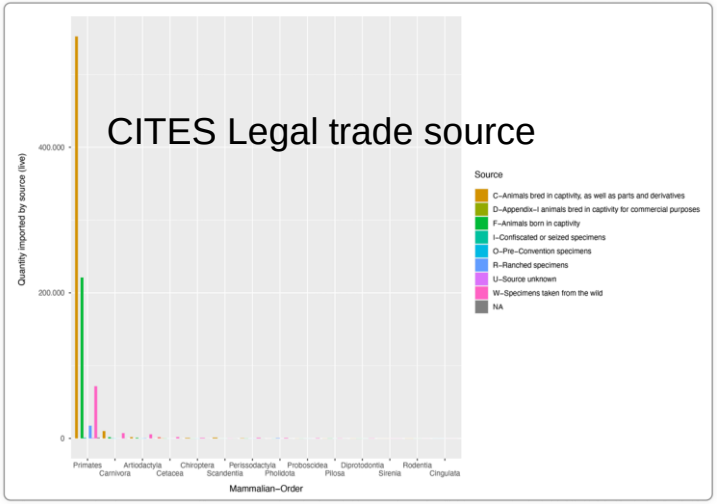
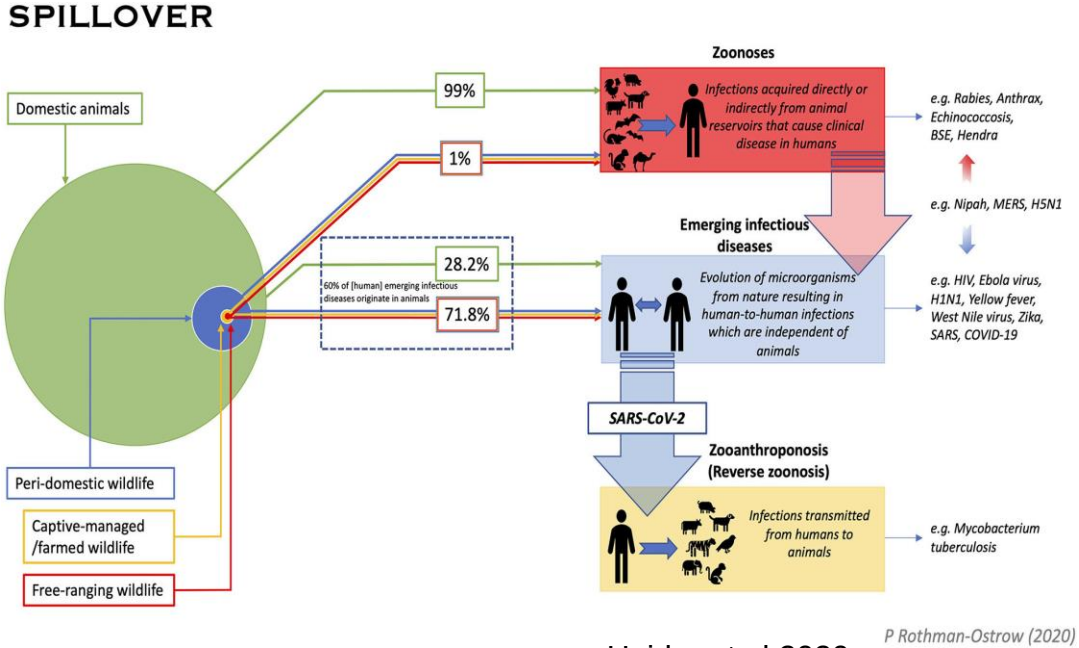
Wildlife

- Strong narrative around emerging disease and wildlife sources.
- This is based on a general principle that novel organisms ultimately must arise from biodiversity (zoonotic).
- The rare events that do occur usually require intermediary (domestic or peridomestic) hosts/vectors and anthropogenic actions to drive events or emergence.
- Wildlife trade source – legal negligible and illegal unknown
- Absence of data





Wildlife is often described as the major source of emerging pathogens – is this true?



If you include non-animal source of emerging human pathogens – wildlife ultimate source <43%

Haider et al 2020
https://doi.org/10.3389/fpubh.2020.596944

Biodiversity suffers disease and ill health

Natural disease ecological processes, arguably, sustain health in populations.

Anthropogenic influences and stressors – starvation, disturbance, pollutants, climate change, disease exposure from humans and domestic animals – unbalanced threat.

Mass Mortality Events greatest threat to biodiversity and populations – expression of populations exceeding thresholds of resilience.

Urban wildlife and disease vectors

Creation of artificial habitats supporting anthropophillic mosquitos and infection e.g. A aegypti Dengue Fever

•Getachew et al 2015 DOI: 10.1155/2015/706276

Greening Urban spaces – risk of vector or pathogen host increase?

Evidence suggests:

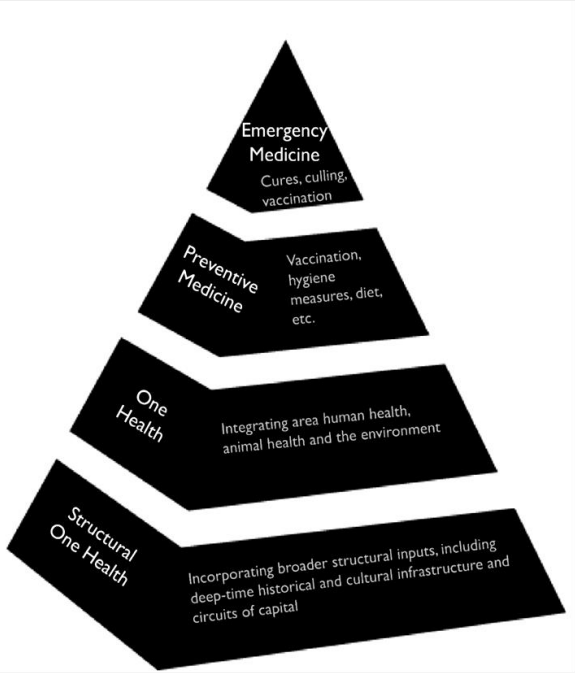
If biodiversity is principle of urban greening, risk is low – ecosystemic stabilities – e.g. insect predators and dilution effects.

Increased rodent diversity, associated with natural forest, likely reduces risk of viral exposures e.g. lassa fever virus
D.Simons 2023 PhD thesis

If based on monocultures of vegetation + animals occupying sterile human domain, vector pathogen risk is higher + also higher incidence of allergic reactions through aerial pollen monocultures.

Biodiversity and Health

Transdisciplinarity



Wallace et al 2014

doi:10.1016/j.socscimed.2014.09.047

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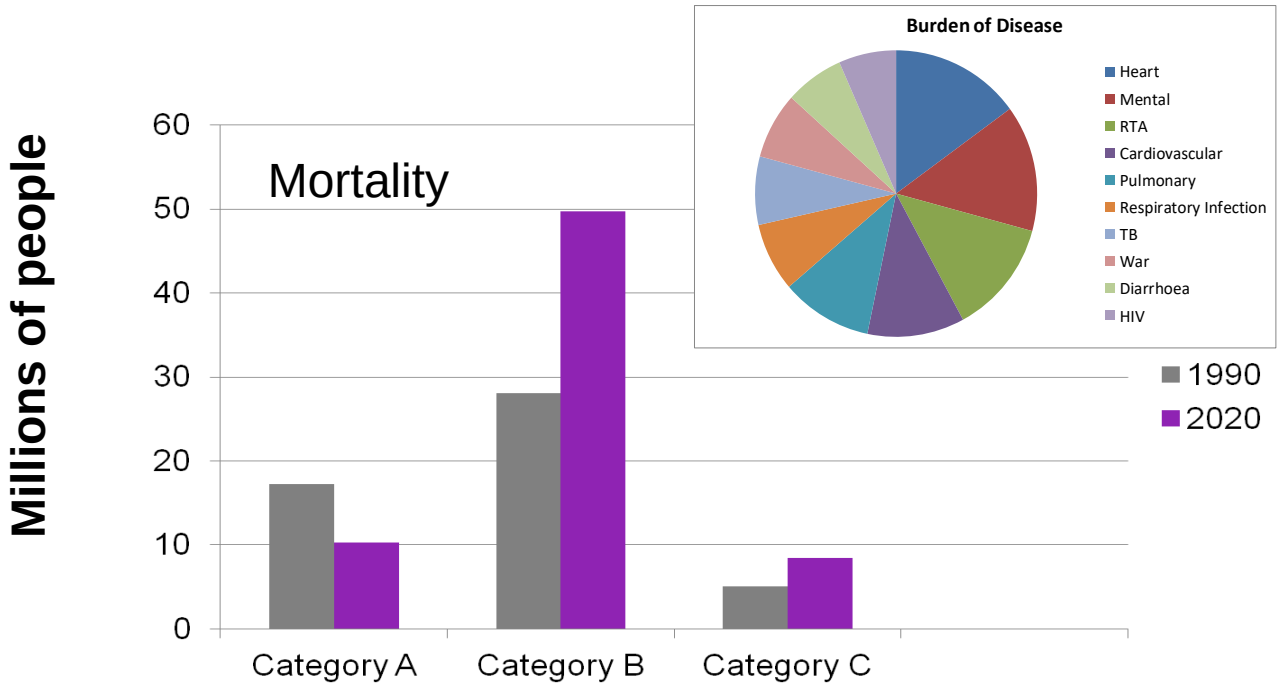
Sustainable Development Goals and One Health (historically) Humancentric

- One Health is an integrated, unifying approach that aims to sustainably **balance and optimize the health of people, animals and ecosystems**. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent. The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development (Quadripartite Advisory Panel)

Global trends in **human** health



Category A communicable maternal, perinatal, and nutritional disorders

Category B non-communicable disease

Category C injury

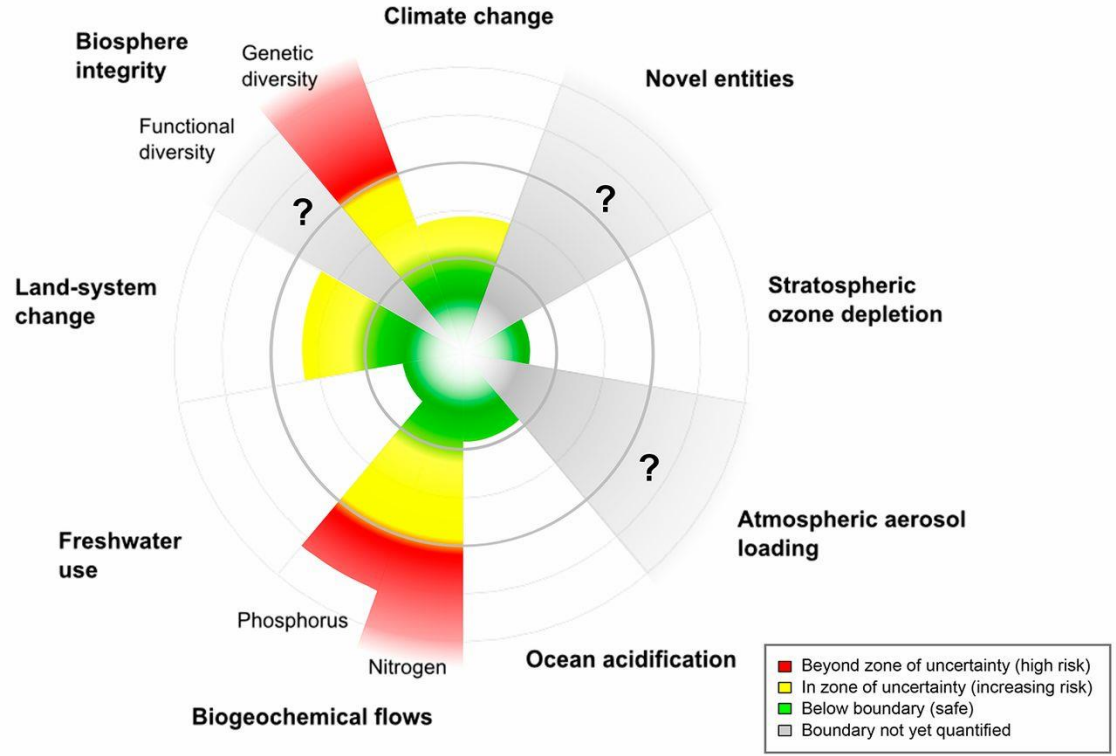
Murray and Lopez 1997

Global trends in **animal** health

- **Animal Mortality**

1. Deliberate killing
2. Starvation
3. Accidental death
4. Parasites
5. Microbial infection
6. Heat or cold
7. Plant toxins
8. Poisons, pollution
9. Thirst
10. Metabolic disease

Global trends in **ecosystems health**



Scientific Reviews Databases

Biodiversity and Health

The 7 anthropogenic drivers of disease emergence described in the UNEP report (UNEP & ILRI, 2020) are:

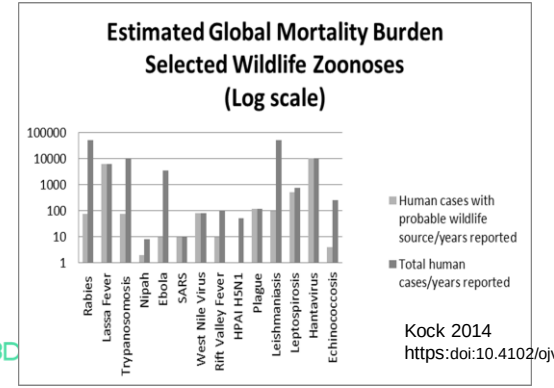
- (1)* Increasing demand for animal protein;
- (2)* Unsustainable agricultural intensification;
- (3)** Increased use and exploitation of wildlife;
- (4)** Unsustainable utilization of natural resources accelerated by urbanization, land use change and extractive industries;
- (5)* Travel and transportation;
- (6)* Changes in food supply chains;
- (7)*** Climate change.

Evidence base:

** significant in endemic and emergent zoonoses*
***weak with indirect evidence to suggest their role in this process (facilitating drivers).*
****moderate with climate change, with a general impact on distribution of hosts, vectors, and pathogens, with associated new emergences and spreading of diseases across geographies. These are often not novel pathogens themselves (yet still described as EIDs), for which there is little direct evidence for a climate effect on their evolution, so far…..*

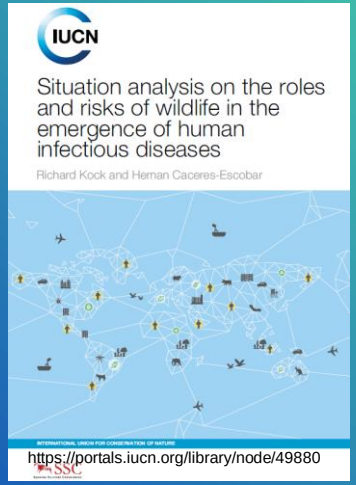
Recent in-depth reviews on Biodiversity and Health issues

Major reports around disease issues from wildlife show broad agreement but some contradictions*, mainly the fact that there is little evidence to support direct wildlife human infection as a regular cause of human disease.

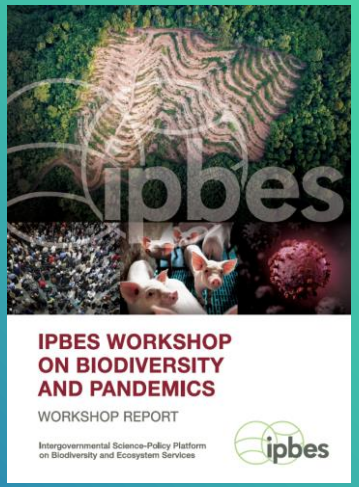


Kock 2014
https:doi:10.4102/ojvr.v81i2.739

Wildlife and Human Disease Emergence



https://portals.iucn.org/library/node/49880



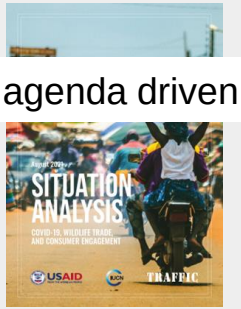
Semi-systematic review*

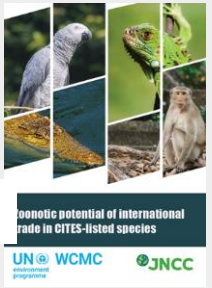
Expert opinion*

Science or Narrative, arising from COVID-19?

Biodiversity and Health

Opportunism agenda driven





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frontiers in Public Health

SYSTEMATIC REVIEW
published: 18 March 2020
doi: 10.3389/fpubh.2020.00052

Nature's Contributions to Human Health: A Missing Link to Primary Health Care? A Scoping Review of International Overview Reports and Scientific Evidence

Laura Lauwers[1]*, *Hilde Bastiaens*[1], *Roy Remmen*[1] and *Hans Keune*[1,2]

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Nature's contributions to human health (NCH) have gained increased attention internationally in scientific and policy arenas. However, little attention is given to the role of the health care sector in this discussion. Primary health care (PHC) is a vital backbone for linking knowledge and practice within the organization of health care. The objective of this scoping review is to evaluate how international overview reports and scientific literature on NCH address to PHC. More specifically, we extracted data on arguments, practice supporting tools and guidelines, challenges and constraints, and management approaches to integrate NCH and PHC. The scientific literature search was run in Web of Science. Two independent reviewers screened the scientific publications. Through the scientific literature search, we identified 1,995 articles of which 79 were eligible for analysis. We complemented the search with a selection of six international overview reports. Both the international overview reports and the scientific publications paid limited attention to the role of PHC regarding NCH. To cope with the current challenges and constraints to integrate NCH and PHC, more evidence on NCH, further development of PHC practice supporting tools, bottom–up integrated approaches, and closer interdisciplinary collaborations are required.

Keywords: primary health care, nature, health, infectious diseases, natural disasters, medicinal plants, nature-based care

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Specialty section:
This article was submitted to Planetary Health, a section of the journal

Main conclusions:

PHC in NCH not fully recognized

Most clearly defined in "nature-based care" / disease prevention green prescriptions & "medicinal plants" / traditional medicine

Lack of specific tools to support PHC practices

Importance of "context" to integrate NCH and PHC: patient's history and background & context of the PHC professional and of the health issue

Overall, knowledge on NCH in PHC in its infancy in both science and practice

One Health approach: strengthen collaboration environmental, human, and animal health care sectors for disease control and prevention

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Urban natural environments as nature-based solutions for improved public health – A systematic review of reviews

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The results show strong evidence benefit on e.g. cardiovascular health and reduced heat stress related disease

ARTICLE INFO

Keywords:
Nature-based solutions
Green spaces
Systematic review
Evidence
Public health
Urbanisation
Heat stress
CVD-mortality
Positive affect
Mental health

ABSTRACT

Increasing urbanisation, innovative strategies for providing healthy and sustainable cities, now and in the future. The recently coined concept, Nature-based solutions (NBS), is one such strategy referring to *actions that are inspired by, supported by, or copied from nature*, designed to address a range of environmental challenges. The objective with this article is to evaluate the evidence on public health benefits of exposure to natural environments and explore how this knowledge could be framed within the NBS concept. We conducted a systematic review of reviews following established methodology, including keyword search in several databases, predefined inclusion criteria, and a data extraction in accordance with the PICOS structure. We reviewed literature on associations between public health and natural environments in relation to pathways – sociobehavioural/cultural ecosystem services (e.g. stress and physical activity) and regulating ecosystem services (e.g. heat reduction) – or defined health outcomes (e.g. cardiovascular mortality). The results show that there is strong evidence for improved affect as well as on heat reduction from urban natural environments. These conditions may mediate the effect seen on cardiovascular disease (CVD)-related mortality by exposure to natural environments. By also reviewing existing literature on NBS and health, we phrase the results within the NBS context, providing guidelines on how public health and well-being could be integrated into implementation of NBS for resilient and liveable urban landscapes and health in a changing climate.

Table 1 | Balance of evidence linking biodiversity to ecosystem services

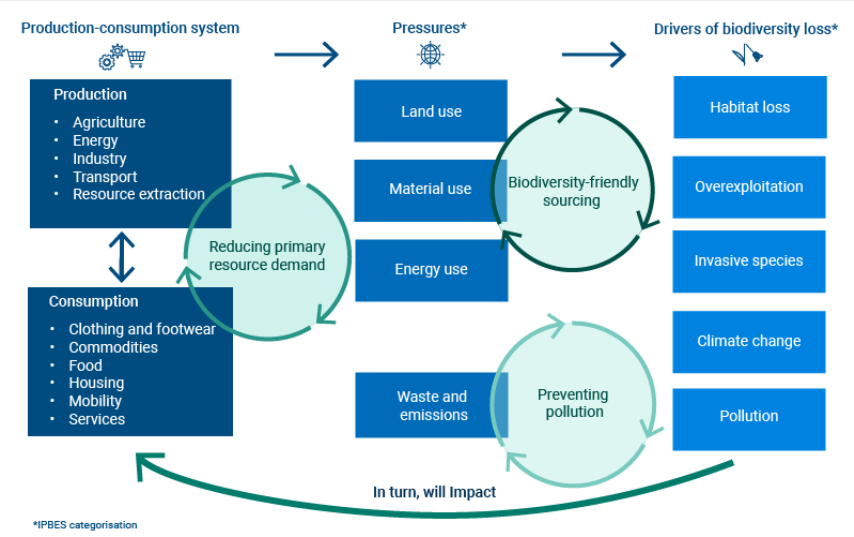
Category of service	Measure of service provision	SPU	Diversity level	Source	Study type	*N*	Relationship: Predicted	Relationship: Actual
Provisioning								
Crops	Crop yield	Plants	Genetic	DS	Exp	575	↗	↗
			Species	DS	Exp	100	↘	↗↘
Fisheries	Stability of fisheries yield	Fish	Species	PS	Obs	8	↗	↗
Wood	Wood production	Plants	Species	DS	Exp	53	↗	↗
Fodder	Fodder yield	Plants	Species	DS	Exp	271	↗	↗
Regulating								
Biocontrol	Abundance of herbivorous pests (bottom-up effect of plant diversity)	Plants	Species	DS*	Obs	40	↗	↗
		Plants	Species	DS†	Exp	100	↗	↗
		Plants	Species	DS‡	Exp	287	↘	↗↘
		Plants	Species	DS§	Exp	100	↗↘	0
	Abundance of herbivorous pests (top-down effect of natural enemy diversity)	Natural enemies	Species/trait	DS*	Obs	18	↗	↗
		Natural enemies	Species	DS†	Exp/Obs	266	↗	↗
		Natural enemies	Species	DS‡	Exp	38	↘	↗↘
	Resistance to plant invasion	Plants	Species	DS	Exp	120	↗↘	↗↘
	Disease prevalence (on plants)	Plants	Species	DS	Exp	107	↗	↗
	Disease prevalence (on animals)	Multiple	Species	DS	Exp/Obs	45	↘	↗↘
Climate	Primary production	Plants	Species	DS	Exp	7	↗↘	0
	Carbon sequestration	Plants	Species	DS	Exp	479	↗	↗
	Carbon storage	Plants	Species/trait	PS	Obs	33	↘	↗↘
Soil	Soil nutrient mineralization	Plants	Species	DS	Exp	103	↗	↗
	Soil organic matter	Plants	Species	DS	Exp	85	↗	↗
Water	Freshwater purification	Multiple	Genetic/species	PS	Exp	8	↗↘	0
Pollination	Pollination	Insects	Species	PS	Obs	7	↘	↗↘

For each ecosystem service we searched the ISI Web of Knowledge for published data syntheses (DS). The footnote symbols in the 'Source' column refer to different syntheses. When a synthesis was not available, we completed our own primary search (PS, see Box 2). Detailed results are given in Supplementary Table 2. Data presented here are summarized as follows: green, actual data relationships agree with predictions (whether service increases or decreases as diversity increases); yellow, Data show mixed results; red, data conflict with predictions. Exp, experimental; *N*, number of data points; Obs, observed; SPU, service providing unit (where natural enemies include predators, parasitoids and pathogens). Note that 13 ecosystem services are not included in this table due to lack of data (<5 relationships, see Supplementary Table 2).

Cardinale et al 2013

Monetary benefits

Biodiversity and Health



To biodiversity (EEA report circular economy 2023)

From biodiversity in reducing health costs…..
through NATURE BASED SOLUTIONS

Nature Based Solutions to economy

- Mental health problems cost UK economy at least £118 billion a year (LSE 2022)
  - Human–nature interaction throughout the life-course have generally demonstrated potential beneficial associations with mental health and well-being. However, inconsistencies exist in the evidence available in terms of their applied methodologies and reported findings. Spano et al 2021
- Exposure to biodiversity general positive physical and immunomodulatory effect and developmental (microbiome) effect vital to health
  - Improved general health reduces primary health costs and economic losses through inactivity

UN systems

Biodiversity and Health

- Health of humans, ecosystems (environment), and agriculture “covered”….**but not biodiversity and health**

Healthy Planet Healthy People

Figure 1.2.3: Biodiversity is the fundament for all life on the planet

Health "is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

Biological diversity (biodiversity) is "the variability among living organisms from all sources including, interalia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

Biodiversity underpins ecosystem functioning and the provision of goods and services that are essential to human health and well being.

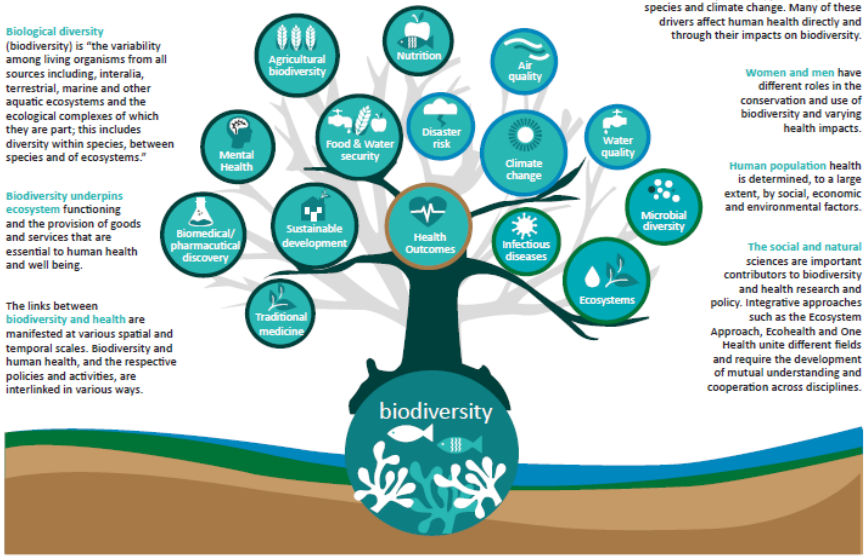
The links between **biodiversity and health** are manifested at various spatial and temporal scales. Biodiversity and human health, and the respective policies and activities, are interlinked in various ways.

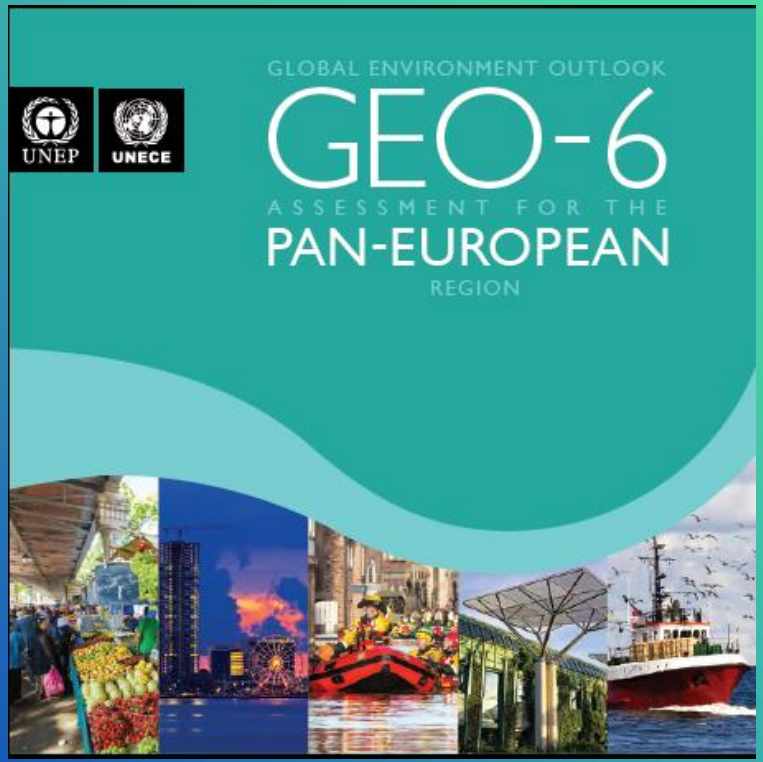
Direct drivers of biodiversity loss include land-use change, habitat loss, over-exploitation, pollution, invasive species and climate change. Many of these drivers affect human health directly and through their impacts on biodiversity.

Women and men have different roles in the conservation and use of biodiversity and varying health impacts.

Human population health is determined, to a large extent, by social, economic and environmental factors.

The social and natural sciences are important contributors to biodiversity and health research and policy. Integrative approaches such as the Ecosystem Approach, Ecohealth and One Health unite different fields and require the development of mutual understanding and cooperation across disciplines.





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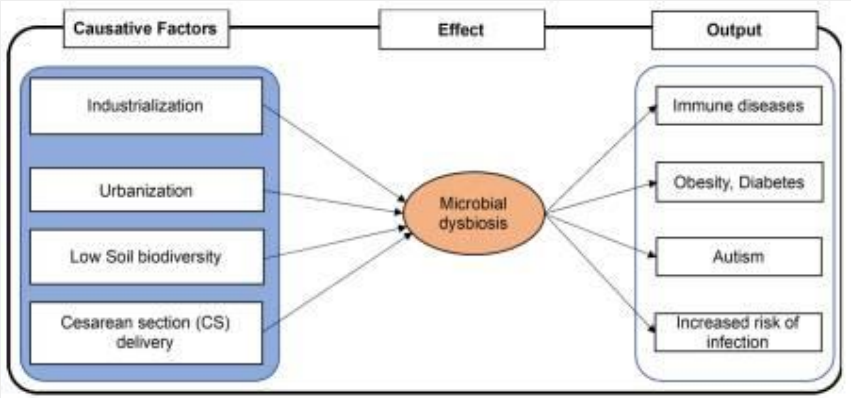
MEAs

Biodiversity and Health

- Numerous MEAs with some linkage to health outcomes, whether biodiversity, reducing trade risks to health, migration health concerns, pollution and microbial systems decomposers, chemicalisation, genetic resources and manipulations, heritage and culture etc.

Green Space and Health

Biodiversity and Health



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The relationship of physical activity and overweight to objectively measured green space accessibility and use☆

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ARTICLE INFO

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Keywords:
Accessibility
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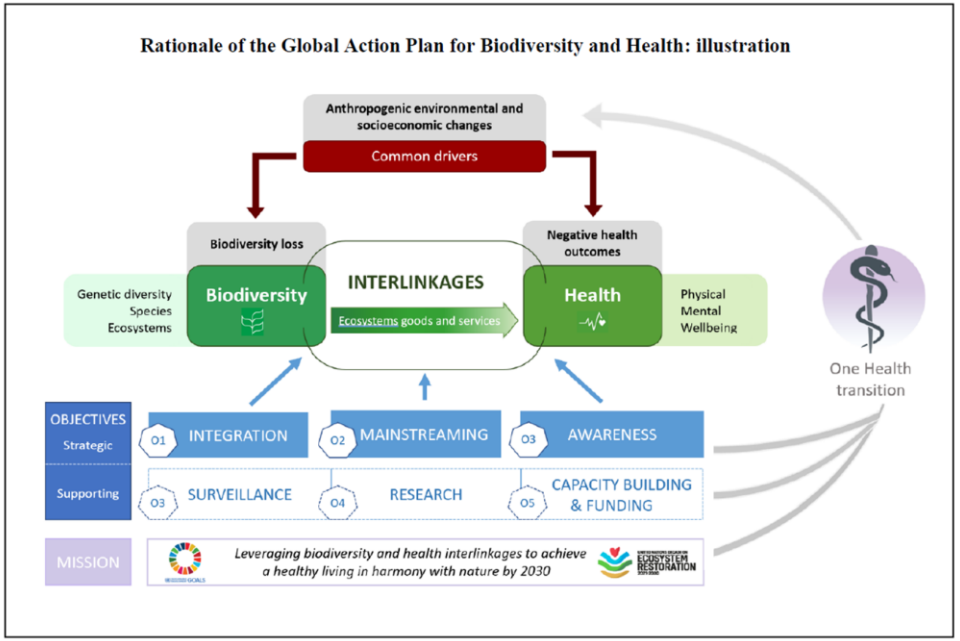
Utilisation
UK

ABSTRACT

This study examines the association between objectively measured access to green space, frequency of green space use, physical activity, and the probability of being overweight or obese in the city of Bristol, England. Data from the 2005 Bristol Quality of Life in your Neighbourhood survey for 6821 adults were combined with a comprehensive GIS database of neighbourhood and green space characteristics. A range of green space accessibility measures were computed. Associations between accessibility and the odds of respondents achieving a recommended 30 min or more of moderate activity five times a week, or being overweight or obese, were examined using logistic regression. Results showed that the reported frequency of green space use declined with increasing distance. The study also found that respondents living closest to the type of green space classified as a Formal park were more likely to achieve the physical activity recommendation and less likely to be overweight or obese. The association with physical activity, but not with overweight or obesity, remained after adjustment for respondent characteristics, area deprivation, and a range of characteristics of the neighbourhood environment. The findings suggest that the provision of good access to green spaces in urban areas may help promote population physical activity.

Indicators on interlinkages

Biodiversity and Health



Biodiversity & Human Health indicators/linkages

- Natural animal and plant resource historically sustained nutrition of human populations directly, now more indirectly.
- Natural resource provided majority of medicinal products historically, subsequently chemically analysed and synthesised.
- Contribution of natural resource to livelihoods, infrastructure, housing and economical wealth of humans.
- Contribution of nature to human mental health and well-being through exposure to a biodiverse environment, animals and plants.
- Developmental and microbiome benefits from exposure to natural environment
- Contribution of biodiversity to agriculture (e.g. pollinators) and sustained nutrition
- Contribution of microbial biodiversity to decomposition, nutrient and energy recycling.
- Contribution of nature to clean air and water, atmosphere and climate stability.

co-benefits of conservation & ecological restoration

Biodiversity and Health

Ecosystem services

- **Ecosystemic stabilities restored**
- **Biodiversity conserved**

Clean air and water
Climate buffer
Natural waste processing (decomposers)
Pathogen dilution effect (someX countered by amplification)
Pathogen buffering (reduced environmental load)
Opportunity for diverse quality nutrition (fish and terrestrial animal harvest)

Conclusive narrative

Biodiversity and health have a nexus, expressed mostly in human terms (impact, benefit), and less so in health of animals and plants but the natural ecologies are fundamental to population health. Microbial community is a neglected element, vital with positive and negative interactions with higher animals, and where ecosystemic stabilities are dependent on biodiversity and ecosystems integrity and function. Current global systems do not address biodiversity and health in any meaningful way, and no UN institution has the mandate for this.

International and even less so National health agencies are not focused on wildlife or biodiversity in any significant way.

Interactions are complex and poorly researched or understood with strong narratives, created from a vacuum.

Methodologies are lacking and capacities highly deficient.

Rather like environment, generally, biodiversity and health are casualties to human development and activity not dissimilar to climate and health, and perhaps should be tackled in a similar manner. Fundamental to existence of life, requiring global implementable policies and regulatory mechanisms that are enforceable. Achieving circular economies, post humanist in outlook, supportive of biodiversity and ecosystems, rather than subsumed to circuits of capital in decline along with natural resources.

Thank you for your attention!

Richard Kock

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