



Institutional reorganisation can be inspired by forward-looking information systems

Institutional
reorganisation

1

Gilbert Ahamer

*Wegener Centre for Climate and Global Change, Graz University, Graz,
Austria and Department for International Relations,
Environment Agency Austria, Vienna, Austria, and*

Johannes Mayer

*Department for International Relations, Environment Agency Austria,
Vienna, Austria*

Abstract

Purpose – This paper is the continuation of an earlier paper in this journal on global megatrends provoking institutional changes. It contains sectoral analyses with relevance to environmental protection. Conclusions for suitable institutional reorganisation of (environmental or other) institutions are presented. The paper aims to discuss these issues.

Design/methodology/approach – A planet-wide information system might optimally also include areas such as human development indicators, water supply and demand and deforestation issues.

Findings – While administrations are increasingly oriented towards servicing a society, environmental institutions should specifically take care of global megatrends in the following areas: genetic engineering and biological safety, integrated plant technology in industry, climate protection, agriculture, noise, emissions and air pollution, sustainability, spatial planning and regional planning, radiation protection and nuclear power, Environmental Impact Assessment (EIA) and Environmental Information Act, traffic, forest, water.

Originality/value – The approach of this paper is the long-term matching of (national) administrative structures with (global) megatrends.

Keywords Institutions, Environment, Reorganisation, Global Change Data Base, Megatrends, Planet-wide information system, Global information system

Paper type Research paper

1. Introduction: institutional reorganisation

An earlier article in this journal (Ahamer and Mayer, 2013) has proposed a methodology to target institutional reorganisation for the environmental, energy or economy-related sectors in a sustainable manner (Holling, 2000) on a national or international level.

The global and strategic positioning of an institution (such as national institutions with the profile of the “Administration de l’Environnement du Grand-duché du Luxembourg” (AEL) or the “Austrian Environment Agency” (AEA)) requires long-term forward thinking on a global scale. The analysis of global megatrends (forward looking (FL), see Ahamer, 2008; 2013a, b) might play a helpful role when designing strategies for institutional redesign.

Furthermore, this text provides the requirements and opportunities for any environmental institution in the overall context of megatrends within the global



The author wishes to express his gratitude to two professional language reviewers, Mrs Andrea Lyman and Mr Alun Brown (internationally based, www.andrea-lyman.com) for highly successful decade-long cooperation.

techno-socio-economic evolution, and combines it with options for specific action within the European Union or anywhere globally.

Institutional reorganisation can take place at national or institutional levels (Ramet, 1984; Olswang, 1983; Rauch, 2013, 2014), especially in education and administration (Hunter, 1981; Montes, 1997, p. 406). Institutional reorganisation may include university-industry-government relations (Etzkowitz and Leydesdorff, 2000, p. 111; Bader *et al.*, 2013, 2014; Moskovkin *et al.*, 2014; Korotayev and Zinkina, 2014; Korotayev and de Munck, 2013; Zinkina *et al.*, 2013) and cares for negotiations between institutional partners, especially when it pertains to ecosystem management (Olsson and Folke, 2001; Mol, 1996; Allison and Hobbs, 2004) or urban planning and metropolitan governance (Brenner, 2003; Yeh and Wu, 1999, p. 177), including climate change (Osbah *et al.*, 2008, p. 1957; Kienberger, 2012, p. 2005; Kienberger *et al.*, 2011; Kienberger and Zeil, 2005). Often based on a resilience theory (Holling, 2001, p. 401, 1987; Gunderson and Holling, 2001; Hughes, 1986, 2005; Bunnell, 2002; Matzenberger, 2013; Holling *et al.*, 2002; Walker *et al.*, 2006), a theory of adaptive change also appears appropriate for the target of carefully restructuring institutions' functions (David, 2004; Olsson *et al.*, 2007; Abel *et al.*, 2006) in order to better allow for sustainable development.

Parliamentary democracies (Baron, 1998) favour a discourse-oriented process of consensus building (Ahamer, 2005, 2006, 2012a, b, c, d) within an institutional landscape that might be capable of caring for the interests of the common good (Ostrom, 1990).

On the occasion of the re-localisation of the AEL in recent years at the new site in Esch-sur-Alzette – in an area of bolder modern urbanisation built on the foundations of the former local industrial site – this text deliberates options to propose concrete and strategically pioneering innovation on administrative levels.

2. Caring for a planet-wide information system

A planet-wide information system should rely on widely agreed data sets as provided by international organisations. For usage in strategic decisions, it is not sufficient to merely use statistical data straight from the statistical offices such as UNSTAT (2008) without any careful consistency checks, because these are too coarse and much too prone to data incompleteness (see Figure 1 for population data and Figure 2 for three or ten economic sectors) even if they seem to be highly differentiated at first sight (Ahamer, 2014, p. xx, where the 40 sectors are mentioned).

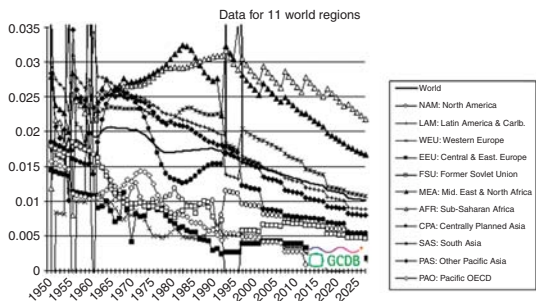
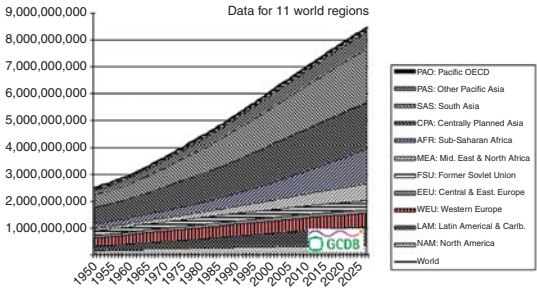
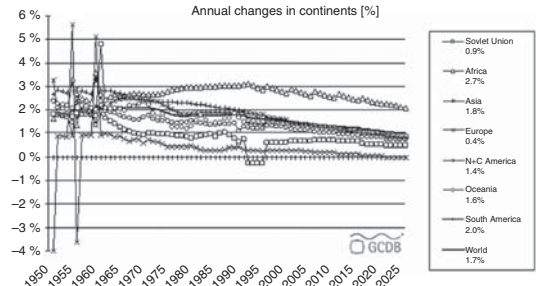
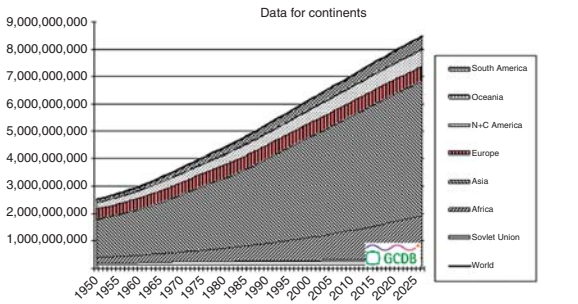
Therefore careful attempts are necessary to safeguard smooth and reliable data sets for describing global megatrends on which well-informed IR may be based. The next chapter undertakes this endeavour for several single cases, each described in one subchapter.

3. Concrete environmental fields for administrative reorganisation

The following chapter enumerates concrete areas for which an environmental institution might be reorganised. It recalls the DPSIR concept of the European Environment Agency (EEA, 1997, p. 4; Pirrone *et al.*, 2005) which is reduced to the steps “D-S-R” in the following figures. The areas – and consequently the potential departments of an organisation – start out where the earlier article has ended (Ahamer and Mayer, 2013, p. 400).

The following substructure of subchapters is used throughout chapter 3 whenever applicable (according to a scheme developed in Ahamer and Mayer, 2013, p. 396):

- position with respect to D → S → R;
- global megatrends; and
- results and recommendations.



Notes: Projections by the GCD8 based on UNSTAT data; Above: by continents; below: by regions

Figure 1. Even the most basic population data are not always free from data inconsistencies that show up especially when computing the first derivative (i.e. population growth)

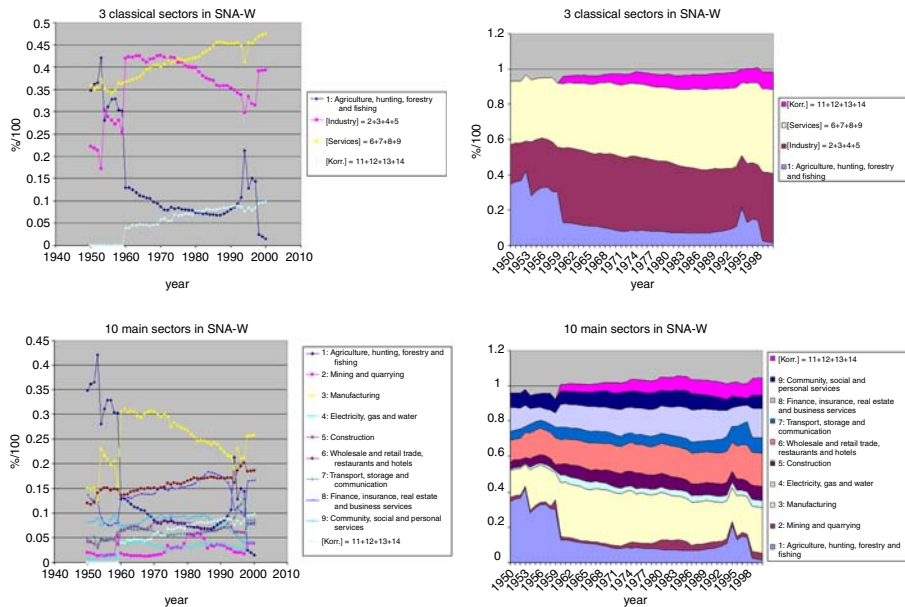


Figure 2.
A detailed but not sufficiently harmonised data set taken directly from the source such as the System of National Accounts (SNA; UNSTAT, 2008) does not suffice to draw substantial conclusions

Notes: Jumps in graphs are due to changes in data coverage, both for granularity of three economic sectors (above) and for ten sectors (below)

3.1 Genetic engineering and biological safety

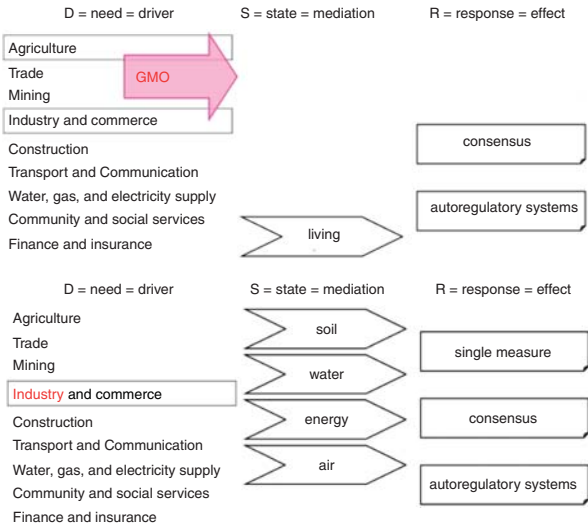
Position with respect to D → S → R: according to the earlier explanations of the graphic presentation (Figure 3 above), the definition of this topic related to technology and demand (genetically modified organisms (GMO)).

Results and recommendations: it seems probable that the further improvement of agricultural productivity is set to continue; however, which technological vehicles might be used by this process remains rather unclear (Breiling *et al.*, 2005). Insofar as agro-industrial production must “cram hungry mouths”; genetic engineering could formally advance into this demand gap (like nuclear power at one time assumed a place in the electricity sector). However, insofar as refinement and quality are primarily required, genetic engineering is difficult to sustain and such a technological approach will soon no longer be demanded by consumers oriented towards quality. Thus, the life cycle of agro-biotechnology could be a surprisingly and atypically short one, just as the lifetime of nuclear energy atypically begins to level off earlier than anticipated when contemplating the flow charts of energy sources exhibiting a seemingly regular pattern of newly incoming energy sources.

3.2 Integrated plant technology in industry

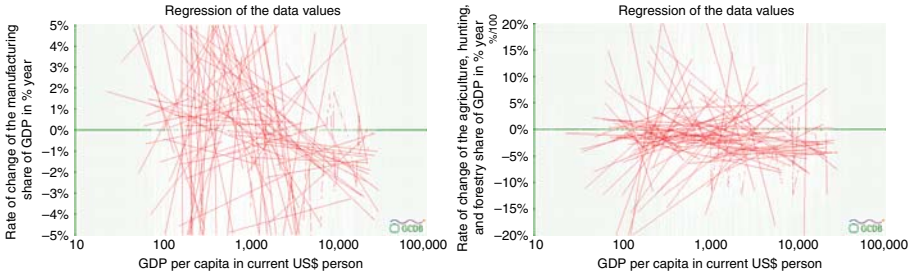
Position with respect to D → S → R: the definition of topics is related to emitters (Figure 3 below).

Global megatrends are described by Figure 4 at left: along economic evolution, the growth of industry’s GDP share declines from plus 1-2 per cent per year in developing countries to minus 1-2 per cent per year in more developed countries. A common expression is that “industry’s shares in total GDP keep decreasing”.



Notes: Above: genetic engineering and biological safety (chapter 3.1); below: integrated plant technology in industry (chapter 3.2). This scheme is explained in Ahamer and Mayer (2013, p. 396)

Figure 3. Graphic representations of the described sectors according to the steps D-S-R in the EEA's DPSIR model



Notes: At left: the decline of the manufacturing (industrial) sector's share of total value added in the most developed countries amounts to about 1-2 per cent per year, and is therefore very dramatic. At right: the sharp decline of the GDP share of agriculture as a share of total GDP, amounting from -1%/a to -5%/a analogically

Figure 4. Plot of change rates along economic development measured by GDP/capita while the green horizontal line means no growth

Regarding environmental protection this pertains to shares of emissions (e.g. air pollution), which regularly sounds like good news. Through its tight internal organisation, industry plays a leading role in the “proof of feasibility”. The dynamic principle of “Best Available Technology” (BAT) prescribed by the EU for several decades seems to be especially applicable in a sector in which there are clearly designed responsibilities and on-going optimisation activities. Thus, despite industry's declining relative shares in GDP, energy consumption and emissions, industry can still take an icebreaker function regarding the following, far more diffuse sectors such as “households” and “traffic”.

Results and recommendations: technological leaps in industry tend to diffuse into other groups of emitters. Thus one option for environmental protection, namely “transferrable learning processes”, could be prepared in industry.

The call for fundamental change in environmental protection tools may be strong in the industry sector: first, the (successful) era of individual measures has been left behind (i.e. when one filter per chimney was enforced by means of one directive administrative act), second, the “equilibrating tool” of EIA, SEA (and EMAS) has provided a frame for balancing environmental and economic interests (Duraković *et al.*, 2012; Müller *et al.*, 2013), and third, a systemic tool, namely “allowing the effect of market mechanisms” is welcomed by some interest groups. Just because industry might be efficient when incited by its genuine optimisation pressure, a well-considered administrative framework could bring about an evolution of environmental instruments: facultative commitments seem toothless, ecolabels too sugary and lame, emissions trading possibly too complex and too poorly secured against abuse. Industry can be a training ground for development of methods on the necessary path to structural environmental protection. Some proponents of sustainability might wish to direct the power flow of economic optimisation onto the mills of environmental protection.

3.3 Climate protection

Position with respect to D→S→R: the definition of topics is related to effects (Figure 5 above).

Global megatrends: trends regarding climate build on energy trends because at least 3/4 of emitted CO₂ stems from energy sources. Further structural decrease of the quotient

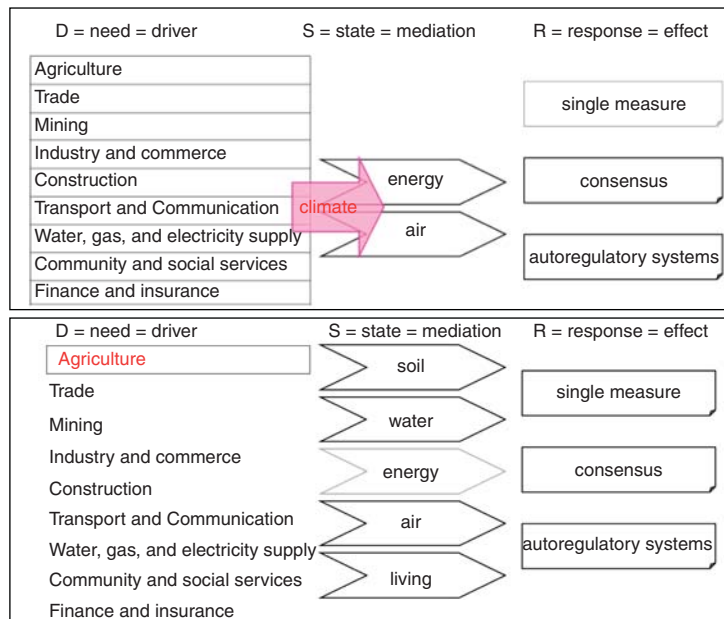


Figure 5.
Graphic representations
of the steps D-S-R
as in Figure 3

Notes: Above: climate protection (chapter 3.3); below: agriculture (chapter 3.4)

$\text{CO}_2/E_{\text{prim}}$ (i.e. energy intensity) should be achieved by changes in energy mix, as widely recommended.

Results and recommendations: the climate issue is significant because the atmosphere acts as an integrator of all previous acts in any part of the world; additionally, the climate issue is rapidly integrated across previously separated policy areas. For climate protection, each of the interests of the emitters must be balanced (e.g. regarding the breakdown of national reduction targets to sectoral or local reduction targets). Similarly, the question of global equity means to approximate towards “justice” between countries, regions and civilisations in different phases of development.

If nothing else (from an evolutionary perspective), the climate issue has at least united the (sensitive) side of mankind and set up a fine superstructure of values, ethical differentiations and concrete international treaties across the globe – similar to the concept of the noosphere formulated by Teilhard de Chardin (1955) and Vladimir Ivanovich Vernadsky (1926). Thus, it has accelerated the convergence of humanity and challenged the development of global policy instruments, especially the detailed design of globally effective, self-optimising mechanisms (such emissions trading, even if its effectivity is highly contested).

The climate issue is now a well-established testing ground for the development of global policy methods, namely for the creation of governance structures that hopefully lead towards lower CO_2 emissions, ideally in a self-optimising manner.

3.4 Agriculture

Position with respect to $D \rightarrow S \rightarrow R$: the definition of topics is related to emitters (Figure 5 below).

Global megatrends: one of the strongest single effects ever in the zoo of trends could be the declining importance of food production: the contribution of agriculture to total GDP decreases by 3-5 per cent per year (Figure 4 at right) and is very unevenly distributed globally (Figure 6). On the one hand, such an effect means freedom from the dictates of an empty stomach; on the other it is dramatically felt as “farmers’ death”. In any case, the sons and daughters leaving the farms have built up other sectors of the evolving civilisations: they had the potential for non-material work and to benefit from cultural education. This influx of potential seems unabated: the productivity increase of meat and cereal per unit area and per labourer sweeps over three orders of magnitude between the richest and poorest countries.

These productivity gains were bought with industrially produced energy input (machinery, chemicals), and some think there is no bottleneck noticeable for further continuation. The trend (Figure 4 at right) does not allow the thought of an end of such development; at best, of a plateauing.

More rural quality tourism could also become a success story which would allow a direct jump from the first to the third sector, as was proved by the early development of tourism in Austria after Second World War.

Results and recommendations: the available data shows indistinct recovery effects due to earlier shrinking processes. They could be attributable to increased value added per activity (i.e. by agriculture of quality such as organic farming) as well as to close proximity to dawning values (such as quality of life, sense of fulfilment) after the onset of saturation in matter-bound economic growth.

The proximity of agriculture to the principally balanced system “nature” promises fulfilment of the increasingly important value “quality of life” for the exponents of the physically rich society. The previous inconveniences of agricultural population,

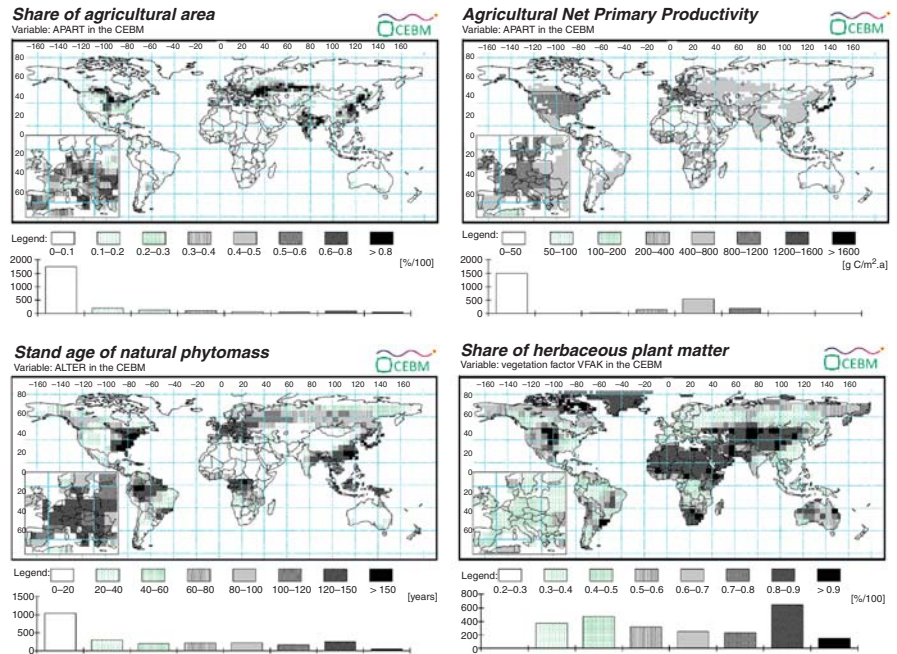


Figure 6. Geographic distribution of agricultural descriptors in the author's Combined Energy and Biosphere Model CEBM computing the annual agricultural yield and production of biomass for energy purposes

Notes: From left to right: percentage of agricultural area, agricultural net primary productivity, stand age of natural phytomass, share of herbaceous plant matter

such as living in a remote and scattered settlement structure, are likely to be largely offset by onrushing improvements in information and communication technologies (high-tech broadband internet connecting to villages, attracting increasingly skilled services sectors, cf. Hardaker *et al.*, 2010; Hardaker and Singh, 2011; Lewis *et al.*, 2005; Watson *et al.*, 2007).

3.5 Noise

Position with respect to D→S→R: the definition of topics is related to environmental media (Figure 7 top).

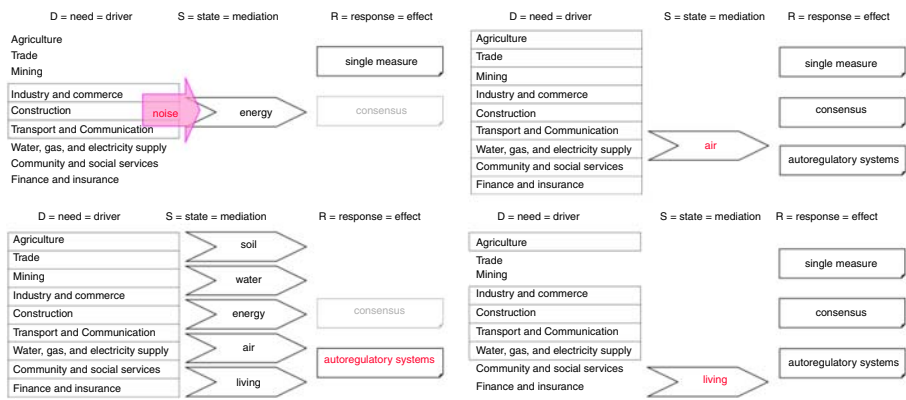
Global megatrends: behaves similar to the industrial and traffic trends. In the above scheme, noise is regarded as an energy form.

Results and recommendations: noise is of very high practical significance. The field of noise was previously highly accessible to technical solutions. Systemic solutions largely go along with air pollution control measures.

3.6 Emissions and air pollution

Position with respect to D→S→R: the definition of topics is related to environmental media (Figure 7 above centre).

Global megatrends: behaves similar to the industrial and traffic trends. In the above scheme, noise is regarded as an energy form. In addition to energy trends, technological advances have also improved specific air emissions. As a “classical” and historically early field of environmental protection, air protection has experienced many historic successes



Notes: Top: noise (chapter 3.5); above centre: emissions and air pollution (chapter 3.6); below centre: sustainability (chapter 3.7); bottom nature conservation (chapter 3.8)

Figure 7.
The steps D-S-R as in Figure 3

(decisive emission reductions in SO₂, particulate matter) and disposes of a well-established and well-administrated reporting system. Main characteristics of the field of air emissions:

- Early historical importance led to early successes.
- Clear logical structure.
- Some multiplications are sufficient for understanding the main issue.
- The coin has only two sides (emission and what in German is called “Immission”), but no more; therefore easy predictability for engineers.
- Low conceptual complexity.
- The “easy” measures have already been largely implemented; this environmental area is now facing the “complexity barrier” (= widely diffused emitter groups such as small consumers, households and transport that must be dealt with). The remaining more complex issues is no longer manageable by the previously successful technocratic access.
- Methodically the field remains the same and is intellectually exhausted by (mechanistic) reporting exercises.

Results and recommendations: tackle the complexity problem, and thereby tackle the as yet unsettled remaining sectors. Let yourself be inspired by new views from the “less common” areas. Develop entirely new approaches and essentially new methodologies for measures; otherwise this environmental pioneering area will incur stagnation after the historically easy initial successes.

3.7 Sustainability

Position with respect to D→S→R: the definition of topics is holistic and action oriented (Figure 7 below centre).

Global megatrends: this theme actually connects all other emitters, driving forces and topics. Considering sustainability corresponds to slowly turning into an integral understanding after decades of staid skilled work. The theme is very close to the dawning paradigm of meaning, and should continue to be well advanced. Strategically,

it is the core area for the approach of all environmental protection, because it is inclusive and action oriented. (Regarding trends: see all other chapters.)

Results and recommendations: the core here is the development of a methodology. Based on the efficiency of this concept “sustainability” to equilibrate environmental and economic interests, this field currently often satisfies itself with pious individual cases (exact calculation of sustainable raspberry yogurt production or sustainable wood pen production), but even ventures into the vast field of complete system redesign and beyond. An important dilemma could be: either stay nice but inconsequential or become amazingly profound by understanding the need for fundamental conversion of existing practices; that is, determine economic constitutions. This is a most exciting area.

The question is how does one define the boundary conditions, so that daily business operations (which might behave like a short-sighted elephant in a porcelain store) optimise in the desired direction? It could give rise to the proverbial building of castles in the air, which would be unfortunate. Even more difficult than outlining an “ideal sustainable world” is triggering the transformation in such a direction: that is, how to get out of the current neoclassical sub-optimum and slip over into a sustainable optimum of the economic system? The prospect is extremely transdisciplinary. Intensive conversation is needed and is still threatened by a great deal of hot air.

A systems theory access would be a basic tool, but this is not a science “that can be looked up in a manual”, nor a science with codified methods.

3.8 Nature conservation

Position with respect to $D \rightarrow S \rightarrow R$: the definition of topics is oriented at environmental media (Figure 7 below bottom).

Global megatrends: nature conservation is the popular classic of environmental protection and also the antipode of technical access to it. Any child understands nature protection, even before they know how to spell “beetle”, as does any grandma or everyone in the park when feeding pigeons. Basically, respect for the living.

This issue needs no scientific formulas, just pictures. More precisely, it is inaccessible to formulas in principle, only to colouring maps of certain areas in various stages of green, depending on the nature of protection. Thus nature conservation suffers no shortage of science aptitude, but it might lack of being able to represent complexity. The motto might be: provide enough space to life to make it able to unfold itself.

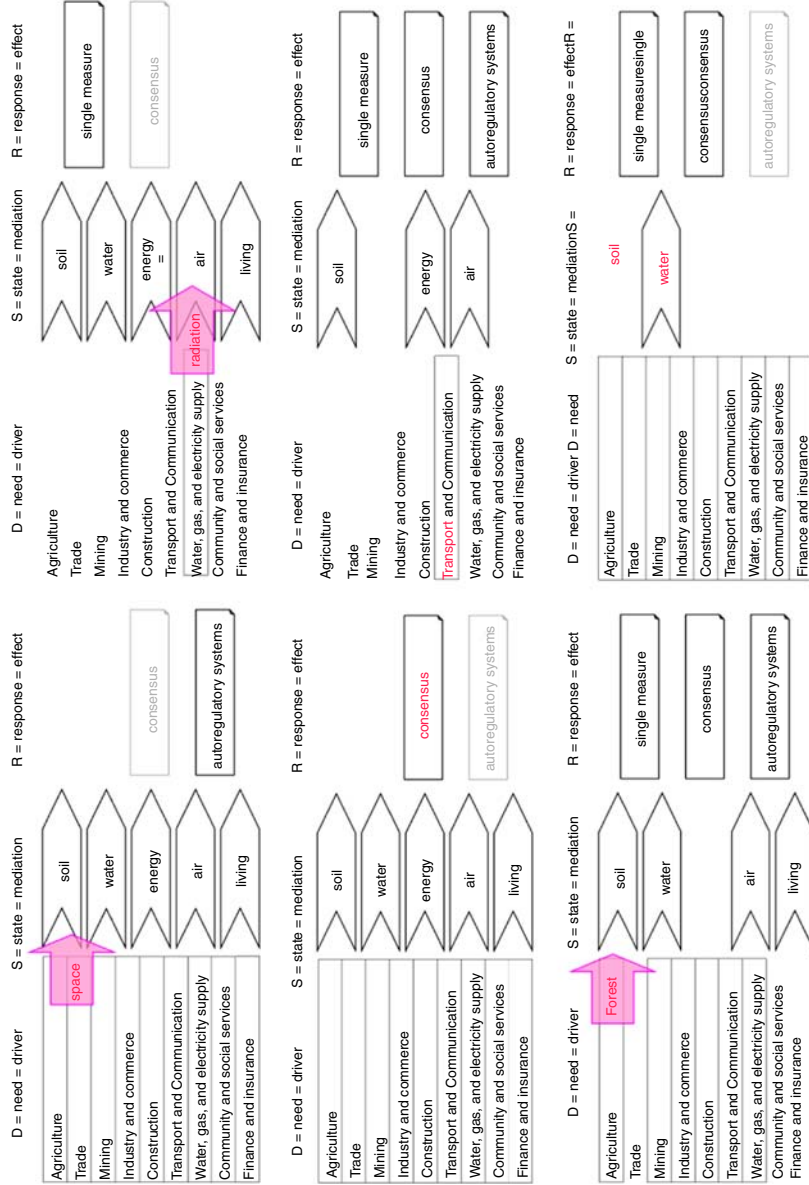
Some variants more compatible to science are, for example, disciplines of biodiversity, where one can at least estimate the number of species and record them in a coordinate system.

This area is heavily dependent on individual empathy with the realities, presumably difficult to convey in written form. Through self-implantation, nature would be communicable to the philistine (i.e. over-urbanised human).

Results and recommendations: one could choose a paradoxical access and fully rely on modern media. For example, just bring nature into the city with large picture wallpaper. Simply beam live recorded pictures from nature conservation areas with a large projector onto the walls of public buildings. Costs and maintenance would be low. If news events can be projected this way, the living environment can also surely be projected as well – if ever deemed appropriate.

3.9 Spatial planning and regional planning

Position with respect to $D \rightarrow S \rightarrow R$: the definition of topics is oriented at action (above left in Figure 8).



Notes: Spatial planning (chapter 3.9); radiation protection and nuclear power (chapter 3.10); EIA and environmental information Act (chapter 3.11); traffic (chapter 3.12); forest (chapter 3.13); water (chapter 3.14)

Figure 8.
The steps D-S-R as in
Figure 3

Global megatrends: planning is the directive force of disposition in individual cases; it is a precursor to the field of “sustainability” insofar as spatial planning still generates no self-regulatory system, but “knows what is right and what the goal is”. Weighing of interests in the public sense should be considered as an administrative task.

Space is the medium and the field through which the figures of individual social interests are placed. Distribution of space is managed by the local sovereign. Annual meal served for the stilling of hunger development of civilisation might function as symbolic action. In principle, it represents resource allocation according to predefined rules. Decades ago, spatial planning was considered a very modern tool that should allow implementing the community’s interests and approaches to a participatory process, as a very valuable intermediate step. The upper hand is gained by whoever can influence an administrative process in the best possible way. Thus, spatial planning is still only the larval stage of self-steering systems theory of society towards sustainability.

Results and recommendations: the consensus reached on how different values are to be weighed in public (e.g. new railway line against precipitated forest) can serve as the building blocks for sustainability efforts. The more directive management system (spatial planning) is a preparation for a (hopefully working) self-regulating system “Sustainable economic structure”.

Environmental authorities seem to be deprived of spatial planning competence as a principle, because other instances have committed responsibilities. Spatial planning is an accompanying activity and can be used to methodically learn from it for higher tasks (namely, to operationalise sustainability).

3.10 Radiation protection and nuclear power

Position with respect to $D \rightarrow S \rightarrow R$: the definition of topics is oriented at drivers and environmental media (above right in Figure 8).

Global megatrends: development of environmental radioactivity fits here (Ahamer, 2012b), after bomb testing, Chernobyl, and recently Fukushima.

Results and recommendations: radiation protection is a very topical issue especially for neighbourly nuclear power plants in Europe (e.g. Cattenom, close to the French-German-Luxembourgish border, or Bohunice, close to the Slovak-Austrian border).

In the newly acceded Central and Eastern European member countries, a fundamentally different cultural mood prevails regarding the issue of nuclear energy; there, the cultural process of re-assessing nuclear power has not yet taken place as it did in Austria. The buttons reading “nuclear power – no thanks!” are missing in the eastern cultural landscape and it seems to be very difficult for this to catch up quickly. Western Europe tends to catch up with the Austrian cultural turn of Zwentendorf (the site where the only Austrian nuclear plant was planned to be built but then stopped by plebiscite), in Central Eastern Europe, such “cultural turn” would be yet to come.

3.11 EIA and Environmental Information Act

Position with respect to $D \rightarrow S \rightarrow R$: definition of topics is oriented at action (centre left in Figure 8).

Global megatrends: increase in internet access, etc. (known developments).

Results and recommendations: EIA is related to the individual case and yet FL, and in spite of its directive, codified sequence it represents a dialogic tool for finding consensus within society on cases of individual buildings. EMAS, a highly standardised instrument, appears to be similar in each case, less foresight but ex post, attempting to disseminate desired behaviour. Both make up the majority of

regulated administrative actions. Both instruments carry in themselves the germ of “sustainability”, a self-organising permanent equilibrium. The value of both instruments is their content of societal rules by which the different components of the environment and components of economic interest can be merged and fused.

3.12 *Traffic*

Position with respect to $D \rightarrow S \rightarrow R$: definition of topics is oriented at emitters (centre right in Figure 8).

Global megatrends: similar to megatrends in ever growing energy demand, while transport (car, train, airplane, etc.) rises fastest, and still visibly increasing growth rates are observable regarding traffic.

Results and recommendations: this sector appears very clearly as the most virulent for “classical pollutants” because it is the one with the highest growth rates. Traffic is the most structural of the classical emitting sectors and therefore requires a systemic approach. Solutions currently seem very difficult, because of the pressure for growth, namely the driving force “need for mobility” is in a period of particularly strong growth. A mixture of technical measures (motor side) and infrastructure (planning side) seems possible, but not sufficient. Solutions are very expensive and require a certain minimum population density for their feasibility (e.g. a subway system in a major city). Pollution by particulate matter shows how individual measures fall short. Sensible and practical measures are designed as a bundle; such are feasible by using a systems analytical way of thinking as a first entry.

3.13 *Forest*

Position with respect to $D \rightarrow S \rightarrow R$: definition of topics is oriented at environmental media and living area (below left in Figure 8).

Global megatrends: the mirror-image of the dynamics of arable development (roughly speaking): the rich nations already reforest (intentionally or not, this is how megatrends work) and the poor nations still keep deforesting. Central Europeans have also deforested, from the Vikings until Bayreuth (second half of name meaning “deforested”, from German “roden”), the Europeans’ good fortune was the thicker soil horizons (except in now-barren Dalmatia) and the lack of clearing machines in historic times, as compared to the jungle in present times. Deforesting is a typical phase-dependent civilisational phenomenon that perfectly fits into the picture of revolving waves of civilisational activities, just as proposed by the concept of a blossoming economy (Ahamer, 2012a; 2013a).

Results and recommendations: growth of forest with the global north, loss of forest with the global south; whether inhabitants like it or not.

3.14 *Water*

Position with respect to $D \rightarrow S \rightarrow R$: definition of topics is oriented at environmental media (below right in Figure 8).

Results and recommendations: this sector is strategically similar to the more traditional air sector, but already much more complex and less predictable because of its character as a living space. For example, the EU Water Framework Directive contains various linear combinations of values which indicate states of quality.

4. Conclusions

The brief theoretical analysis on “institutional reorganisation” in chapter 1 of this paper has proven the need for a functional approach and has fostered the impression

that discourse-oriented processes of consensus building serve best the societal targets of democracies.

The above article has used a methodology of dynamic restructuring of institutional departments based on global megatrends (partially reported in this paper's chapter 2) and applied it to the structural reorganisation of institutions.

The following 14 fields pertaining to environmental institutions were briefly analysed (chapter 3): genetic engineering and biological safety, integrated plant technology in industry, climate protection, agriculture, noise, emissions and air pollution, sustainability, spatial planning and regional planning, radiation protection and nuclear power, EIA and Environmental Information Act, traffic, forest, water. Several more are found in an earlier article in this journal.

A planet-wide information system would increasingly support a greater level of detail on which institutional reorganisation could be based.

References

- Abel, N., Cumming, D.H.M. and Anderies, J.M. (2006), "Collapse and reorganization in social-ecological systems: question, some ideas, and policy implications", *Ecology and Society*, Vol. 11 No. 1, p. 17, available at: www.ecologyandsociety.org/vol11/iss1/ (accessed 9 September 2013).
- Ahamer, G. (2005), "Surfing global change": how didactic visions can be implemented", *Campus-Wide Information Systems*, Vol. 22 No. 5, pp. 298-319.
- Ahamer, G. (2008), "Im Spiegelkabinett unterschiedlicher Entwicklungsvorstellungen", *Journal für Entwicklungspolitik*, Vol. 24 No. 3, pp. 56-76.
- Ahamer, G. (2006), "SURFING GLOBAL CHANGE: negotiating sustainable solutions", *Simulation & Gaming – an International Journal*, Vol. 37 No. 3, pp. 380-397.
- Ahamer, G. (2012a), "Human geography trains diverse perspectives on global development", *Multicultural Education & Technology Journal (METJ)*, Vol. 6 No. 4, pp. 312-333.
- Ahamer, G. (2012b), "Geo-referenceable model for the transfer of radioactive fallout from sediments to plants", *Water, Air, and Soil Pollution*, Vol. 223 No. 5, pp. 2511-2524, available at: www.springerlink.com/content/2x23x1np5r536413/ (accessed 11 September 2013).
- Ahamer, G. (2012c), "The jet principle: technologies provide border conditions for global learning", *Multicultural Education & Technology Journal (METJ)*, Vol. 6 No. 3, pp. 177-210.
- Ahamer, G. (2012d), "Training to bridge multicultural geographies of perspectives", *Campus-Wide Information Systems (CWIS)*, Vol. 29 No. 1, pp. 21-44.
- Ahamer, G. (2013a), "Forward-looking qualities of global studies", *Campus-Wide Information Systems*, Vol. 30 No. 5, p. 320.
- Ahamer, G. (2013b), "A planet-wide information system", *Campus-Wide Information Systems*, Vol. 30 No. 5, pp. 369-378.
- Ahamer, G. (2014), "Forward looking needs systematised megatrends in suitable granularity", *Campus-Wide Information Systems*, Vol. 31 Nos 2/3, pp. xx-xx.
- Ahamer, G. and Mayer, J. (2013), "Forward looking: structural change and institutions in highest-income countries and globally", *Campus-Wide Information Systems*, Vol. 30 No. 5, pp. 386-403.
- Allison, H.E. and Hobbs, R.J. (2004), "Resilience, adaptive capacity, and the "lock-in trap" of the western Australian agricultural region", *Ecology and Society*, Vol. 9 No. 1.
- Bader, L., Bereuther, T., Deutsch, E., Edlinger, J., Füreder, S., Kaspar, E., Köttstorfer, M., Mautner, C., Rossegger, C., Samonig, A., Samonig, S., Schuster, C., Witz, G., Zotter, V. and Ahamer, G.

- (2013), "Quality improvements in curricula for global studies", *Multicultural Education and Technology Journal*, Vol. 7 Nos 2-3, pp. 113-126.
- Bader, L., Bereuther, T., Deutsch, E., Edlinger, J., Füreder, S., Kaspar, E., Köttstorfer, M., Mautner, C., Rossegger, C., Samonig, A., Samonig, S., Schuster, C., Witz, G., Zotter, V., Rozanov, A., Ilyin, V. and Ahamer, G. (2014), "Looking forward to curricula for global studies worldwide", *Journal for Multicultural Education*, Vol. 1 No. 3.
- Baron, D.P. (1998), "Comparative dynamics of parliamentary governments", *American Political Science Review*, Vol. 92 No. 3, pp. 593-609.
- Brenner, N. (2003), "Metropolitan institutional reform and the rescaling of state space in contemporary Western Europe", *European Urban and Regional Studies*, Vol. 10 No. 4, pp. 297-324.
- Breiling, M., Hashimoto, S., Sato, Y. and Ahamer, G. (2005), "Rice-related greenhouse gases in Japan, variations in scale and time and significance for the Kyoto protocol", *Paddy and Water Environment*, Vol. 3 No. 1, pp. 39-46.
- Bunnell, P. (2002), "Panarchy. The resilience alliance", available at: www.resalliance.org/index.php/panarchy (accessed 9 September 2013).
- David, P.A. (2004), "Understanding the emergence of "open science" institutions: functionalist economics in historical context", *Industrial and Corporate Change*, Vol. 13 No. 4, pp. 571-589.
- de Chardin, T. (1955), *Der Mensch im Kosmos*, Beck, München.
- Duraković, E., Feigl, B., Fischer, B., Fleck, C., Galler, L.-M., Heinrich, J., Kulmer, K., Kurzweil, B., Scholze, M., Sperl, R., Unterköfler, R., Matzenberger, J., Remele, K. and Ahamer, G. (2012), "Dialogic global studies for multicultural technology assessment", *Multicultural Education and Technologies Journal (METJ)*, Vol. 6 No. 4, pp. 261-286.
- EEA (1997), "Air pollution in Europe 1997. European environment agency, Copenhagen", available at: www.eea.europa.eu/publications/92-9167-059-6-sum (accessed 11 September 2013).
- Etzkowitz, H. and Leydesdorff, L. (2000), "The dynamics of innovation: from national systems and mode 2 to a triple helix of university-industry-government relations", *Research Policy*, Vol. 29 No. 2, pp. 109-123.
- Gunderson, L.H. and Holling, C.S. (Eds) (2001), *Panarchy: Understanding Transformations in Human and Natural Systems*, Island Press, Washington, DC.
- Hardaker, G., Dockery, R. and Sabki, A.A. (2010), "Cognitive learning styles and digital equity: searching for the middle way", *International Journal of Inclusive Education*, Vol. 14 No. 8, pp. 777-794.
- Hardaker, G. and Singh, G. (2011), "The adoption and diffusion of Elearning in UK Universities: a comparative case study using Giddens's theory of structuration", *Campus-Wide Information Systems*, Vol. 28 No. 4, pp. 221-233.
- Holling, C.S. (1987), "Simplifying the complex: the paradigms of ecological function and structure", *European Journal of Operational Research*, Vol. 30 No. 2, pp. 139-146.
- Holling, C.S. (2000), "Theories for sustainable futures", *Conservation Ecology*, Vol. 4 No. 2, available at: www.consecol.org/vol4/iss2/art7/ (accessed 11 September 2013).
- Holling, C.S. (2001), "Understanding the complexity of economic, ecological, and social systems", *Ecosystems*, Vol. 4 No. 5, pp. 390-405.
- Holling, C.S., Gunderson, L.H. and Ludwig, D. (2002), "In search of a theory of adaptive change. Chapter 1", available at: www.resalliance.org/files/1137008896_chapter_1.pdf (accessed 9 September 2013).
- Hughes, J.D. (1986), "Pan: environmental ethics in classical polytheism", *Religion and Environmental Crisis*, in Hargrove, E.C. (Ed.), The University of Georgia Press, Athens, available at: www.resalliance.org/index.php/panarchy (accessed 11 September 2013).

- Hughes, J.D. (2005), "Global environmental history: the long view", *Globalizations*, Vol. 2 No. 3, pp. 293-308.
- Hunter, S.N. (1981), "Reorganising institutional structures and processes for excellence", *Journal of Tertiary Education Administration*, Vol. 3 No. 2, pp. 169-174.
- Kienberger, S. (2012), "Spatial modelling of social and economic vulnerability to floods at the district level in Búzi, Mozambique", *Natural Hazards*, Vol. 64 No. 3, pp. 2001-2019.
- Kienberger, S. and Zeil, P. (2005), "Vulnerability assessment and global change monitoring: the role of remote sensing-potential and constraints for decision support", *Proceedings, 31st International Symposium on Remote Sensing of Environment, ISRSE 2005: Global Monitoring for Sustainability and Security*.
- Kienberger, S., Zeil, P. and Castellano, A. (2011), "When disaster strikes", *GEO: Connexion*, Vol. 10 No. 8, pp. 38-41.
- Korotayev, A. and de Munck, V. (2013), "Advances in development reverse global inequality trends", *Journal of Globalization Studies*, Vol. 4 No. 1, available at: www.sociostudies.org/journal/articles/156128/ (accessed 11 September 2013).
- Korotayev, A. and Zinkina, J. (2014), "On the structure of the present-day convergence", *Campus-Wide Information Systems*, Vol. 31 Nos 2/3, pp. xx-xx.
- Lewis, G.J., Graham, G. and Hardaker, G. (2005), "Evaluating the impact of the internet on barriers to entry in the music industry", *Supply Chain Management*, Vol. 10 No. 5, pp. 349-356.
- Matzenberger, J. (2013), "A novel approach to exploring the concept of resilience and principal drivers in a learning environment", *Multicultural Education & Technology Journal*, Vol. 7 Nos 2-3, pp. 192-206.
- Mol, A.P.J. (1996), "Ecological modernisation and institutional reflexivity: environmental reform in the late modern age", *Environmental Politics*, Vol. 5 No. 2, pp. 302-323.
- Moskovkin, V.M., Bocharova, E.A. and Balashova, O.V. (2014), "Journal benchmarking for strategic publication management and for improving journal positioning in the global ranking systems", *Campus-Wide Information Systems*, Vol. 31 Nos 2/3, pp. xx-xx.
- Montes, G. (1997), "Public funding and institutional reorganization: evidence from the early kindergarten movement", *Nonprofit Management & Leadership*, Vol. 7 No. 4, pp. 405-420.
- Müller, U., Ahamer, G., Peters, H., Weinke, E., Sapper, N. and Salcher, E. (2013), "Technologies and collaborative education strengthen conviviality in rural communities in the Alps and in Senegal", *Multicultural Education and Technologies Journal (METJ)*, Vol. 7 Nos 2-3, pp 207-227.
- Olsson, P. and Folke, C. (2001), "Local ecological knowledge and institutional dynamics for ecosystem management: a study of lake Racken Watershed, Sweden", *Ecosystems*, Vol. 4 No. 2, pp. 85-104.
- Olsson, P., Folke, C., Galaz, V., Hahn, T. and Schultz, L. (2007), "Enhancing the fit through adaptive co-management: creating and maintaining bridging functions for matching scales in the Kristianstads Vattenrike biosphere reserve, Sweden", *Ecology and Society*, Vol. 12 No. 1.
- Olswang, S.G. (1983), "Planning the unthinkable: issues in institutional reorganization and faculty reductions", *Journal of College and University Law*, Vol. 9 No. 4, pp. 431-449.
- Osbahr, H., Twyman, C., Adger, W.N. and Thomas, D.S.G. (2008), "Effective livelihood adaptation to climate change disturbance: scale dimensions of practice in Mozambique", *Geoforum*, Vol. 39 No. 6, pp. 1951-1964.
- Ostrom, E. (1990), *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press, Cambridge.
- Pirrone, N., Trombino, G., Cinnirella, S., Algieri, A., Bendoricchio, G. and Palmeri, L. (2005), "The driver-pressure-state-impact-response (DPSIR) approach for integrated catchment-coastal

-
- zone management: preliminary application to the Po Catchment-Adriatic sea coastal zone system”, *Regional Environmental Change*, Vol. 5 Nos 2-3, pp. 111-137.
- Ramet, P. (1984), “Political struggle and institutional reorganization in Yugoslavia”, *Political Science Quarterly*, Vol. 99 No. 2, pp. 289-301.
- Rauch, H. (2013), “Reframing for global sustainability”, *Multicultural Education and Technology Journal*, Vol. 7 Nos 2/3, pp. 151-175.
- Rauch, H. (2014), “Naming’ is ‘Taming’ – Outlining psycho-social hypotheses with regard to the present ‘Global Situation’”, *Campus-Wide Information Systems*, Vol. 31 Nos 2/3, pp. xx-xx.
- UNSTAT (2008), “United Nations Statistics Division”, System of National Accounts (SNA) data as of 2008, available at: http://unstats.un.org/unsd/economic_main.htm (accessed 7 September 2013).
- Vernadsky, V. (1926), *The Biosphere [in Russian language]*, Synergetic Press, Oracle, AZ, (English translations: 1986).
- Walker, B., Gunderson, L., Kinzig, A., Folke, C., Carpenter, S. and Schultz, L. (2006), “A handful of heuristics and some propositions for understanding resilience in social-ecological systems”, *Ecology and Society*, Vol. 11 No. 1, available at: www.ecologyandsociety.org/vol11/iss1/ (accessed 10 September 2013).
- Watson, J., Ahmed, P.K. and Hardaker, G. (2007), “Creating domain independent adaptive e-learning systems using the sharable content object reference model”, *Campus-Wide Information Systems*, Vol. 24 No. 1, pp. 45-71.
- Yeh, A.G.O. and Wu, F. (1999), “The transformation of the urban planning system in China from a centrally-planned to transitional economy”, *Progress in Planning*, Vol. 51 No. 3, pp. 167-252.
- Zinkina, J., Korotayev, A. and Andreev, A.I. (2013), “Measuring globalization: existing methods and their implications for teaching global studies and forecasting”, *Campus-Wide Information Systems*, Vol. 30 No. 5, pp. 321-339.

About the authors

Dr Gilbert Ahamer after studies in Physics, Engineering and Economics the author worked on scenarios since 1990 with affiliations to the International Institute for Systems Analysis, the Austrian Academy of Sciences, several universities and presently plans to build a Global Change Data Base. Dr Gilbert Ahamer entered the Environment Agency Austria in 1996 where he was responsible for air emissions, CO₂ emissions and climate protection measures. In 2004 he was entrusted to author an analysis of long-term trends that should lead to a long-term corporate vision of the Environment Agency Austria with currently over 500 employees. Both authors performed an assessment of the Luxemburg Environmental Agency. Dr Gilbert Ahamer is the corresponding author and can be contacted at: gilbert.ahamer@umweltbundesamt.at, gilbert.ahamer@oeaw.ac.at

Dr Johannes Mayer is the Head of the Department for International Relations of the Environment Agency Austria and has decade-long experience in steering successful twinning cooperations both as the Project Leader and Long-Term Pre-Accession-Adviser. As an Austrian National Focal Point (NFP) Representative of the European Environment Agency, he is also responsible for the successful Austrian reporting to EEA: for several past years Austria has been on top of the European “Priority Data Flow Reporting” country ranking. In the 1990s, he coordinated of several editions of the national Austrian State-of-the Environment Report addressed to the Austrian Parliament, and designed the first www homepage of the Agency in 1996.