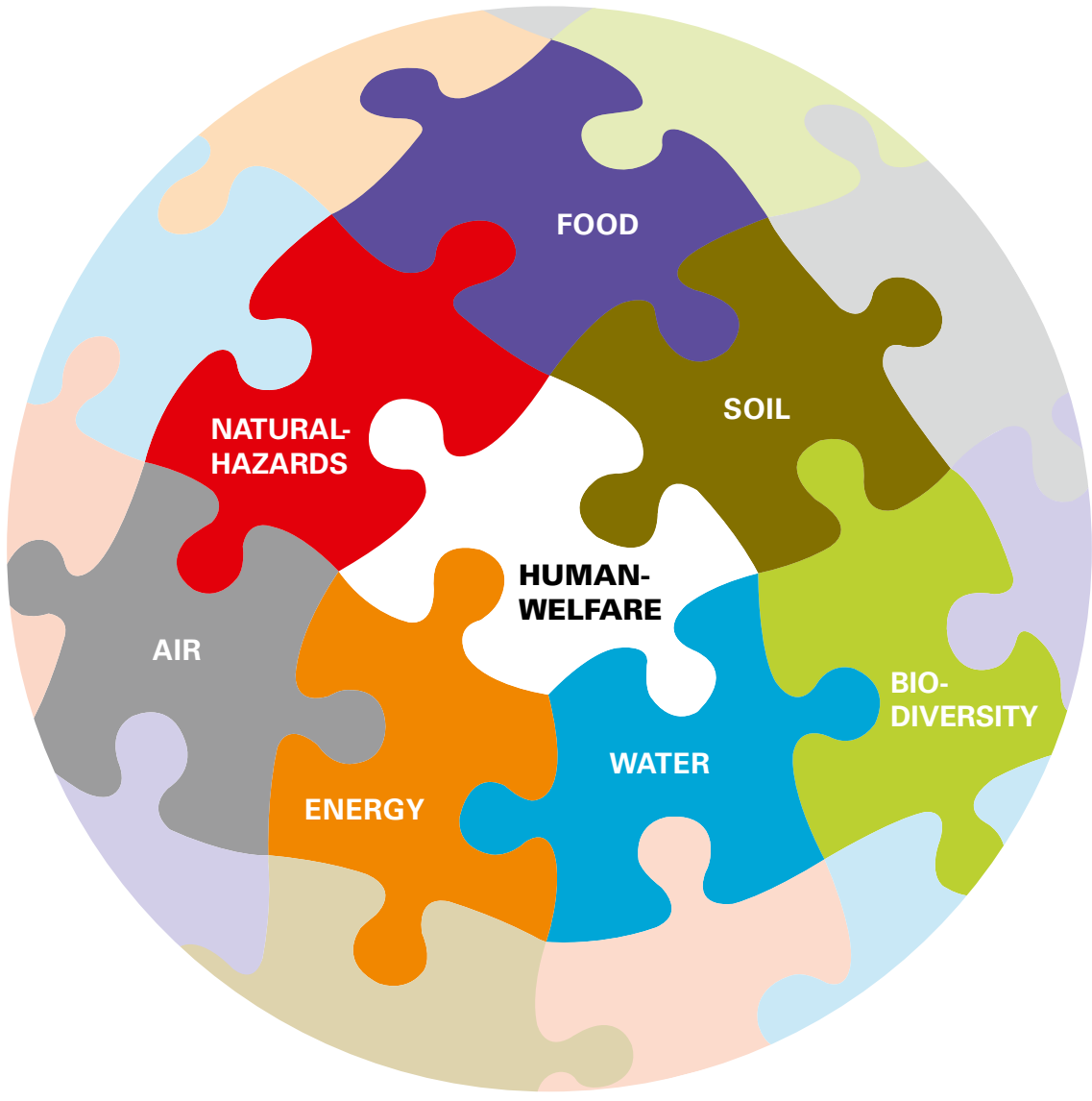
Many paths to a common goal: water in context

To conserve and improve the conditions of the world's water resources and aquatic ecosystems, we must value ecosystem services appropriately, promote transparent information on trade-offs between the use of water and other natural resources, and ensure an adequate level of human welfare for all. *Text: Janet Hering*



A powerful argument can be made for putting human welfare at the centre of the puzzle of how to manage our natural resources sustainably.

All people are concerned for their own welfare and that of their families – not only their children and grandchildren but also future generations. Increasingly, we recognize that our welfare depends on the integrity and functioning of ecosystems, and that ecosys-

tems provide valuable (indeed nearly irreplaceable) services for society. We also increasingly recognize the interdependencies of our resource use. Allocation of water for irrigated agriculture may, for example, decrease river flow so much that fisheries are compromised – an increase in one type of food production is linked to a decrease in another [1]. First-generation biofuels were criticized for driving up food prices and trading water for energy [2]. The ecological impacts of hydropower production include dramatic changes in flow patterns, up to and including the complete diversion of water from natural channels, as well as large-scale flooding of former riparian habitat and release of the potent greenhouse gas methane [3]. An increasing concern for biodiversity has led to decreasing acceptance of such trade-offs and a willingness to commit resources for ecosystem restoration.

Recognizing the scale and scope of human impacts on our environment and the unsustainability of our current practices can, however, be overwhelming. Furthermore, the need for improvement in human welfare for the vast majority of the world's population cannot be denied. The challenges are immense, but how can we make progress? How can we avoid being overwhelmed? How should we set priorities? How can we avoid unintended consequences?

How to make progress?

A powerful argument can be made for putting human welfare at the centre of the puzzle of how to manage our natural resources sustainably [4]. Human activities that encroach on and even overshoot the ecological boundaries of our planet [5] can only be changed through individual and collective decisions and actions. Until an adequate level of human welfare is assured, these pressing and obvious needs will take precedence over the longer-term and less obvious need to conserve ecosystem integrity and function. At the same time, innovative ways must be found to reduce human demands for natural resources and human impacts on environmental systems.

The concerns of human welfare are expressed in the Human Development Index (HDI), which includes factors such as life expectancy and literacy rates as well as the conventional measure of gross domestic product [6]. An analysis comparing the HDI for the world's nations with their ecological footprints shows (for data from 2009) that all the nations above the high HDI threshold of 0.8 have ecological footprints exceeding the world-average biocapacity (see Fig. 1). For example, Switzerland was reported to have an HDI of 0.96 and an ecological footprint of 5.0. It is inevitable that less developed countries will seek to improve their HDI, yet the world's current trajectory is clearly unsustainable. The critical question is how to achieve the goal of "high human development within the Earth's limits", a space on the graph that is singularly unpopulated.

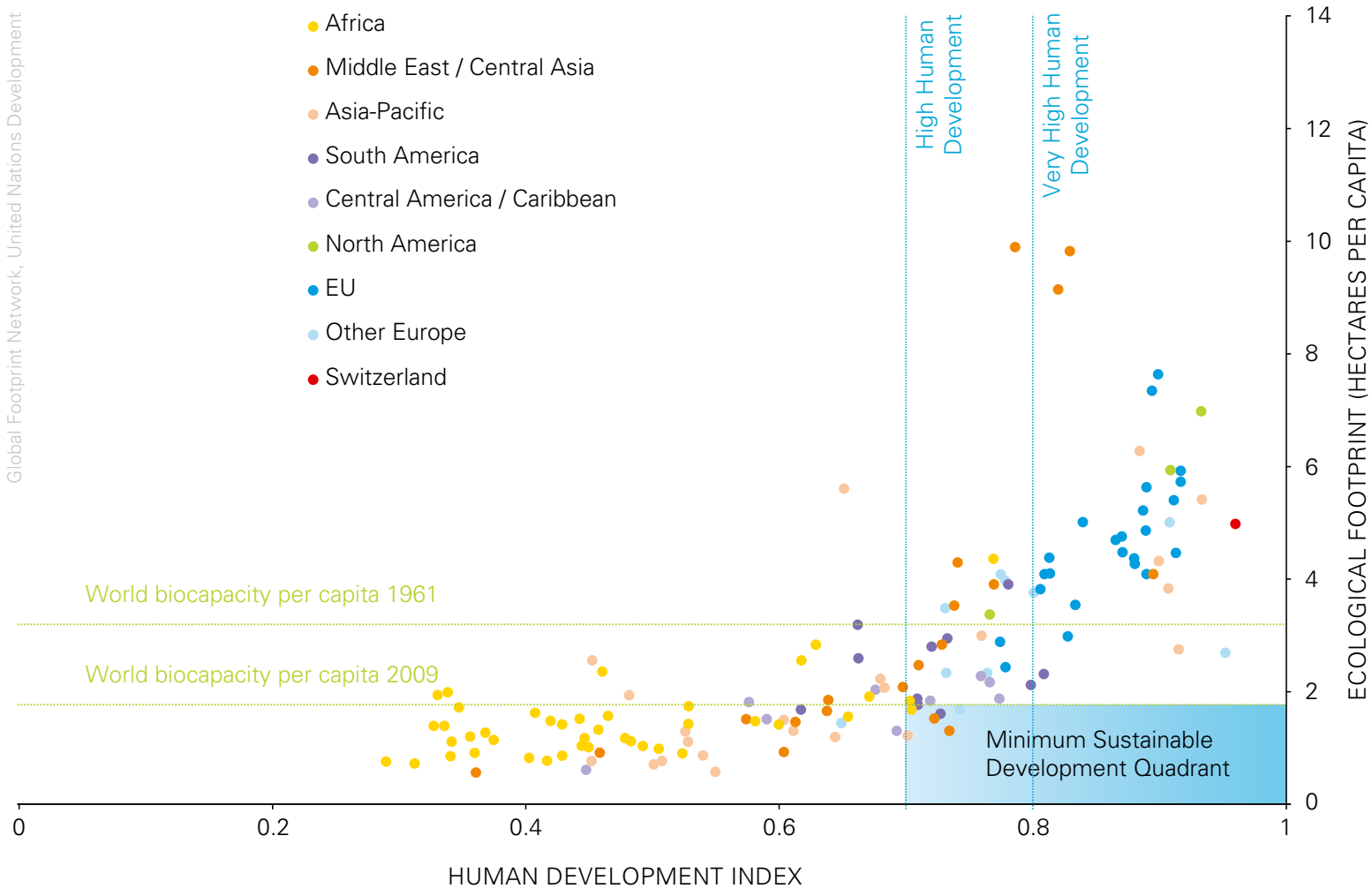


Fig. 1: Comparison of the Human Development Indices (HDI) with the Ecological Footprint (EF) of nations. The HDI includes factors such as life expectancy and literacy rates. The EF accounts for the land and water area required to support human activities, including absorbing the carbon dioxide waste generated. Conversely, biocapacity is a measure of the capacity of an ecosystem to provide services which are essential for human [7].

How to avoid being overwhelmed?

A challenge as inherently large and complex as sustainability cannot be met by a simple solution. Despite the attractiveness of a "silver bullet", it is more realistic to accept that a portfolio of approaches and technologies will provide an aggregate solution [8]. This creates the possibility that multiple ways to contribute can be pursued. Each contribution can take advantage of available opportunities, talents and interests. Although the problems of unsustainable human activities are inherently interconnected, it will always be possible to identify ways to make progress in addressing specific aspects of the larger problem.

How to prioritize?

Prioritization of problems often becomes more tractable when they are evaluated in the local context of resources, needs and opportunities. This is particularly important for water resources since the availability of renewable freshwater is inherently a local and regional problem. Bringing available talents and resources to bear on problems of local significance is likely to be more effective than targeting global problems in the

absence of the necessary skills and resources. Targeting "low-hanging fruit" can be highly effective and stimulate further efforts. Focusing on single issues (such as water [9]) can be effective in raising awareness and inspiring action but carries the risk that interdependencies may be ignored and the full consequences of trade-offs may be neglected.

How to avoid unintended consequences?

The first step in avoiding unintended consequences is to recognize that they can, and probably will, occur. This means accepting the limits of our knowledge and our capacity to predict the responses of complex socio-technical-ecological systems to interventions or evolving external conditions. Uncertainty must be addressed explicitly and management strategies must allow for adaptation if expectations are not met.

A second step is to promote transparency regarding the trade-offs that are implicit in the allocation of water and other natural resources for various uses. It is important to recognize that many practices that attract criticism (e.g. the global transport of food) are not new and that long-distance transport of goods (specifically by ship) can be more energy efficient than local production and transport [10]. Attempts to use consumer power to influence water use and management should take into account not only local pressures on water and other natural resources but also potential effects on livelihoods. The integration of human welfare with environmental concerns is fostered through organizations that explicitly incorporate different aspects of sustainability. For example, Fairtrade International has its primary focus on offering better trading conditions to marginalized producers and workers but also requires the use of sustainable farming techniques [11]. GoodGuide provides information on the health, environmental and social performance of products and companies for over 145,000 food, toys, personal care and household products [12].

Further steps include being willing to work with existing organizations to build on past successes. Leveraging and expanding successful activities can use human and financial resources more efficiently than developing new initiatives. Such development should be driven by significant gaps in existing activities.

Not new but timely

The awareness of the biophysical limits of our environment and of the human capacity to overuse natural resources and degrade ecosystems extends throughout history in many cultures. Even the effects of fossil fuel combustion on the composition of the atmosphere and the potential consequences for the Earth's energy balance and climate were clearly identified by Svante Arrhenius in 1896 [13]. What is more recent is popular recognition of the global consequences of human activities, which has stimu-

lated responses at all levels of society, from individual consumer choices to international governance. Although new technologies have achieved substantial gains in efficiency, the use of energy and other natural resources has continued to increase, partly as a result of much-needed improvements in human welfare in developing countries but also due to rebound effects [14].

These concerns become ever more urgent, however, with the rapid growth in the environmental demands and impacts of the aggregate activities of societies worldwide. Existing efforts to constrain these demands and reduce these impacts should be strengthened and expanded. New efforts should target meaningful gaps and emerging opportunities. It is important to foster a systemic perspective in which, for example, the societal constraints on individual decisions and actions are examined and needs for collective action are identified [15]. Ultimately, the role of consumption per se, particularly in industrialized societies, must be tackled [16], so that the goal of the "highest human development within Earth's limits" can be reached.

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