GERC/UK Future Earth Agenda-setting Workshop

Natural Resources and Human Health

Chicheley Hall, 16-17th October 2017

Introduction

The relationship between natural resources and human health is complex, multidimensional and dynamic. Human progress has taken place in interaction with the Earth's natural systems over millennia. Our food systems have been supported by sustainable ecosystem services, forests have provided clean air and regulated water cycles, while nature has contributed to physical and mental wellbeing. Resources including minerals, soils, seas and ecosystems have provided shelter, fuels, food, raw materials and medicines. Human use and stewardship of natural resources have shaped huge gains for human health and wellbeing.

However, this use has led to unsustainable patterns of resource consumption and environmental change, compounded by rapid population and economic growth in recent decades. These changes, captured in the concept of the Anthropocene, pose serious challenges not only the sustainability of natural environment but also to human health and wellbeing.

This report summarises the outcomes of an agenda-setting workshop addressing the nexus of environmental change, natural resources, human health and wellbeing held in October 2017. It brought together research, policy and practitioner communities from health and environmental resources management, to explore new interdisciplinary opportunities for the Global Challenges Research Fund (GCRF) and other UK and international funders. The Sustainable Development Goals (SDGs) were identified as a useful framework to structure consideration of the global challenges at this nexus of human health and natural resources in a more integrated way.

The aims of the workshop were to:

- Discuss and identify interdisciplinary research priorities relating to human health and natural resources;
- Make recommendations for the Global Challenges Research Fund and other funders to support and deliver an international research agenda with societal impacts; and
- Build new relationships and partnerships for future work.

The workshop was a contribution to UK Future Earth, organised with support from the Global Environmental Research Committee (GERC) of The Royal Society. It was held at The Kavli Royal Society International Centre, Chicheley Hall, on 16-17th October 2017, with 37 participants from academic research, policy making, civil society organisations and business.[1]

[1] The Steering Committee members: Kirsti Ashworth (Lancaster), Frans Berkhout FAcSS (KCL, chair of UK Future Earth), John Ingram (Oxford's Environmental Change Institute, member of GERC), Andy Haines FMedSci (LSHTM), Pete Smith FRS (Aberdeen, member of GERC), with support from Ruth Cooper and Sarah Giles (Royal Society staff).

Sustainable Development Goals as a lens

The Sustainable Development Goals (SDGs) are a set of global social, economic and environmental goals, agreed by countries at the United Nations General Assembly in 2015 (Figure 1). These seventeen goals and 169 associated targets have become a common framework for setting priorities for national and international sustainable development policies. Intended to be viewed as indivisible, the SDGs also bring attention to the complex interactions, synergies and trade-offs that exist between different goals and targets at a global, national or local level.[2]

Figure 1: The Sustainable Development Goals

The World Health Organisation (WHO) has observed that although only one SDG (SDG3) is directed at human health, 16 of the 17 goals affect the health and wellbeing of people. The consensus at this workshop was that the SDGs provide a generative lens for understanding the nexus between natural resources, environmental change and human health, providing a useful perspective with which to identify and explore interactions, while also serving as a context for understanding the policy significance of investments in research, evidence and synthesis. The objective of developing more integrated and solutions-oriented research, exemplified by Future Earth, could be significantly advanced by using the SDGs as an agenda-setting frame (see Figure 2 for one visualisation of SDG interactions)[3]. In addition to recognising the complexity of mechanisms and interlinkages with many SDGs, such interactions also offer opportunities. For instance, a proposed adaptation strategy that was initially aiming to contribute towards a given SDG may have a direct or indirect positive impact on other SDGs.

[2] Nilsson, M., Griggs, D. and Visbeck, M. (2016) Map the interactions of Sustainable Development Goals. *Nature*, 534: 320-322.

[3] International Council for Science (ICSU), 2017. *A Guide to SDG Interactions: from Science to Implementation* [D.J. Griggs, M. Nilsson, A. Stevance, D. McCollum (eds)]. ICSU, Paris

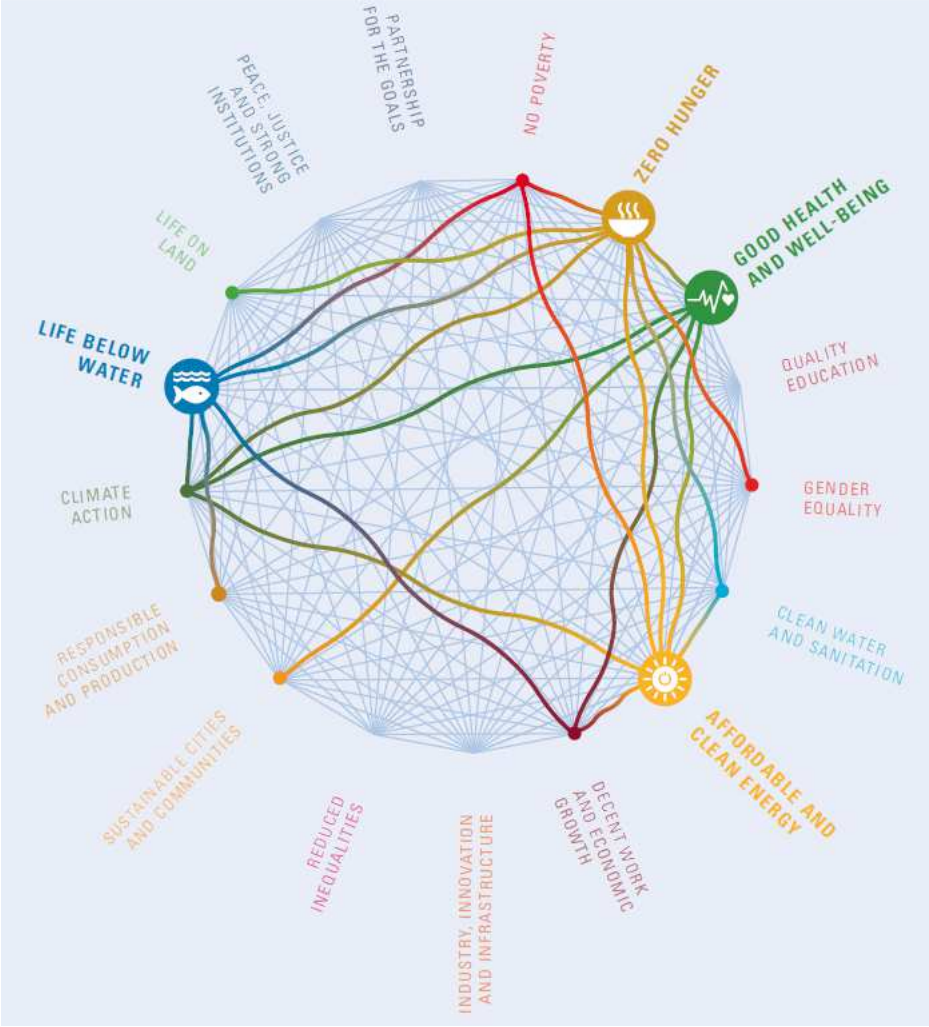


Figure 2: Illustrating SDG interactions (ICSU, 2017)

Research Priorities

Through plenary and small group discussions, guided by experts in research, policy and practice, the workshop developed several priorities for research on the natural resources, environmental change and human health nexus. Themes which offered significant scientific challenges, while also promising global impacts measured by human health or sustainability outcomes, were identified and are summarised below. The priorities also took account of the need for research, policy and practice to move towards addressing interactions amongst SDGs. In each case, we have indicated for which SDGs research under the priority could be relevant.

1. *Mechanisms, interactions, pathways, and trajectories of change: Models and metrics*

Multiple, dynamic and complex interconnections exist between natural resources, environmental change and human health. These are only partially characterised and understood, while the evidence base and modelling effort remains thin. There has been a major growth in scientific and policy interest in the nexus of natural resources and health over the past decade, with the

establishment of new research centres and programmes and several path-breaking reports and initiatives (for example, the Lancet/Rockefeller Commission on Planetary Health, Healthy Environment Healthy Planet/UNEP, Our Planet Our Health/Wellcome, European Commission Environment and Health programmes). These all point to the need for a major, interdisciplinary effort to understand basic mechanisms, interactions, pathways of influence and the impacts of interventions. They also highlight the need for a new generation of models and metrics which seek to integrate environmental and human health across different scales. This challenge calls for fundamental science and evidence, across spatial levels from the molecular to the globe, and across temporal levels from days to generations, as well as the development of new observational and data science tools and techniques. Delivery will bring health and environmental research together in new ways. The new emphasis is needed because health and environment are intrinsically linked: ecosystem health is an essential prerequisite for human health, and (to some degree) vice versa; both aspects should be considered together.

Especially relevant for SDGs 2, 3, 6, 11,12, 13, 14, 15

2. Ecologically sustainable food systems and healthy diets

Research on food security continues to be dominated by a 'productionist' outlook – focused on meeting the nutritional demands (mostly expressed in calories) of a growing and more affluent global populations. Historically, this has been achieved through improved productivity (yield growth and intensification) and the extension of agriculture lands. There are well-known environmental costs to this approach, with significant implications for local and global environmental change, including impacts on water, soils, biodiversity and climate. Food systems are themselves subject to natural resources degradation and growing environmental and climate risks.

While hunger and undernutrition (including nutrient deficiencies, or 'hidden hunger') continue to be a challenge for many, the greatest health problems associated with food and diet (measured in terms of the global burden of disease), across incomes, is now overconsumption and obesity. Global food systems, as they are now configured, are unsustainable from both environmental and health perspectives. Current research and policy efforts need to respond to the clear need to transform food systems, including aquaculture, to be ecologically sustainable while promoting greater human health and well-being. More research into dietary choices and changes in food quality are important aspects of this.

Especially relevant for SDGs 2, 3, 12

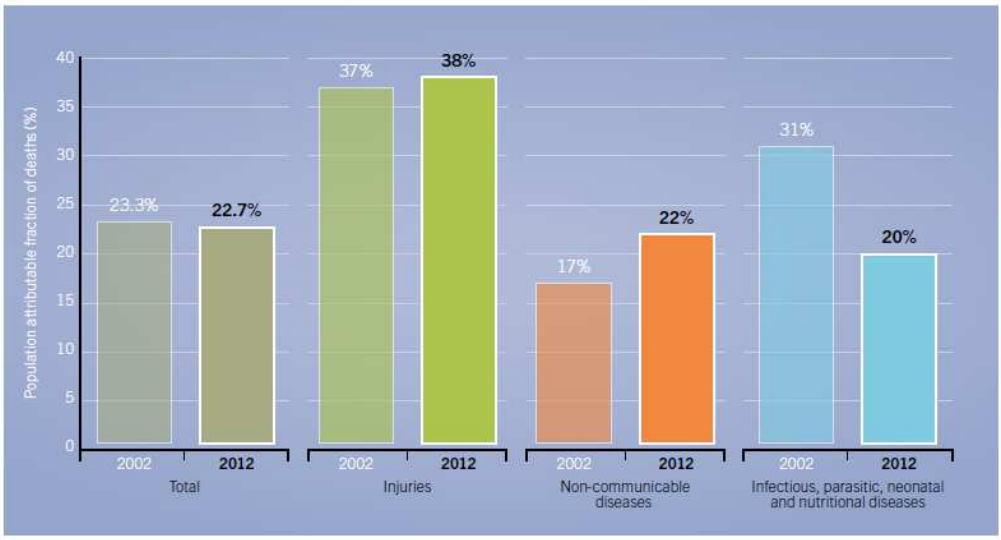
3. Microbiome, biodiversity and non-communicable disease

There is growing evidence of the major role the microbiome plays in human and animal health. Current research is focused on mapping microbiomes across populations to understand how they reflect and influence wellbeing and disease. Microbiome science challenges our understanding of the interactions between diet, physical activity, biodiversity and human health. It is becoming evident that diet contributes to health and well-being not only through calorific and nutritional provision, but also through the composition of the microbiome, which is in turn influenced by microbial diversity in the food system. Mapping, understanding and managing the broad set of relationships among nutrition, biodiversity and human health opens new possibilities for research addressing disease and improvements in human health.

Especially relevant for SDGs 3, 14, 15

4. Environmental drivers of non-communicable diseases through the life-course

Recent advances in the understanding of the impacts of air and water pollution on key non-communicable diseases (cardiovascular, respiratory and musculoskeletal disease, cancers and pollutant-induced metabolic disorders) suggest that about one-fifth of deaths are attributable to environmental causes (WHO, 2016, see below). The impacts of pollution on cognitive function and mental health more generally, especially in early and later life, are becoming more apparent at a global scale. The connection between air pollution and heart disease and dementia is as salient in London as it is in Kolkata. While studies are beginning to quantify the burden of disease attributable to environmental factors, new research is needed to understand the causal mechanisms and pathways and mechanisms of toxicity, and to identify effective measures to mitigate them, including policy, technical and behavioural change.



Source: Annette Prüss-Ustün and others, Preventing disease through healthy environments: A global assessment of the burden of disease from environmental risks, WHO (2016).

Especially relevant for SDGs 3, 6, 9, 10, 11, 12

5. Human health, wellbeing and the natural environment

There is a complex relationship between human health, wellbeing and the natural environment. On the one hand, human contact with plants and animals may lead to new risks (directly, as with zoonotic disease, and risks associated with anti-microbial resistance, or indirectly through exposure to accidental injury and physical dangers in hazardous natural settings). On the other, there are widely-recognised benefits to human physical and mental health of exposure to green and blue nature for recreation.

These risks and benefits are distributed in uneven ways across human societies and the fundamental mechanisms involved are not well understood. Policymakers are placing greater importance of the health co-benefits of nature when developing biodiversity and land-use policies, but the evidence base remains weak and insufficiently specified for different populations and social groups, especially where it relates to mental health.

Especially relevant for SDGs 3, 10, 11, 14, 15

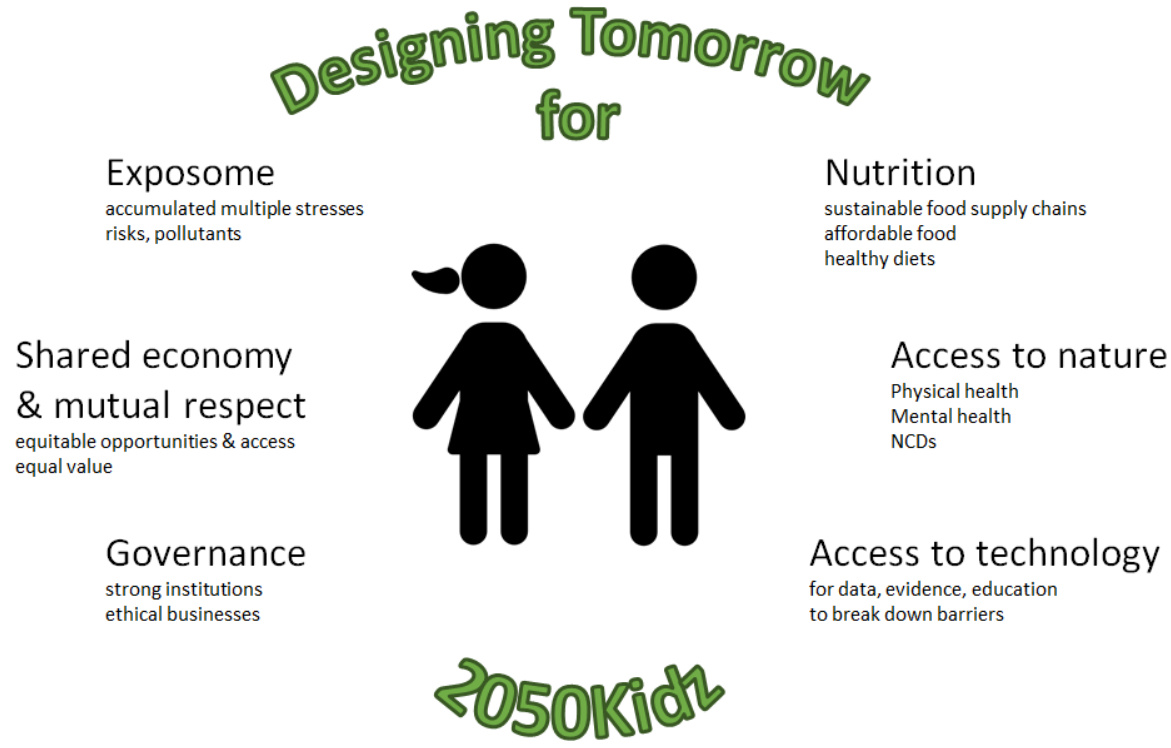
6. Unequal access to natural resources and human well-being

Access to physical and biological natural resources is contested at local and global scales. As populations grow and people become wealthier, the potential for these resource contests to become conflicts may grow. Such risks are especially apparent in Africa, the Middle East and Central Asia. Even where conflict is less likely, unequal access to resources may lead to harm and dislocation for many people, as in the case of famines. Understanding the interactions and feedbacks between access to natural resources, environmental degradation, conflict, enforced migration, and human wellbeing remains fragmentary and weak. Because of the many factors at play, ranging from biophysical to economic and cultural influences, untangling causal pathways remains difficult. Better evidence, models and interventions are vital to support the development of political and policy responses that are effective also in reducing health inequalities, and improving overall health and welfare.

Especially relevant for SDGs 1, 2, 3, 10, 16

7. Emerging interacting drivers of human health: a focus on youth

One objective of long-term research supporting policy and actions to meet the Sustainable Development Goals is to improve understanding of multiple, interacting stresses on health across the life-course. These research questions could productively be framed from the perspective of achieving better and more equitable outcomes for children. Many inequalities in health outcomes through the life-course are determined by prenatal and early childhood exposures and risk factors. Better understanding of how these many factors work together, and how more integrated policy interventions may bring measurable improvements to health and wellbeing is a major research priority globally.



Especially relevant for SDGs 3, 4, 5, 10

8. Urban and agricultural waste

Urbanisation is leading to a massive concentration of materials resulting in challenges for waste management. These include metals and agricultural nutrients, causing pollution of urban land, water and air. Policies and practice need to be developed to enhance materials and nutrients capture and coupling these to a circular- and bio-economy. This will reduce urban pollution and improve agricultural productivity, mitigating 'nutrient mining' and reducing the need for more fertilizer manufacture, while leading to better nutrition. One area of special attention is urban waste management to remove the growing number of contaminants (including industrial chemical residues, pharmaceuticals, nanomaterials, microplastics) from the human waste stream. The role of micro-plastics in the global food chain is not well understood but of vital importance for both human an non-human health

Especially Relevant for SDGs 9, 11, 12, 13

Governance, policy and evidence

In a concluding Policy Panel[4], the workshop identified opportunities for more integrated and evidence-based governance of natural resources, the environment and health. Taking the SDGs as a guide for policy analysis, design and evaluation is a fruitful approach. The SDGs offer a framework for identifying opportunities for collaboration as well as trade-offs between policy fields. This approach was seen as important in the context of current UK planning towards 'new generation' environmental, food and agriculture policies that are more integrated which aims to generate measurable additional benefits for all.

This provokes questions, such as: What does agriculture, environment, biodiversity, and health policy look like if the aim is to 'optimise' SDGs? Is it possible in policy design and implementation to map the 'chains of influence' between different areas of policy, business and investments? Can we identify opportunities (co-benefits) and pressure points (risks) to leverage goals across policies and business activities? The notion of an *SDG health check* for humans and natural resources as a routine for policy development, similar to cost-benefit analysis (CBA) or environmental impact assessment (EIA), was suggested. The SDGs also invite the development of new and composite metrics of well-being and sustainability – capturing synergies and interactions across SDGs, goals and targets, while being sensitive to social and economic inequalities. Setting out SDG ambitions for UK policy and business audiences remains a challenge, but this could be helped with visualisations and other communication forms.

Without deep transformations in production and consumption systems, meeting the SDG goals and targets will not be possible. However, linking energy, nutrition, mobility and health transitions will also face strong resistance in the face of winners and losers. There will be a need for tailored evidence for policymakers, business and civil society to instigate transformational changes that are needed, including evidence of co-benefits for health and wellbeing. Governance for transformations requires major investments across both fundamental research and evaluation. Two forms of evidence and knowledge creation were viewed as especially important:

- synthesis and rapid assessments;
- open and collaborative 'virtual platforms' involving experts and citizens.

[4] Panel members: David Griggs (Monash and Warwick Universities), Rob Bailey (Chatham House), Louise Heathwaite (Lancaster University), Jacquie McGlade (UCL) and Ruth Waters (Natural England)

The complex and fast-moving nature of scientific evidence and policy cycles may limit timely opportunities for alignment and engagement. This suggests a growing need for synthesis and rapid assessments of emerging evidence in advance of policy changes. At the same time, there is a greater demand and appetite of well-informed publics to become involved in the generation of evidence for policy. Creating these new arenas for evidence-building, communications and scenario thinking can generate new ideas and embed policy, planning and behavioural changes, including rigorous evaluations of 'what works'.[5] UK Future Earth may have a role in producing synthesis reports and in convening virtual or other platforms bringing a wider range of voices to support evidence-informed policymaking.

Frans Berkhout and John Ingram

22nd November 2017

[5] The Scottish Government has experimented with virtual platforms on climate change, water and animal diseases.