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A new approach to quantifying the sustainability effects of healthcare: Applied to the diabetic foot

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A vital role for any society is to deliver health care considering: 1) the planetary boundaries, 2) the complexity of systems and 3) the 17 sustainable development goals (SDGs). The aim is to explore the feasibility of a method to quantify the sustainability effects in health-care services. A toolbox was explored in the prevention and care of foot complications in diabetes. People with diabetes run the risk of developing foot ulcers and undergoing amputations. Three relationships between ecosystems and human health and health-care systems were identified as: (i) The economic resources for health care have previously appropriated ecological resources in the economic process. (ii) Health-care systems consume natural resources. (iii) Ecosystems and the landscape affect human well-being. Some types of landscape support human well-being, while others do not. This category also includes the impact of emissions on human health. Diabetes is one of the non-communicable diseases with high mortality and foot complications. With health-promoting interventions, the risk of developing foot ulcers and undergoing amputations can be halved. The toolbox that was used could manage the complexity of systems. Several of the 17 SDGs can be calculated in the prevention of complications in diabetes: quality of life improves, while the costs of healthcare and the burden on the economy caused by people not being able to work decrease. The appropriation of natural resources and the wasted assimilated capacity for the same welfare level decreases, thereby offering an option to deliver health care within the planetary boundaries.

Keywords: healthcare, sustainability, diabetes, diabetic foot, noncommunicable diseases, NCD, SDG, sustainable development goals

Achieving sustainable development from local to global level is challenging. One vital part is offering health care to patients in need. One unresolved question remains and that is how to ensure that healthcare is delivered within the planetary boundaries [1,2]. Health care should serve an increasing number of patients diagnosed with non-communicable diseases (NCD) and in need of prevention and care [3]. The intention is to minimise the negative consequences of the disease for the individual, society and the planet.

There is very little scientific research that presents approaches designed to measure the consequences of health care in the three dimensions of sustainability; ecological, economic and social. Tools such as analytical hierarchical processes have been used to manage and evaluate the complexity of the health-care system in relation to the social aspects

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using semi-quantitative measurements [4]. The authors Aljaberi et al encourage health-care professionals to collect data, in particular data on patient satisfaction, as a basis for further analysis of the sustainability dimension of health-care systems. However, two important dimensions, the ecological and the economic, were left out of their analysis. The definition of sustainability that the authors used was put forward in 1992 by the International Institute for Sustainable Development in conjunction with Deloitte & Touche and the World Business Council for Sustainable Development: "For the business enterprise, sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today, while protecting, sustaining and enhancing the human and natural resources that will be needed in the future" [5]. Twenty-three years later, in 2015, the UN approved the 17 Sustainability Development Goals (SDG) to secure a life for future generations on our planet, not only limited to the business enterprise but also including all aspects of life [6].

A substantial percentage of Gross Domestic Product (GDP) funds health-care systems. With well-functioning health care, the benefits to the individual and to society are substantial. Dealing with sustainability means dealing with complex systems and complexity. The complexity is expressed in the 17 sustainable goals the UN approved in 2015 [6]. At national level, Sweden manages the 16 Swedish national environmental quality objectives [7]. The systems in which sustainability is an issue are typically complex. To a significant degree, their complexity stems from the fact that life, bios, is a vital system-defining element. No system of importance for ecological, economic or social sustainability is possible, if we assume life outside the borders of the system. This information is fairly general. Is it necessary? The OECD made an important contribution to the definition of sustainable development and how to achieve it [8]. Two of the main problems that were identified were the implementation gap and knowledge gap respectively. Despite knowing fairly well how policies supporting sustainable development should be designed, implementation is at a low and varying level [1]. In the 2000s, some authors [9-13] concluded that the implementation gap and the closely related knowledge gap were caused to a substantial degree by inappropriate analytical and management tools.

With life as a crucial system element, it is clear that all processes are driven by a flux of energy by which quality is degraded. The sum of energy is constant, while the quality of energy is degraded. From an energy perspective, the system is a linear one.

Cells, organs, individuals and ecosystems represent different system levels in biological and ecological systems. Feedback loops at each of these levels and between them are important for the efficient use of available resources [14, 15]. The linear flux of energy with quality drives loops of matter. These reinforcing loops may include a number of system levels, as well as all three sustainability dimensions. This results in systems with mutual dependence between system levels and the three sustainability dimensions. With the existence of thresholds, and the nature of interconnections, the system typically has features such as thresholds, irreversibility and resilience. The knowledge gap and demand for analytical tools that takes account of thresholds, irreversibility and resilience has been addressed by the Rockefeller Foundation-Lancet Commission on planetary health [1].

Within life sciences, irreversibility is easily understood. The process from living to dead cannot be reversed. Resilience is a phenomenon that requires some effort to understand. A resilient system is able to withstand stress from internal and external sources without changing its character. If the source of stress is removed, it returns to its original status. Systems that are not resilient are pushed away by internal and/or external sources from the domain of an operating balance space or point, into a phase of rapid, unpredictable change. Its system conditions then experience rapid, catastrophic changes. Some important considerations:

1. A change in a well-defined part of a system may affect a hierarchy of sustainability goals from low to high system levels in the ecological, economic and social dimensions

2. Instruments from mathematics, such as differential functions and linear and non-linear algebra, are of importance in

analytical and management tools supporting sustainable health care.

With a multitude of goals in different dimensions and system levels, there is a need for instruments that support the optimisation of utilised resources. With systems with reinforcing loops operating close to the borders of chaos, differential functions are tools that are able to extract order from chaos.

As mentioned before, the OECD found that the understanding of what sustainable development is and how to achieve it was well understood [8]. In spite of this, policies for sustainable development that were in place were on a low, uneven level. The OECD expressed great concern about this and related it to two closely related obstacles they called the implementation gap and the knowledge gap.

These gaps reflected a broken connection between

1. A general understanding of what sustainable development is and the policies needed to promote it, expressed in fields and policy contexts such as classic economic theory back to the 18th century, agricultural sciences as living knowledge until the Second World War, system ecology and ecological economics from around 1990, the UN Millennium Development Goals [6], the OECD [8], the Millennium Ecosystem Assessment [16] and the Economics of Ecosystems and Biodiversity [17], on the one hand, and

2. Instruments and concepts in common practice with the aim of putting sustainable development in place, on the other hand [10].

Typical instruments and concepts in (2) are life cycle assessments, in accordance with the ISO 14 001 system, the Best Available Techniques (BAT) principle in the Integrated Pollution Prevention and Control Directive in the EU, the Integrated Production Policy from the EU Commission and a number of other policies from the same scientific ground, suffering from the same drawbacks [10]. As these concepts and tools are derived from engineering sciences, they do not express the competence relating to systems where life, bios, defines system characteristics. Their “default solution” when managing the complexity of life, e.g. in the understanding of the impact of the use of natural resources and the emissions in biological and ecological systems actually affected by production, is to assume that this complexity does not exist [9, 10, 12, 13].

Within agricultural and forestry science and practice, tools that are able to manage this complexity have emerged over hundreds of years of theoretical development and of trial and error in practice. A similar development has been seen in system ecology and economic theory during the last few decades. A combination of contributions from agricultural sciences, forestry sciences, system ecology, integrative assessments, applied environmental sciences and economic theory at micro and macro level offers a solution to the implementation gap by resolving the challenge, in everyday actions, of managing complex real-world systems, while being aware of and respecting their genuine complexity due to life as a defining system characteristic. A new approach to calculating the sustainability effects in health care is needed with criteria as mentioned above. An approach of this kind considers the planetary boundaries, the three dimensions of sustainability and the complexity of ecosystems. The aim of the article is to present a new approach to measuring sustainability in health care, applied to the prevention of foot complications in diabetes.

Method

Conceptual model

Tools and methods that considered the planetary boundaries, the three dimensions of sustainability and the complexity of ecosystems were chosen. The toolbox originates from a variety of fields. For example, they supported sustainable animal production systems; sustainable industrial production systems; effective policies to minimise health hazards associated with cadmium fluxes in food systems; milk consumption and the human health impact; physical planning for sustainable attractiveness at local and regional level; sustainable local, regional and national development; the development of certification schemes such as ISO 14 001 to contribute more effectively to improving the status of ecosystems actually affected by production and consumption; the development of public procurement in favour of growth, employment and a better environment in accordance with national environmental objectives [9, 10, 12, 13, 18-26].

In what follows, our approach that supports the management of health-care systems in a sustainable society is presented. The accuracy of these instruments is investigated and applied to the prevention of foot complications in diabetes. The effects on the individuals living with diabetes is dramatic, with a lifetime risk of 25% that a foot ulcer will develop, a threatening reality for the 425 million people living with diabetes [27]. Every thirty minutes, an amputation takes places on the planet due to diabetes [28]. People with a lower socioeconomic status are more likely to develop complications such as cardiovascular disease and/or foot ulcers and amputations [29-31]. This means that people already struggling for their lives and surveillance will be marginalised, more vulnerable in the presence of foot ulcers and amputations. Their health-related quality of life will decrease [32-34].

The article presents a new approach that includes a conceptual model, a map, of the economic system in its ecological and social context [13]. From this map of the sustainability landscape, we are able to define different pathways by which we can improve human health and meet the demands of society. One way of estimating the impact of health care on the appropriation of natural capital, man-made capital, human capital and social capital is suggested. We use the diabetic foot as a case in this exercise. The hypothesis is that a set of these instruments developed with the aim of supporting the effective management of natural resources, with the emphasis on acreage-dependent sectors, is able to significantly improve the efficiency of health-care systems in meeting the 17 SDGs. The toolkit has five internally consistent instruments:

1. A conceptual model of the GDP part of the economy embedded in its ecological and social contexts where stocks of natural, man-made, human and social capital are located [11].
2. From the conceptual model, Biophysically Anchored Production Functions (BAPFs) are constructed showing how the GDP economy is dependent on nature and delivers resources for the fulfilment of human needs [13].
3. An application based on the general features of Impredicative Loop Analysis by which the impacts in a hierarchy of sustainability sub-goals of a specific change in a specific production process can be evaluated [20].
4. From BAPFs, ecological economic accounts (EEA) can be derived by which the sustainability performance of any system can be evaluated [10-12].

In what follows, the conceptual model of the economic system in its ecological and social context is presented in some detail. This supports the understanding of health care in a broader sustainability context. The conceptual model of the economy in its ecological and social context is presented, Figure 1 [12].

The model consists of three compartments, where the first refers to nature, to ecosystems providing natural resources and taking care of emissions. The second is the traditional economy where goods and services are produced from natural resources and inputs of labour and (traditional) capital. GDP measures the size of the output. The third is the social dimensions where the economic resources that are created to meet human needs, including health care. In all parts of the economy, emissions and waste return to nature.

With some simplification, Compartment I represents nature, the ecological dimension of the economy, Compartment II represents the economic system, in the narrower sense in which we often discuss it, and Compartment III represents the social dimension of our economy. In reality, they are three closely integrated parts of our economic system.

Compartment I defines ecological restrictions in society, Compartment II provides the means, while Compartment III contains the objective: human well-being.

From the perspective presented in Figure 1, the challenge of health care is to use appropriated economic resources as efficiently as possible in order to improve the health of the population. It focuses on preventing and/or compensating for the functional loss of the individual. With the efficient use of economic resources, the needs of the people suffering from illnesses are met, while the economic burden on the rest of the economy is kept down. This increases the demand for goods and services from households, which stimulates the economy. At the same time, the competitiveness between enterprises is increased, while everything else is equal. The efficiency measurement referred to implicitly is the ratio between the level of health in the population as the numerator and the economic cost of providing it as the denominator. With efficient health care, the level of health in the numerator is increased, while everything else is equal, which improves the life quality of individuals, thereby improving the social capital. With improved health, the productivity of the same individuals increases and the stock of human capital is thereby also improved.

Relationships between nature and health care

There are three types of relationship between health and health care and NC (Natural Capital) and NR (Natural Resources), as shown in Figure 1.

(i) The appropriate economic resources are produced in the GDP economy where NR are upgraded to goods and services through the input of labour and capital, while, on the output side, potentially harmful emissions are generated. Health care thus appropriates NR embedded in the economic resources that are used and indirectly cause emissions that can harm human health and ecosystem health. This is the indirect support to service sectors such as health care from nature [35, 36].

(ii) The health-care system also directly consumes NR, by using the energy needed to build and heat/cool the buildings, fuel the equipment and transport personnel and patients to and from hospitals [35, 36].

(iii) The third type of relationship relates to the way ecosystems and the landscape affect human well-being. Some landscapes support human well-being, others do not. This category also includes the impact of emissions on human health. The first two relationships are connected to the appropriation of ecological resources in the production of health. The third relationship relates to the demands on health care to the needs to be met.

Through emissions and changes in land use, the capacity and quality of the life-support system of ecosystems are affected. In maps of Europe [10, 11] the effect on (i) expected human life expectancy due to the emission of particles into the air is presented, as well as (ii) the deposits of nitrogen exceed the assimilative capacity of ecosystems. The congruence in the geography of these human health and ecosystem health impacts is profound.

The United Nations Environment Programme (UNEP) [37], in collaboration with the World Health Organisation (WHO), estimated that, in 2012, 12.6 million deaths, or 23 per cent of the total, were due to deteriorating environmental conditions [38]. Air pollution which, according to the UNEP, kills seven million people across the world each year, dominates. Of these, 4.3 million are due to household air pollution, particularly among women and young children in developing countries. There is an uneven distribution of deaths due to environmental deterioration, with the highest proportion of deaths attributable to the environment in South-East Asia and in the Western Pacific (28 per cent and 27 per cent respectively). The percentage of deaths attributable to the environment is 23 per cent in sub-Saharan Africa, 22 per cent in the Eastern Mediterranean region, 11 percent and 15 per cent in OECD and non-OECD countries in the Americas region and 15 per cent in Europe.

In the case of the diabetic foot, the transport of personnel and patients to and from providers of health care consumes energy and causes a multitude of emissions, harming the health of ecosystems and of humans. The emissions from hospitals should be considered. Health-care services located in areas stressed by high emission rates have a greater negative impact on human health compared with health-care services localised in areas with forests and land. Forests and land assimilate emissions [10, 39].

Non-communicable diseases (NCDs) are a group of diseases with a substantial impact on health [3].They kill 41 million people each year. Cardiovascular diseases account for most NCD deaths, or 17.9

million people annually, followed by cancers (9.0 million) and respiratory diseases (3.9 million). Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets all increase the risk of dying from an NCD. The facts in the UNEP [37] and the WHO [38] imply that environmental issues are a substantial category of factors causing NCDs. This is supported by Lim et al. [40].

Health care and Agenda 2030 with 17 SDGs

Society can work through three major pathways to improve human health; traditional health care when illness is present, preventing illnesses by lifestyle changes within the population and by upgrading the quality of the environment and life-support systems. Odum [15] describes in detail the life-support systems of ecosystems, providing the physiological necessities for all life. In 2015, the UN [6] approved 17 SDGs. They form the basis of Agenda 2030. The overall objective of County Administrative Boards in Sweden, the regional representation of the national government, is to support the implementation of the 17 SDGs at regional level, in each county. The first paragraph in the task assigned to them is, at regional level, to contribute to sustainable, enduring solutions. The second is to contribute to the implementation of Agenda 2030 [41]. In Sweden, there is also a system of 16 environmental quality objectives [7]. Their role is to lay the environmental foundation for economic and social development within affected ecosystems carrying capacity limits. They agree well with the 17 SDGs from the UN with their foundation in the need for ecological sustainability as a prerequisite for economic and social sustainability. The recommendation from the UNEP [37] to reduce the number of deaths due to environmental deterioration reflects the purpose of the UN's 17 SDGs.

The presented toolbox supports policies that improve (i) health, by lowering the environmental burden on the ecosystem and human health, and (ii) diet patterns and physical activity, for example, to benefit both ecosystem health and human health, thus lowering NCDs.

In what follows, an approach is presented in which the capacity of the toolbox to help health-care systems to comply with the 17 SDGs and the Swedish environmental quality objectives is tested. We do this using the case of diabetes and the prevention of diabetic foot ulcers (DFU).

Costs associated with diabetes and the diabetic foot

From 1980 to 2014, the prevalence of diabetes rose by a factor of 3.9, to 422 million people in 2014 [42]. In 1980, 4.7% of adults had diabetes and, in 2014, it was 8.5%. The rate of the increase in diabetes is highest in low-income and middle-income countries. If we add up the effect of diabetes and high blood glucose, 3.8 million deaths were related to these causes in 2012 [43]. The social and economic costs of diabetes to the individual and to society are therefore significant. Lowering the prevalence of diabetes will improve social and human capital (see Figure 1) and support a number of the 17 SDGs.

A healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are ways to prevent or delay the onset of diabetes type 2. For patients with diabetes it is important to maintain good function in the feet and in the lower extremities.

The cost of the treatment of DFUs is substantial. In one study with data from Sweden, the span was 993-17,519 US$ [44, 45]. Table 1 presents estimates of treatment costs for diabetic foot ulcers at regional, national and global level [46].

		Treatment costs US$ 2015	
	Patients, no	Per patient	Total, millions
Region Västra Götaland	3,000	5500	16.5
Sweden	20,000	5500	110
Global	20,000,000	5500	110000

Table 1 Estimated regional, national and global costs for treating DFUs in 2015. The equivalent of 5,525 US$ of 2015 converted from figures from 1990 per treatment of DFUs (5000 US$) was originally provided by Apelqvist et al. (1995) and refers to Sweden. Available 2018-07-12. http://www.historicalstatistics.org/Currencyconverter.html .

Region Västra Götaland is one of the counties in Sweden. The estimated cost relates to the treatment of DFUs not infected or in need of intervention due to artery disease. The estimate is therefore conservative. We assume the same cost at regional level in Sweden (Västra Götaland) and global level as well. The estimate agrees well with the figures from Prompers et al [47], presenting estimates at European level, suggesting that the estimate is relevant at international level as well.

The prevalence of DFUs is set at 5% among patients with diabetes [48]. The estimate is based on a population-based annual incidence of DFUs of 1.0-7.2% [49-53]. The number of patients with diabetes in Västra Götaland, in 2015, was approximately 60,000, in Sweden 400,000 [54] and globally 400 million people [55].

Results

By using the example of DFUs and the need for early prevention and treatment as an example, we shall now outline how the principles presented in previous parts can be considered in everyday practice in health care. We, therefore, present a proposal for ways of operationalising the UN's 17 SDGs in health-care systems from the level of individual treatment to aggregated effects regionally, nationally and globally.

Of the population of people suffering from diabetes, it is estimated that 50% are in need of preventive foot care. This is based on the presence of the risk factor of loss of protective sensation, which can be as high as 50% in patients with diabetes [46]. Using early monitoring, patients at risk are identified, enabling intervention at an early stage [56]. Promising results show a reduction in the amputation rate of 40% to 60% [57] and DFUs of 50% [58]. Halving the presence of small DFUs leads to a reduction in ulcers that might develop into severely infected ulcers and amputations.

One part of early treatment is the provision of insoles from a Department of Prosthetics & Orthotics (DPO) [59]. Insoles reduce the risk of pressure-induced DFUs [58, 60]. Insoles can be prefabricated or custom made or traditionally made [46]. Assume that we have custom-made insoles. Two visits to a health-care provider are needed. The costs associated with this solution are:

- Time appropriated by
  a. The patient
  b. The staff at the health-care provider
- Energy (with quality) consumed for
  a. Transportation to and from the health-care provider
  b. Heating of buildings and for the production of insoles
- Emissions from energy consumption potentially harming human and ecosystem health.

The time appropriated by patients can be leisure time, or times when the patient would otherwise have worked, contributing to GDP.

The energy cost can be measured in both monetary and physical terms. Both are of interest. When measuring in physical terms, information is gathered that makes it possible to evaluate future risks and opportunities in relation to possible changes in the price of energy. The available amount of fossil fuels is limited. In 2015, fossil fuels provided 86% of the global energy budget [61].

The climate challenge calls for action which, in a fair number of decades, will eliminate the increase in greenhouse gases in the atmosphere [6, 7]. Energy consumption causes the emission of a spectrum of substances that affect the majority of the 16 environmental quality objectives in Sweden and those of the UN's 17 SDGs that are related to emissions and their impact on ecosystems and human health. Regarding energy systems, we also have a range of aspects related to hydropower and nuclear power to consider, as well as contributions to climate change. Renewable fuels are of increasing importance for the supply of energy.

Taken together, the limitedness of non-renewable natural resources, fossil fuels, their dominance among energy sources in the economy from local to global level and the environmental and human health impacts of these energy sources and of hydropower and nuclear power all indicate a future, substantial transformation of the energy systems from local to global level. This transformation to future energy systems effectively supporting a sustainable society will cause a change in energy prices.

Since 1998, there has been a substantial increase in the fixed level of global oil prices [10]. This may affect the outcome with regard to the rational localisation of future health care in the landscape. As a result, there are good economic reasons for health-care providers to be in control of their energy consumption in both economic and physical terms.

The time that each patient appropriates from the staff is time during which the staff are unable to support other groups of patients within budget restrictions.

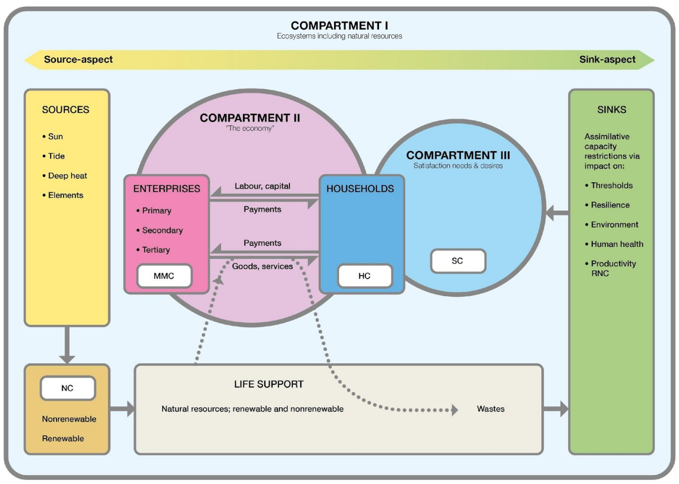

Figure 1 A conceptual model of the economy in its ecological and social contexts.

Assume that we have a solution where we can offer the same benefits to the patient with only one visit (the system with prefabricated insoles). If so, the above-mentioned costs can be cut by 50% per patient treated. On a regional, national and international scale, this would substantially improve the contribution to a number of ecological, economic and social sustainability goals.

So far, we have not dealt with the challenge of health-care systems that operate within affected ecosystems with capacity limits. The toolbox for sustainable development mentioned above [10] supports a solution to this challenge. It thus supports the emergence of health-care systems promoting Agenda 2030.

The production of ecosystem services from the life-support systems of ecosystems can be quantified. These systems are located in rural areas, in the so-called cultural and natural landscapes as defined within system ecology [15]. The contribution from Odum laid the scientific foundation for most of the work that has subsequently been devoted to the issue of ecosystem services and their importance for human well-being: the OECD [8], the Millennium Ecosystem Assessment [16] and the Economics of Ecosystems and Biodiversity [17].

Ecosystems are Compartment 1 in the model of the economic system in its ecological and social contexts in Figure 1. This is the ecological dimension of our economy and of our society. Using the same tools, the consumption of ecosystem services can also be quantified.

So, using the same tools deeply rooted in natural sciences, including agricultural sciences and system ecology, we are able to quantify the sustainable production of ecosystem services, as well as consumption. With this information related to the demand for and supply of ecosystem services, the human appropriation of ecosystem services can be adapted to affected ecosystems with capacity limits.

This suggests a way in which the appropriation of natural resources and the emissions related to the treatment of the diabetic foot are related to the area of ecosystems with the capacity to deliver natural resources and assimilate emissions. This suggests a methodological route to evaluate the pressure on nature from health-care systems and to adapt health-care systems and other socioeconomic systems to the carrying capacity of affected ecosystems.

Through this route, ecological and economic dependence between rural and urban areas can be visualised and policies that contribute to their mutual development in a sustainability context can be effectively implemented.

Discussion

This paper presents a framework for measuring sustainability in health-care using a toolbox supporting the effective management of natural resources. Analytical tools evaluating the sustainability performance in health care in ecological, economic and social terms are a prerequisite for the management of health-care systems, in agreement with the UN's 17 SDGs. Using a sustainability map, three types of relationship between ecosystems and human health and health-care systems were identified.

(i) The economic resources needed to cover the cost of health care have previously appropriated ecological resources in the economic process, at the same time as good health care may reduce future economic costs and thereby the ecological resources that are appropriated.

(ii) Health-care systems consume natural resources.

(iii) Ecosystems and the landscape affect human well-being. Some types of landscape support human well-being, while others do not. This category also includes the impact of emissions on human health.

Diabetes, one of the NCDs, has a substantial impact on the health level of societies. In Sweden, around 20,000 patients with diabetes suffer from DFUs, while the global figure is 20 million people. With preventive interventions, the prevalence can be halved, saving 50 million USD in health-care costs in Sweden and 50 billion USD globally.

Further research should preferably present details in ecological units, economic monetary terms and social terms from a real case for the two alternatives: the supply of insoles with one visit as compared with two visits to a DPO.

Effective, preventive interventions reduce the cost of health care, as well as the burden on the economy imposed by people who are not able to work. Life quality, i.e. social sustainability, is improved. The appropriation of natural resources and the waste of assimilative capacity for the same welfare level decrease. As a result, ecological, economic and social sustainability is improved – a prerequisite for development within the planetary boundaries.

Abbreviations

BAPF; Biophysically Anchored Production Functions, GDP; Gross Domestic Product, NC; natural capital, NCD; non-communicable diseases, NR; natural resources, SDG; Sustainable Development Goals, WHO; World Health Organisation, UNEP; United Nations Environment Programme

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Authors' contributions

S.H and U.H.T wrote the main manuscript text. S.H. prepared Figure 1. U.H.T prepared Table 1. All the authors reviewed the manuscript.

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Competing interests

S.H. manages Nolby Ekostrategi but does not consider this to be a conflict of interest in this work. UT declares no competing interests.

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