Benno Werlen *Editor*

Global Sustainability

Cultural Perspectives and Challenges for Transdisciplinary Integrated Research

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Preface

We live in the age of the anthropocene. Nature is no longer nature, but everywhere bears the deep imprint of human activity. Of course, human beings have long influenced the habitats in which they live. Some of the early civilizations, for example, by felling forests, or causing watercourses to dry up, created deserts where none existed before. Yet none intervened into the natural world by more than a small fraction of the degree to which our civilization does, and on an everyday basis. Climate change is perhaps the fundamental example of this transformation, caused by the burning of fossil fuels on a massive scale. The speed with which we are using up the world's oil reserves, for instance, contrasts in an extraordinary way with the length of time it took for them to be laid down – which happened over many millennia. At current rates of consumption, we will burn our way through most of them in less than 200 years from the first time at which their commercial exploitation began.

It is an awesome thought that we are busy changing the world's climate – and on a permanent basis, since we know of no way of getting the greenhouse gases that are causing the world to warm up out of the atmosphere once they are there. Some will persist for centuries. If left unchecked, current trends will produce more and more volatile and extreme weather patterns the world over. As I write, a typhoon with gusts of wind reaching more than 100 miles per hour has just hurtled through Japan, leaving a trail of destruction in its wake. In the future, without practical policy intervention, such storms will increase in average intensity. To be sure, there are uncertainties around just how extreme changing weather patterns will be and over what time period. The climate change skeptics fasten on this and declare that the risks are exaggerated. Yet uncertainties cut both ways. The risks could just as well be greater than the majority of climatologists believe, and develop at a faster pace. James Hansen, from NASA, one of the world's pre-eminent climate scientists, believes such to be the case. He sees some truly terrifying possibilities waiting down the line if greenhouse gas emissions are not curbed, and in relatively short order.

There are three models of the impact of human activities upon the natural world – or what used to be the natural world. The skeptics argue that the earth is robust. Nothing human beings can do will influence it very much. Nature will go its own way regardless of what we might do. Those in the green movement, to the contrary, see the planet as fragile and vulnerable in the face of the human onslaught. Such a perspective is worrying enough. Yet there is a third view, associated with authors such as Hansen. This is that the earth is like a wild beast, and we are busy prodding it with sticks. It will react with increasing violence to our interventions. Every typhoon, hurricane or large earthquake is a reminder of the awesome forces in play and we toy with them at our collective peril.

So far, in spite of endless conferences organized by the UN, policy interventions by some governments and a proliferation of bottom-up approaches, we have had very little success in bringing down the level of carbon emissions globally. As measured by the Mauna Loa Observatory in Hawaii, the level of Co_2 in the atmosphere is increasing relentlessly year upon year. In 2014, it passed 400 ppm for the first time – the highest level observed for at least 800,000 years and probably far longer. The Arctic ice is melting at a rate not thought possible by most observers until recently. Some scientists believe that the Arctic could be ice free in the summer within some 15 years. On the face of things, the visible shrinking of the Arctic ice should be a wake-up call to the world to take more radical action to cut emissions. Not a bit of it. There is a rush on the part of nations and companies to exploit the mineral resources that become accessible as the ice retreats.

It is a similar picture with broader issues of sustainability. The destruction of the world's rain forests is one of the sources of climate change, since that process releases large amounts of Co_2, and the capability the forests have to absorb it is being eroded. That destruction has consequences for many of the world's flora and fauna too. Here is another battle we are losing. The oceans are becoming increasingly acidified, with an accumulating threat to many of the life forms that exist in them. Species are disappearing. These wider ecological disasters overlap with other sources of stress and strain the world's ecosystems – such as the radical and continuing increase in the world's population. There are likely to be ten billion people on earth by 2050. Only about a century and a half ago, in 1850, there were less than one billion.

Why are we finding it so hard to take effective action against burgeoning climate change and environmental degradation? A cluster of reasons exists and it is important to see how powerful these are when added together: (1) There are powerful interests opposing the necessary policies – such as some of the most powerful fossil fuel companies. (2) These are global issues. Yet there is no effective system of global governance. Nations very often have different short-term interests from one another and collaboration over a longer time-span is especially difficult. Developing states are more vulnerable to the changing climate than the richer nations, who can spend more to defend themselves. Yet the richer countries are reluctant to transfer needed resources to the developing world on anything like the scale needed. (3) We are dependent upon the work of scientists to diagnose the risks we face and how severe they are. Most non-specialists – and especially the lay

public – have no chance at all of mastering the detail of the scientific work involved. The climate change skeptics and those who say that proclamations of imminent ecological disaster are exaggerated step into this gap. (4) These are risks of which we have no previous historical experience, certainly on the scale they exist now. Many people find it hard, therefore, to treat them as real, since their worst consequences lie in the future. So far as climate change is concerned, the worry is that little will be done until there are cataclysmic disasters that can be unequivocally attributed to the warming of the world. Yet by this time it will be too late. For we have no way of getting the greenhouse gases out of the atmosphere once they are there. Some – like CO_2 in fact – will be there for centuries.

In trying to cope with these problems, more innovative policies will be needed than those that have dominated thinking up to the present. Moreover, a certain level of climate change is inevitable whatever happens now. As well as radically upgrading the struggle to reduce emissions, we shall have to think about how to improve environmental resilience and take proactive action to adapt. My preferred outlook for doing so is within the framework of what I call 'utopian realism'. A dose of utopianism is needed because policy thinking must go well beyond the parameters of the here and now if a more sustainable world economy is to be created. However, if not coupled to realistic modes of achieving them, such goals will remain mere aspirations.

This book is a significant contribution to the rethinking that will be necessary. It is global in scope, encompassing studies from a range of countries around the world. The work quite correctly focuses upon the need to bring the social and natural sciences much closer together. The task is a formidable one because the same holds true of different sectors of within these categories. For instance, economists have to work with sociologists, anthropologists and human geographers; climatologists have to collaborate with biologists and earth scientists. Younger researchers – such as represented in this volume – perhaps more able than their elders to think in radically new ways – should be in the vanguard.

Achieving greater sustainability must be grounded in the transformation of local practices, including in some of the poorest societies on earth. There causes for optimism alongside the entrenched problems. In the digital age, ideas can be directly discussed, and strategies developed, without the traditional limitations of time and space. The pace of change has accelerated, but so have the opportunities for positive innovation. To take the core example: the Internet barely existed 20 years ago. Now it is more or less universal, and embedded both in the largest global institutions and in the conduct of everyday life. Perhaps the same could happen with radical advances in renewable technologies? Perhaps the famous inertia of the fossil fuel industries, which seems to be condemning us to such a disturbing and dangerous future, could be less implacable than it seems? Think what happened with mobile phones in large parts of Africa. A whole stage of technological evolution was simply skipped.

We live today in what I like to call a high opportunity, high risk society. The biggest risks we face, as collective humanity, come not from nature but from ourselves. They derive from our newfound global interdependence and the fragility

of the systems that are driving it. The level of technological innovation is so high that we do not know where it will lead. The very same research that could produce breakthroughs in genetic medicine, for example, might also inadvertently create lethal pathologies. A previously unknown virus, for instance, could produce a pandemic. As we saw in the financial crisis, the global electronic economy is inherently vulnerable and the effects of that crisis are as yet far from being fully resolved. We don't know in advance how the balance of opportunities and risks will pan out, simply because we have little past historical experience to go on. No previous generation has lived in a world as highly globalised as that of today. Some of the risks we face are existential. Yet the opportunity side of the equation is equally huge and we have to make it count.

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Contents

Introduction

Sustainability has been one of the keywords in the sciences, as well as in local, regional and global policies, since at least the United Nations Conference on Environment and Sustainable Development (also known as the Earth Summit) in Rio in 1992. It is also at the center of the latest – and probably one of the biggest – joint research initiative of the world's umbrella organizations for the natural and social sciences: Future Earth. With this initiative, led by the International Council for Science (ICSU) and the International Social Science Council (ISSC), sustainability is also at the heart of the Belmont Forum's activities, which is an association of some of the world's most important national research organizations, including those of the US, China, the UK, Germany, India, Brazil, Japan, France, Norway and others.

Although sustainability is of core importance for so many dimensions of human action, the concept lacks a convincing integration into the social and natural sciences. In addition, it is particularly important that our recognition of cultural dimension should be enhanced to achieve a shift towards sustainable lifestyles. We suggest that the social and natural sciences' contribution to achieving sustainability on a global scale may be to work towards a truly transdisciplinary approach: An approach that overcomes the merely additive logic of inter-disciplinary cooperation.

The adverse impacts of climate change, as well as earthquakes, hurricanes, and bush fires, are commonly reported as 'natural disasters'. It is, however, important to understand that there is a distinct social dimension to these events. Because they are very often primarily the outcome of inadequate knowledge and actions, they are above all social disasters. Basically, they are the unintended consequences of social actions and therefore as much a social as a natural problem.

These and other events demonstrate, however, that we need to better integrate natural and social-scientific research, as well as the insights from the cultural sciences and the humanities, in order to better understand the so-called natural disasters or ecological crises. This book, and the more encompassing initiative of

the International Geographical Union for an UN International Year of Global Understanding, aims to make a significant contribution to this goal.

This book has two specific main objectives. First, it aims to document the latest theoretical developments in integrative research on the society-culture/nature interface within and outside the academic mainstream. Second, it aims to investigate the varied ways natural and social environmental sciences are applied in different cultural worlds.

These objectives have to be seen in their historical context. The theoretical foundations of ecological research and sustainability policies were developed at the end of the nineteenth century. They are largely based on investigations of living spaces, and the evolution and differentiation of varied life forms. It is important to realize that this perspective is embedded in the practical and theoretical European problem situations of their time. As a consequence of evolutionary imperialism – the dominant ideology at the time – the perspective lacks the appropriate social and cultural differentiation. The interim transformation of spatial and natural relations is based on the globalization process, which is so radical that we cannot continue trying to solve twenty-first century ecological problems with strategies derived from theories designed for nineteenth century problems.

This book offers new transdisciplinary research perspectives, in methodological and theoretical respects. The four parts offer insights into the twofold bio-physical and the socio-cultural global embeddedness of local living conditions on the basis of selected empirical studies from Latin America, Asia, Africa, Australia and Europe.

Part I: Integrated transdisciplinary research focuses on the critical evaluation of integrated research's current status in respect of developing a promising strategy for transdisciplinary problem solving. Taking into account the pace and magnitude of the environmental challenges that all life forms on Earth face, we need a systematic inventory and a careful appreciation of the existing research approaches, especially the ones that hold promise regarding overcoming clearly identified weaknesses, namely: (i) natural scientists and engineers' lack of appropriate understanding of the social world; (ii) social sciences and the humanities scholars' lack of understanding and integration of biophysical elements of; and (iii) the reductionist implications of systemic integration. It is imperative to identify research that goes beyond interdisciplinary frameworks towards genuine transdisciplinary research. To call for transdisciplinarity reinforces, rather than questions, the validity of disciplinary and interdisciplinary research, of course. But switching disciplinary perspectives alone will not yield an integrated view of the nature/society interface. To overcome disciplinary blind spots, we need a perspective that specifies and solves problem complexes regardless of the disciplinary interests and boundaries.

Part II: Knowledge encompasses contributions dealing with the basic conditions of everyday practices, the core 'elements' of global sustainability and transdisciplinary research. The pace and magnitude of climate change and other environmental issues rooted in human intervention in the natural world call for a systematic review and evaluation of the different research approaches in all cultural contexts. Promising approaches should be identified and evaluated. Besides consulting the

leading figures in integrated research and in natural and social science sustainability research in the different scientific language communities and disciplines, it is essential to examine how scientific knowledge is integrated into everyday actions. Case studies in the different cultural realms exemplarily demonstrate the challenges of knowledge integration at the science-policy interface and policy-society interface as well as the complex nature of sustainability.

Everyday local human practice is based on powerful cultural needs, such as food, housing, ways of life, the requisites of leisure, mobility, communication and spirituality, which powerfully influence the states of global life-support systems. Part III: Society nature investigates approaches focusing on the society/nature interface to reveal the varying impacts of human practice on the global environment. In addition, understanding the impact of cultural interpretations is a prerequisite for achieving sustainable development. Therefore an investigation of the varied ways in which environmental sciences are applied in different parts of the world is essential, especially with specific attention paid to mitigating unsustainable practices and to the adaptation of the consequences of climate change at the local level.

These papers identify the impacts of cultural differences, as well as the role of cultural factors in the use of natural resources.

Part IV: Interfaces science policy introduces a systematic inventory and careful examination of existing national problem-solving strategies: Leading public figures in the different nation states are hypothetically the most experienced actors in sustainability. A comparative analysis from a cultural perspective of governmental environmental action units reveals cultural blind spots in political strategies for achieving sustainable development. In the politics of sustainability, the grand challenge is perhaps still that of changing human behaviour on the basis of scientific insights. Traditionally established customs, habits and everyday routines very often impede the application of scientific insights to unsustainable practices and policies. Young scientists and policy developers may be more open than their elders to the changes needed for the adoption of sustainable ways of life. The consequences for the adaptation of sustainable development standards are also discussed in this chapter.

Jena, Germany Benno Werlen

Part I
Integrated Transdisciplinary Research – New Approaches

From Local to Global Sustainability: Transdisciplinary Integrated Research in the Digital Age

Benno Werlen

1 Introduction

The theoretical foundations of ecological research and sustainability policies were developed at the end of the nineteenth century and were largely based on biological and geographical investigations of living spaces, and the evolution and differentiation of varied life forms. Both the biological and geographical disciplinary perspectives are embedded in the practical and theoretical European problem situations of their time. The two scientific investigations – one into life general and the other into human life on our planet – were linked to the social and spatial formations we currently regard as historical. Given the current problem constellations, we need to rethink these concepts. Systematically and historically, we can learn a lot from these biological and geographical scientific traditions: the positive outcomes and, even more importantly, the highly problematic implications.

The interim transformation of the spatial and natural relations is based on the globalization process. This process is so radical that we cannot continue to try and solve twenty-first century ecological problems with problem-solving strategies derived from theories designed for nineteenth century problems. To overcome the problematic implications of this constellation, we must trace back its historical roots. Since the theoretical horizons of the biology and geography disciplines are embedded in the practical European problem situations of their time, the theoretical foundation of the sustainability concept's original elaboration lies at the beginning of the eighteenth century's abuse of forests for early forms of industrial production in Saxony, central Germany.

The transformation of the spatial and natural relationships that have occurred in the interim is based on technical innovations aimed at mastering the spatiality of

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human existence (Werlen 2010, 324ff; 2013) and at empowering the transformation of contemporary natural living contexts. This process of innovation was first accelerated in the nineteenth century with the appearance of carbon-based engines, which is part of the current ecological crisis. The second wave of acceleration was a result of electronic communication innovations, which led to radical implemented changes in the spatial conditions for human actions. We must therefore reconsider the two key environmental policy concepts for current times and for our future. Under these globalized and globalizing conditions, it is indicated that we should move from a primarily space-centered regional perspective to a primarily practice-centered global perspective.

2 From Local to Global Sustainability

Today, global sustainability is needed, and global sustainability requires global understanding. To think globally and act locally, we require a better understanding of our local, daily activities' impacts on a global level. Reaching true global understanding is a prerequisite for a more sustainable planet through everyday practices. Our shared future on earth depends on successfully establishing sustainable everyday actions. This is where the local and global become one. To grasp this, we need a widespread awareness of how everyday actions create the challenges that impact humanity on a global scale. This includes our capacity to connect actions and thoughts that may seem disconnected across time and space.

Global environmental change research has produced unambiguous scientific insights into earth system processes. Nevertheless, these findings are globally too rarely translated into effective policies that can help prevent the worst consequences of global change. It seems that we not only need to deepen our knowledge of socio-cultural contexts, but must also improve the level of society's acceptance of scientific knowledge. The reasons for this are not only clear in the underrepresentation of the social sciences in environmental and sustainability research, but also in an even more radical – and very often widely accepted – diagnosis of the current situation: the social sciences and the humanities' lack of interest.

The reasons for this unsatisfactory situation lie very deep and can certainly not merely be overcome through the integration of the social sciences and the humanities into the existing methodology of environmental research, which are dominated by natural scientific research methodology and methods. This dominance is very often the reason for large parts of social sciences and the humanities' lack of interest in these two fields of investigation. Their role cannot just be to transmit natural scientific insights into environmental and sustainability research "into society," whatever that may entail. This constellation, with its highly problematic methodological background, can probably only be solved if we succeed in overcoming its shortcomings. These shortcomings are based in the afore-mentioned historical roots of environmental research, and has certainly nothing to do with any lack of competence in the social sciences and the humanities. Rather, these shortcomings are a result of the still dominant conceptualization of environmental research.

The theoretical foundations of ecological research were largely developed at the end of the nineteenth century. Ernst Haeckel's (1866, 1878/1879) biological investigations into living spaces and the conceptualization of human geography by Friedrich Ratzel (1882, 1901) formed the basis of the elaboration of ecology. In both scientific traditions, living spaces were seen as a kind of directory for selective evolution and the subsequent differentiation of varied life forms.

It is important to acknowledge that living spaces have much in common with the Newtonian container space elaborated in the context of the classical mechanics and optics (Newton 1704). We can conclude that the historical basis of ecological thinking is rooted in a mechanistic worldview (Jaeger et al. 2001), directly derived from the basic assumption of the Newtonian container space and its causal power. The mechanical view of all process implies that nature as well as society are controllable and maneuverable by the same means and same intervention type. Consequently, this mechanistic worldview requires – at least implicitly – that we neglect socio-cultural differences and the reflexivity potential of human practices. Therefore, it largely ignores the social scientific insights into the ways social realities are produced and reproduced, including the social context of the transformation of biophysical realities.

It is also important to understand that Hans Carl von Carlowitz's (1713) development of sustainability is also – at least indirectly – linked to the Newtonian container space. He developed the basis for sustainable ways of production in the mining and forestry contexts at the end of the seventeenth and beginning of the eighteenth centuries. In Germany and in many other places in continental Europe, most of social and economic life is characteristic of regional societies and their typical spatio-temporal constellations. Over time, stability has been based on the domination of local traditions. Transportation and communication's technical standards have led to narrow spatial limitations. The predominance of walking and the limited significance of writing restrict social and cultural expressions to the local and regional levels. Additionally, technological development has led to production processes tied to natural conditions. Economies and the (problematic) consequences of the transformation of nature for human purposes are, as a result, bound to a regional rather than a global reach. Pre-modern and early modern ways of living largely correspond to the basic assumption and shape of the Newtonian container space (Werlen 2005).

The methodological approach conceived by the above-mentioned scholars – the pioneers of regional environmental and local sustainability concepts – is still largely valid (World Commission on Environment and Development 1987; Hauff 1987) in respect of most international sustainability politics, especially the UN environmental politics and the UN decade of education for sustainable development (www.unesco.org/education/desd). The natural and spatial (including their ecological components) remain the starting points of ecological investigations, preceding all human actions (Werlen and Weingarten 2003, 2005, 2013; Grober 2010; Grunwald and Kopfmüller 2012). In this context, it is very important to realize that sustainability refers not only to the Newtonian container and Haeckel's living

space, but also to life forms with clear local and regional borders, and certainly does not include the global reach of the social and economic spheres.

Thus, the logic of mainstream research in this field starts conventionally from pre-given spatial constellations, and normally also forms the empirically observed problem situation in the biophysical world. Therefore – and at first glance absolutely logically – natural sciences, including the geosciences, are seen as disciplines with first-order competences. In addition, sustainability problems have very often been regarded as spatial problems that should be addressed by spatial strategies, or at least territorial problem-solving strategies.

These views can be understood as expressions, or consequences, of spatial ontology, rather than of pre-modern space ontology in the tradition of the Newtonian container and Haeckel's living space. This understanding is based on highly problematic geodeterminist and even dramatically destructive geopolitical ways of thinking, especially in European history in the nineteenth and first half of the twentieth centuries. We simply cannot deny that this logic of thinking, acting, and politicizing has the same historical, scientific, and epistemological basis as traditional geopolitics practiced by the European imperialistic expansion politics and the national socialist blood and soil doctrines.

With the acceptance of all human action upstream, pre-given container or living spaces imply two naturalistic reductions (Werlen and Weingarten 2005, 291). Because only extended material facts can be localized in such spaces, all meaning aspects are at first neglected and reduced to a material vehicle of the representation of meaning. The social dimensions evaporate, and meaningful human action is reduced to the biological aspect of simple behavior. The second naturalistic reduction lies in the reification of the social. The social becomes a natural object with the same qualities as biomaterial world entities. Entities of the social world are thus addressed as biomaterial properties. On the basis of these kinds of operations, biomaterial properties such as race, sex, etc. are regarded as social features, and the derived racist, sexist, etc. discourses are believed to be, or at least implicitly presented as, naturally or even natural-scientifically justified. We must overcome this intellectually, politically, and ethically highly problematic constellation and move towards a post-colonial geographical imagination (Said 1978; Gregory 1993, 2004; Jazeel 2012) or, better still, towards a post-colonial worldview, taking into account the new spatio-temporal constellations, meaningful social-cultural worlds, and generalized democratic principles.

On the whole, the pre-given status of nature and space implies normative standards that undermine cultural and social differences in an affirmative, democratic way. From this we can draw the hypothesis that the container/living space perspective also undermines the required acceptance of the suggested ecological policies based on these premises.

3 The Needs for Revision and Sound Integration

There is much evidence that human action induces most ecological problems. Scientific research methodologies and designs should therefore adapt the same logic: They should start from social-cultural practices and regard them as the causes of, or better, the reasons for ecological problems. The global reach that the consequences of human practices have means that we should focus on tracing back the global problem constellation to daily actions and routines, with their manifold cultural differentiations, which are produced and reproduced in a specific local context.

If human actions do indeed cause the current ecological problems, the reasons for these actions consequentially and largely lie outside the competence of the realm of natural science. The nature of and the human reasons for non-sustainable practices are increasingly understood, but gaining knowledge on how to change individual and social practices concerning sustainability remains a major challenge for healthy nature-society relationships, as well as in terms of designing environmental policies informed by sound science. But this is only one side of the problematic constellation.

On the other hand, social scientists, with their competence to analyze human practices, must pay more attention – also in terms of traditional geodeterminist thinking – to biophysical conditions and to material culture. However, practice-centered approaches so far largely excluded the natural world from the outset. Because the biophysical world does not have meaning in itself, the social sciences' actions and practice-centered approaches – such as those of Max Weber (1912, 1913, 1920) and others standing in the tradition of his way of reasoning – excluded the natural world from their investigations. This meant a kind of spatial amnesia, which paradoxically parallels the spatial obsession of biological living space and geographical (environmental) research. Both these methodologies obstructed the non-deterministic integration of the biophysical into socio-cultural research, which would provide access to a non-reductionist form of social scientific ecological that would accept the importance of subjective meaning and interpretation in natural living conditions' transformation processes. This methodological constellation calls for a better understanding of material facts' significance and human actors' corporeality as the mediating biophysical part that constitutes the social realities that the newer practices-centered approaches address in the social sciences (Bourdieu 1977; Giddens 1984; Gregory and Urry 1985; Beck 1986; Lefebvre 1974; Latour 1991) and in social geography (Harvey 2005; Werlen 1993, 2007, 2010; Schmid 2005; Lippuner 2005; Gäbler 2015).

The historically established double blindness – regarding the social-cultural concerning the natural sciences and regarding the biophysical concerning most of the social and cultural sciences – have led to a widespread absence of non-reductionist social science and humanities insights into sustainability research and into global change issues such as the politics of climate change (Beck 2009; Giddens 2009; Stehr and Storch 2009; Urry 2011), which were until very recently

excluded from social scientific research. This can be seen as the second challenge for nature-society and the science-policy interfaces. In short, the natural sciences do not have a differentiated view of the causes of and reasons for human-induced ecological problems, and mainstream social scientific approaches suffer largely from a near absence of biophysical world expertise concerning social practices.

The exclusion of a meaningful construction of the socio-cultural world and social-cultural meaning attribution to the biophysical world on the one hand (the naturalistic perspective) and the exclusion of the embodied actor as a medium of human practices from the biophysical world on the other hand (the culturalist perspective) is constitutive for the gap that has to be overcome by integrated ecological research. However, general systems theory is, to date, the most prominent approach to overcome this gap by means of a theoretical framework. This approach is applied in the natural and the social sciences as well in ecological research. It integrates biophysical and socio-economic systems on the same ontological level. However, the ways biophysical and socio-economic facts exist differ: Biophysical facts can be characterized as existing in a realm of materiality and (causal) determination, whereas socio-economic facts reside in a realm of contextuality, meaning, and path dependency. The two cannot be treated as if they were integrated into a single system governed by the same kinds of functional relationships; recognizing their distinctive logics is a prerequisite for successfully addressing socio-cultural realities and ecological challenges, or the dilemmas that human action produces. Understanding cultural interpretations' impacts is a prerequisite for achieving sustainable development to reach global sustainability.

The current status of integrated research broadly lacks an ontologically sound and promising strategy for integrated problem-solving and an acceptable consideration of the power of cultural schemas concerning interpretations of natural living conditions. We can conclude that we are facing four weaknesses – a lack of:

- appropriate understanding of the social world by natural scientists and engineers;
- understanding and integration of biophysical elements by social sciences and humanities;
- ontological differentiation resulting in the reductionist implications of systemic integration;
- sensitivity regarding the power of cultural differences when dealing with the natural.

4 New Realities, New Challenges

As briefly noted, new production and communication technologies are reshaping the geographies of the economic and cultural; time-space compression occurs through innovations in transportation and communication (McHale 1969; Harvey 1989; Rosa 2013), while resource and energy use is expanded. All these processes

are interrelated, and transform daily life all over the globe. Daily, we are experience that globalization has brought – and is bringing – far-flung places and people into ever-closer contact. New kinds of supranational communities are emerging at an accelerating pace. At the same time, these trends do not efface the local. Globalization is also associated with a marked reaffirmation of places and regions as distinctive forums of human action. In one way or another, all human actions remain regionally and locally contextualized, even if their consequences have global impacts.

The acceleration of globalization is bringing about a new world order. This involves both the integration of natural-human ecosystems all over the world into a unified planetary environment and the steady emergence of an integrated global socio-economic reality. At the same time – perhaps as a result of these processes – global environmental change is occurring at the same, continuously increasing acceleration (Rosa 2013). The extent to which global environmental change is human induced was again documented in the latest IPCC report (IPCC 2014) on climate change mitigation. This report makes it even clearer that there is no alternative but to deepen our knowledge of socio-cultural contexts, to improve social and cultural acceptance of scientific knowledge, and to take culturally differentiated paths to global sustainability.

Although the recognition of global processes' interrelatedness is increasing, parochial discourses have become more forceful on the global stage, often in ways that seem to provoke discord rather than foster global understanding. Many of these discourses postulate a parochial or nationalist interpretation of global processes, or even territorial conflicts as 'solutions' for the most pressing issue of the day, instead of favoring interpretations based on global understanding as guidelines for local and regional actions and measures. In this regard, we also need to deepen our understanding of the new global realities so as to productively address the emerging interconnected challenges.

Although it is clear that local and global issues are intimately related, attempts to address the issue of global climate change have never focused adequately on the question of scale (Marston 2000; Brenner 2001; Beck 2006). In our view, this is one of the central issues of environmental politics and entails two aspects. The first is the specific spatial constellations of politics and global challenges; the second refers to the regional bases of action and the problem's planetary reach.

The first scale problem is that science develops planetary models, but decision-making bodies are primarily involved in finding solutions that have a national scope. The second scale-related problem affects the democratic legitimization of environmental politics in general, and climate politics in particular, beyond national borders. To become fully politically potent, the global orientation of political action and goal-setting must ultimately achieve national endorsement. To reach this sustainably, the first condition is for individuals to develop a global consciousness of their living situations. International institutions such as the UN and political networks should encourage and establish the development of global understanding in the everyday lives of the majority. In short, we need a stronger and broader awareness of the why and how of the link between the global and the local.

A fully binding decision-making body with global jurisdiction can certainly not be established in the timeframe available to humanity's most pressing problems. Global necessities require swift yet considered political action and goal-setting. We must promote global justice, while integrating local interests and concerns. In short, since it is unlikely that a global authority will be established in the near future, the most sustainable solution is to downscale planetary mitigation and adaptation programs to personal levels of decision-making in different everyday constellations.

5 From Interdisciplinary to Transdisciplinary

Given the described everyday and scientific conditions, we must acknowledge that societies and cultures determine the ways we live with and shape our natural living contexts. We must address the ways we live in an increasingly globalized world and the transformation of nature from the perspective of global sustainability for the sake of future generations.

To achieve the above, science must overcome the identified weakness in the field of integrated research in both natural science and social science, as well as in the humanities and even beyond general systems approaches. Natural and social scientific knowledge, as well as insights from the humanities, must be integrated by respecting the ontological differences of the various research realms.

Calling for transdisciplinarity is, first, to ask for a clear differentiation between interdisciplinary and transdisciplinary research methodologies. Attempts to establish interdisciplinary research cooperation clearly show that instead of promoting scientific cooperation and integration, the (paradoxical) opposite has occurred – the profiling of disciplinary boundaries. The disciplinary organization of modern science can, to a certain extent, be compared to nation states as a form of political organization.

Each discipline and each nation state proclaim their competence regarding and responsibility for the attributed or claimed sphere. If the problem constellation surpasses the capacity of one of them, the interaction between them is normally put on the agenda in the form of interdisciplinary or international cooperation. This tendency is a currently one. Since each nation state gains a certain profit from cooperation, each scientific discipline also gains. Consequently, disciplinary boundaries or identities are enforced rather than dismantled, and cooperation is only possible on the basis of a scientific division of labor and with specific – very often even incompatible – perspectives, methodologies, and methods. In most cases, the dilemma of incompatibility is solved by choosing to accept the logic of traditional environmental research, by maintaining the primacy of the natural and, as a result, the primacy of a natural scientific perspective, and a natural (scientific) research unit.

A typical example of such a 'solution' would be investigations into sociocultural aspects of river catchment areas. The research unit of integrative research

is natural, the topic is socio-cultural, and integration will only be possible on the basis of (geo)deterministic explanations of the socio-cultural by natural (living) space (river catchment area). Switching disciplinary perspectives will therefore not yield an integrated view that respects the ontological differences between the socio-cultural and the biophysical realms.

And if the additive logic of interdisciplinary cooperation does not lead to effective integration, this is not due to a lack of ability or goodwill. The lack of integration is inherently linked to the organizational logic of scientific research. While this logic is very effective for many purposes, it certainly does not aid integration.

To overcome disciplinary blind spots, we need a perspective that specifies and solves problem complexes independent of disciplinary interests and boundaries (Mittelstrass 2001). One possibility is to focus on problem constellations of general concern in the way human actions produce these human-induced problem constellations – such as global warming or establishing global sustainability – and by taking the integration of the natural and the social into account concerning the way these actions integrate them.

Therefore, a genuine transdisciplinary perspective starts with the logic of everyday actions rather than with traditional scientific disciplines. Learning how human actions produce ecological problems is the first step. The second step relies on seeking appropriate science-based analyses of the different aspects of human actions (socio-cultural, mental, biophysical, etc.). The third step does suggest solutions through the logic of problematic human actions, which provides suggestions on how to do things differently in the given everyday context, or in a context that must be newly established. In this way, topic-focused cooperation and not discipline-focused cooperation should become feasible between scientists and humanities scholars without reductionism and without one research sector inappropriately dominating the other.

The proposed form of transdisciplinary research perspective is marked by the logic of everyday human actions and practices, proceeding from the socio-cultural to the biophysical, and not according to the logic of a scientific, disciplinary division of labor. Therefore, we first require insights into the problematic context of action. We should then seek to answer the question of what kind of scientific stock of knowledge should be used to change harmful practices. It is not the disciplinary order determined by the analytical 'decomposition' that defines a problem as being a chemical, physical, sociological, historical, geographical, etc. one; instead, the practical problem provides the organizing principle of the use of knowledge, moving from the everyday to the science level and not the other way around. As a result, transdisciplinary perspectives should focus on actual embodied individual human activities performed by every person, every day, everywhere in the world. Finally, complex environmental problems should be addressed as social problems. This perspective will enable us to address society-nature and science-policy interfaces in new ways (Werlen and Weingarten 2004).

6 Building Bridges

According to the perspective suggested in this chapter, the predominance of the natural over the social should first be replaced by problem production logic, from the socio-cultural to the biophysical. To build a bridge between knowledge and action, knowledge should be presented in the logic of action, and not in the logic of nature.

Second, it is imperative that science should bridge the gap between global problems and national, regional, and local behavior, as well as decision-making. Thereafter, effective solutions should be prepared. According to this perspective, effective solutions based on bottom-up decisions and actions are at least as likely to be effective as top-down measures. This bottom-up strategy of scientific methodology aims to gain insights into the behavior of individuals, households, and firms that make the majority of decisions that collectively cause human-induced global change. In the process, differing perspectives and insights from everyday experiences should be integrated with research results from the natural and social sciences, as well as the humanities, into a geographical locality-based framework. The third bridging step addresses the world of sciences and the everyday worlds in their manifold constitutions.

Actions and thoughts that may seem disconnected in space and time are often fundamentally linked, and global understanding enables people to make such connections. Many people know about the need for sustainability, but few make the corresponding decisions. Consequently, the main scientific goal should be to promote global understanding so that actions and decisions yield sustainable outcomes, every day, all over the world.

7 Global Understanding: The IGU Initiative for an International Year

To help establish the necessary conditions for such global awareness, the IGU Initiative for the 2016 International Year of Global Understanding (IYGU) proposes a new geographical worldview that takes into account the specific spatial features of current living conditions. The outline of this initiative first illustrates the direction of the development of newly designed research methodologies, of subsequent research programs, and of everyday policies. Second, it seeks to make visible the implication of such an orientation and the three interfaces: between local and global, between the natural and social sciences and the humanities, and between the sciences and everyday life/policies.

The IYGU Program: Levels and Interfaces

Local || Global
Global understanding

Social || Natural
Transdisciplinary research

Science || Everyday
Integration of different types of knowledge
Bottom-up policies based on everyday decisions

The IGU initiative starts with the hypothesis that humanity's grand challenges (Reid et al. 2010) are self-made and affect the whole planet. A widespread awareness of how everyday actions create the challenges that impact humanity is a prerequisite to finding solutions. This initiative addresses the why and how of people's and peoples' distinct responses to similar ecological dilemmas. It seeks to improve conditions for the policies and strategies required to deal with these difficult situations.

First, the IYGU wants to make the global understandable through local everyday actions. True global understanding requires awareness of the global implications of everyday living and will demonstrate how the socio-cultural and biophysical spheres are connected in different life-worlds. The IYGU seeks to facilitate understanding of global processes, to encourage everyone to make daily decisions in light of the global challenges, and to contribute to bottom-up initiatives that connect individual, local actions to global sustainability.

To overcome the mentioned shortcomings of the currently dominant ecological approaches, the IYGU program, at a first level, ignores the differentiation between the natural and social, and starts with basic human practices such as working, housing, eating, etc. that encompass both realms in an integrated way.

Socio-cultural	Human actions as everyday practices	Natural
Cultural values	**Eating/drinking//surviving**	Food systems
Risk	**Working/housing//urbanizing**	Climate change
Cultural diversity	**Moving/staying//belonging**	Biodiversity
Schemes of interpretation	**Wasting/recycling//preserving**	Soil degradation
Glocalized lifestyles	**Communicating/networking//interacting**	Sea level
	Sports/entertaining//recreating	

The reconciliation of the global and the local, as well as the natural and social, is as much a part of global understanding as the reconciliation of science and everyday lives. To reach this goal, the IYGU wants to encourage scientists and citizens to effect change towards sustainable social actions, habits, and routines on the basis of a new geographical imagination of the world, one in which the practices of geography making are at the core, rather than spaces, countries, or continents. Social practices are at stake, not predominantly living spaces or ecotopes.

The International Social Science Council (ISSC), in collaboration with its member organizations, the international umbrella organization for philosophy and

the humanities (CIPSH), and the ICSU, the global umbrella organization of all natural scientific disciplines, strongly supports this initiative.

The objectives of the International Year of Global Understanding will complement those of the Future Earth initiative by the International Council of Science (ICSU) and the International Social Science Council (ISSC):

The International Year of Global Understanding has five outreach objectives:

1. Establish a comprehensive global understanding and awareness of the natural and cultural embeddedness of all human action.
2. Contribute to changing ecologically harmful habits by designing culturally differentiated, exemplary alternative models of core everyday (best) practices.
3. Enhance awareness of the individual capacity and responsibility for everyday decision-making.
4. Produce school teaching modules and study guidelines to be implemented at all educational levels – from primary to tertiary and post-experience education.
5. Serve as a catalyst for transdisciplinary cooperation and improve the culturally differentiated transfer of scientific insights into social practice.

This way, the IGU initiative hopes to yield deep but actionable insights into the ways all peoples can live more sustainably on and with the earth, as well as with one another. It includes action sets that will establish scientific research initiatives and improve public awareness of key human life issues. Furthermore, the initiative intends to boost the scientific community's enthusiasm for transdisciplinary research.

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