The Wildbad-Kreuth Declaration

on the

Global Stabilization through Decentralization?

In search of the right balance between central and decentral solutions

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Loss of stable functioning of major market mechanisms, decay of good governance in many countries of the world, continuation of pollution and excessive exploitation of resources, vanishing interpersonal relationships and last but not least deterioration of aquatic and terrestrial ecosystems stimulated a group of 39 scientists, representatives of regulatory agencies, NGOs, businesses and from media to explore whether shifting from globalization towards decentralization would re-stabilize the Earth system including its human dominated components. The discussions resulted in the following

Thought-provoking Stimuli and Recommendations

§1 It is an illusion to consider natural ecosystems a normative model for human-made systems. The human capacity for imagining alternative futures and ethical social responsibility distinguish human-made systems calling for unique approaches towards resilience and sustainability.

§2 Resilience requires a high level of adaptability. Through maintaining ecological and social diversity a reservoir of options and opportunities are preserved that ensure adaptability. Redundancy buffers systems against shocks and allows to keep them functioning.

§3 Effective protection of the global commons is a prerequisite for any governance approach, be it central or decentral.

§4 Existing governance systems based on the principle of subsidiarity should shift towards decentralized decision making, policy implementation and controlling. In this approach the distribution of power and control lies with the most appropriate agent and all agents are empowered to act according to the best interest of all stakeholders on the basis of fundamental civil rights and obligations.

§5 System science with modern communication technologies (cyber physical systems) allow for extensive distributed sensing and control, thereby providing the technology for "distributed intelligence", the prerequisite for future shifts of anthropogenic systems towards more decentralization.

§6 Governance systems need democratic legitimacy to assure social support, checks and balances.

§7 Positive and negative case studies are effective means to inspire global learning.

§8 To avoid depletion of material resources, violation of ecological values and loss of cultural diversity the trend towards globalization must be broken and replaced by new economic approaches (e.g. circular economy) tailored to local conditions.

§9 Product functions should gain priority over product ownership.

§10 To ensure that anthropogenic systems become and remain sustainable requires a tight interplay of all major societal resources: ecology, economy, science and technology, politics and civil society. Each has to play a specific role in achieving effectiveness, efficiency, social cohesion and resilience, while providing legitimacy to the overall process.

Explanations

§1 It is an illusion to consider natural ecosystems a normative model for human-made systems. The human capacity for imagining alternative futures and ethical social responsibility distinguish human-made systems calling for unique approaches towards resilience and sustainability.

The species *Homo sapiens* is part of the biosphere on planet Earth and therefore humans, like all other creatures, depend on fundamental natural laws and ecosystem function. Hence, ecosystems should be kept healthy and must not be degraded.

The ecosystem´s resilience and function are mainly maintained by the process of self-regulation. In contrast, human-made systems are governed by human traits such as free will, anticipation and eagerness to avoid extinction of humankind at large.

Maintenance of stability of anthropogenic systems is a cognitive process which requires a hierarchical control. Setting and enforcing norms and laws is to be understood as an intrinsic democratic process. To be effective and fair, regional and local conditions must be accounted for as an ethical prerequisite in the pursuit of maintaining and strengthening the state of resilience and stability of regions, and subsequently of the globe as a whole. Implementation implies better insights into the drivers of institutional and individual behavior.

Natural ecosystems evolve around certain environmental opportunities and constraints. In contrast, human systems evolve along a trajectory of awareness and agency. We as human beings, as a community, as a nation, decide where we as a species want to go and which kind of life our environment should enable. Similar to natural ecosystems, the coordination of these nested systems relies on feedback loops, which require honesty in the statement of the intentions and goals set at each level of the nested system.

Achieving resilience and subsequently sustainability does not merely depend on finding technical solutions even if these are inspired by nature itself. Instead, ethical concerns together with religious beliefs and philosophical approaches are likewise important and should not be ignored as they are pertinent in several respects. First, they can help us clarify the relationships between human beings as well as their position in relation to nature and other species. Secondly, they can help individuals to get a grip on their own role, concerns and rights within the process of adaptation.

When choosing ethics as a guiding principle of behavior, a strong distinction between "idealistic ethics" and "realistic ethics" is to be made. The first refer to what a community may consider "the most desirable behavior", while the second refers to what its constituents are actually doing. In order to empower communities to act in accordance to their ideal, confounding conditioning factors and deceptive motivation have to be removed, the most important of which is economical, but also other factors such as ideology, indoctrination, group behavior and peoples quest for pleasure. The community or society has to be open to frequent adjustments, re-negotiations and consensus finding of what the ‘most desirable behavior’ really is.

§2 Resilience requires a high level of adaptability. Through maintaining ecological and social diversity a reservoir of options and opportunities are preserved that ensure adaptability. Redundancy buffers systems against shocks and allows to keep them functioning.

Changes of climatic, economic, political and technological conditions require simultaneous adaptation. Insufficient system elements need to be improved or replaced by others of higher capacity to cope with novel challenges. A natural ecosystem is in a continuous process of alteration in exchange with other ecosystems (co-evolution). It appears that those shifts can be managed the better the more diverse and redundant components are built into the system.

This concept applies also for anthropogenic systems. For instance, monocultures in agriculture as well as monopolies in the economic arena are known to be vulnerable to disturbances whereas diverse systems have a better chance to remain in a dynamic equilibrium. Robustness in the face of varying local conditions can be readily achieved in systems with a high degree of diversity and redundancy. Adaptive properties are based on overall conditioning of the system.

§3 Effective protection of the global commons is a prerequisite for any governance approach, be it central or decentral.

Global commons refer to the use and ownership of vital resources shared by humanity at large. The World Conservation Strategy proposed by the International Union for Conservation of Nature and Natural Resources (IUCN) jointly with UNESCO, the United Nations Environment Programme (UNEP) and the World Wildlife Fund (WWF) considers the Earth's surface beyond national jurisdiction as generic global commons. Included in the list of global commons are the open ocean, the atmosphere, the Polar Regions, but also the outer space and the cyberspace. This encompasses an intact environment, i.e. well functioning ecosystems as the basis for sustainable use of these global commons.

As outlined in the Wikipedia chapter on Global Commons, their management requires pluralistic legal entities, usually international and supranational, public and private, structured to match the diversity of interests and the type of resource, and stringent enough with adequate incentives to ensure compliance. Such management systems are necessary to avoid, at the global level, the classic tragedy of the commons, in which common resources become overexploited or ecosystems are abused as waste disposals.

The authors of this declaration suggest an important upgrading of the list of global commons to resources such as safe drinking water and fertile soil. Access to electricity, medical care and reasonable income should also be considered as global commons. The community of States as well as national and local communities are encouraged to take all possible measures to ensure safeguarding such commons in the interest of maintaining and keeping social and economic systems at all levels in the state of long-term stability.

§4 Existing governance systems based on the principle of subsidiarity should shift towards decentralized decision making, policy implementation and controlling. In this approach the distribution of power and control lies with the most appropriate agent and all agents are empowered to act according to the best interest of all stakeholders on the basis of fundamental civil rights and obligations.

Subsidiarity is an organizing principle of decentralization stating that a matter ought to be handled by the smallest, lowest, or the least centralized authority capable of addressing that matter effectively. The concept is applicable in the fields of government, political science, neuropsychology, cybernetics, management and in military command (http://en.wikipedia.org/wiki/Subsidiarity).

However, the principle of subsidiarity is only one way of deciding on the division of power and responsibility between hierarchical levels. There are at least two problems: (1) it is based on hierarchical thinking, and (2) it is rigid and often leads to conflicts between levels. In politics, this can be illustrated by a federalist state organization, where e.g. provincial governments compete with state governments.

A better principle is that of the most appropriate agent, e.g. the one which has to exert the least possible effort to achieve the desired result, or else the agent that has the best expertise. A well working distributed system will most likely be based on a network between largely independent but highly connected agents (a very flat hierarchy), in which power and responsibility is given to the most effective agent, and the network is set up in such a way that empowerment is decentralized to achieve the intended results most effectively.

A good example is found in the modern "Smart Grid", in which every agent (the network authority, energy prosumers, large energy producers, specialized storage agents, users) all have their own power and responsibilities logically fitting together. In that system technological expertise is unevenly distributed but empowerment is evenly distributed. Local agents can make decisions in the best interest of the stakeholders, while network stability is ensured by the network provider. This induces economic incentives with the prosumers ensuring stability. However, every agent in a large distributed network has to be accountable to all stakeholders so that no single agent or group of agents misuses the trust invested in them. Subsidiarity reaches its limits however, if local actions have major repercussions on larger units or are in contrast to fundamental human rights and obligations.

§5 System science with modern communication technologies (cyber physical systems, CPS) allow for extensive distributed sensing and control, thereby providing the technology for "distributed intelligence", the prerequisite for future shifts of anthropogenic systems towards more decentralization.

In a technical evolution, a global communication network (World Wide Web) is emerging with surprising similarity to self-organizing (“decentralized”) neural networks provided by evolutionary biology. The motivation for this is clearly that modern communication technologies "break the prisoner's dilemma" by allowing the sharing of strategies, the setting of common beneficial goals and early adaptation to changing conditions. However, this will only function when proper alignment based on a common understanding on benefits is achieved, and distributed conditioning measures are put in place that motivate agents with independent control to make beneficial choices.

Modern information and communication technologies have provided concepts and solutions facilitating a balance between centralized and decentralized systems. Those concepts, e.g., virtualization of resources, self-organization of processes, and hierarchisation of services have demonstrated the ability to substantially increase robustness and adaptability of systems, as seen in large-scale robust internet-based functionalities like VoIP (Voice over IP).

By using the so-called ‘embedded systems’ technology, i.e. digital information processing combined with analog electric/electronic control, as a bridging technology, these concepts are increasingly incorporated in large-scale systems governing physical (i.e., mechanical, chemical, electrical, etc.) processes as well as ‘cyber’ (i.e., organizational, economical, etc) processes. These ‘cyber-physical systems’ like smart traffic systems, smart factories, or smart electric grids, generally use ‘fractal’ (i.e., hierarchically self-similar) forms of cooperation and coordination, thus achieving the necessary balance between centralized and decentralized governing schemes.

The balance between centralized and decentralized governing schemes enables CPS to provide the core capabilities of cross-X (like cross-organization, cross-domain, cross-discipline), life-X (e.g., life-update, life-reconfiguration, life-extension), and self-X (e.g., self-documenting, self-monitoring, self-healing). Using these capabilities CPS support the construction of architectures and processes robust against and

adaptive to unexpected or changing behavior of their users and environments. The practicably of this approach is currently demonstrated by the increasing number of CPS being constructed. For example, in the smart grid domain, the above-mentioned capabilities allow the stable integration of low-volume renewable resource like private-home photovoltaics using coordinated decentralized buffering and load-shifting schemes, implementing the 'cellular' approach for grids and markets asked for by the German Bundesnetzagentur in its 2011 Position Statement 'Smart Grid und Smart Market'.

In the past the classical IT-world was only virtual and separated from physical infrastructures. In CPS, the IT-world grows together with the physical infrastructure of our civilization like the nervous system with an organism. CPS observe their environment by sensors, process their information and influence their environment with actuators according to communication devices. CPS are complex systems of many self-organizing net components, dramatically increasing the adaptability, autonomy, reliability and usability of automotive, aerospace, energy, healthcare, manufacturing, transportation, and consumer appliances – a challenge of human control and responsibility.

In general CPS lead to the next, the 4th industrial revolution. The 1st industrial revolution introduced the steam engine. The 2nd industrial revolution meant centralized mass production, division of labor, and working on the assembly line. The 3rd industrial revolution additionally applied industrial robots for further automation of production. The 4th industrial revolution changes production on the basis of CPS and the "Internet of Things". Production, marketing, and trade are transformed into self-monitoring and self-organizing complex system. Cloud manufacturing connects the "Internet of Things" with cloud computing, supported by VR (virtual reality)-technologies, parallel and distributed working computer nets. Cloud manufacturing leads to decentralized production and trade nets. The working world is organizing itself, supports flexible work of employees, on demand, individual („tailored") service of clients. In contrast, centralized and standard mass production was typical for industry 2.0 and 3.0.

CPS produce a huge amount of data in all domains of science, economy, and society. Big data technology and computing networks open new avenues of fast data mining and profiling of products and persons in economy and society, but also of centralized and totalitarian control worldwide. Contrary to this dangerous misuse, fast algorithms and computing networks should improve human well-being with more secure and efficient, but less vulnerable human infrastructure. Digital dignity is the primary ethical goal in the complex world of Big Data and cyber-physical systems. In the age of globalization, mankind is in an unstable ("chaotic") phase transition of high complexity, depending on innovations of science and technology, risks of ecology, economy and finance, creative chance and innovative change. The nonlinear dynamics of CPS need complexity policies of global governance and controlled emergence to support a balance of centralized and decentralized order.

§6 Governance systems need democratic legitimacy to assure social support, checks and balances.

Democratic legitimacy does not guarantee any of the desirable properties of the Earth system. It is certainly necessary for reasons of societal health, but it has to be flanked with purpose, just as good health does not guarantee good behavior; the issue is "what is good behavior and how can a person be conditioned to behave well?" Much more is needed than democratic legitimacy.

There must be a democratically accepted common direction which might be termed "common ethics". How can this be achieved? Agents act at the various levels of a society. There are several stratifications, not only government strata. To be considered are also functional strata, such as business systems, interrelated financial institutions, service sectors including learning, knowledge and information agents.

What is needed is an "alignment of intelligence" between all these intelligent institutions. The societal system has to provide the means for such an alignment. The latter is a kind of "democratic legitimacy", but not one in the usual sense as majority agreement. Understanding how it comes about and how it can be propagated and adopted is essential for our goal to achieve a sustainable earth system.

The more centralized governance systems are, the more it is essential to accomplish a well-rounded balance between effectiveness, efficiency, resilience and social cohesion. Effectiveness refers to the need of societies to have a certain degree of confidence that human activities and actions will actually result in the consequences that the actors intended when performing them. Efficiency describes the degree to which scarce resources are used to reach the intended goal. The more resources are invested to reach a given objective, the less efficient the activity under question remains. Resilience describes the capacity to sustain functionality of a system or a service even under severe stress or unfamiliar conditions. Finally, social cohesion covers the need for social integration and collective identity despite plural values and lifestyles.

All four needs or functions of society build the foundation for legitimacy. Legitimacy is a composite term that denotes, first, the normative right of a decision-making body to impose a decision even on those who were not part of the decision-making process (issuing collectively binding decisions), and second, the factual acceptance of this right by those who might be affected by the decision. These two conditions of legitimacy can best be accomplished by assuring a transparent and inclusive process of decision making (social support) and the implementation of an effective controlling process by independent agencies (such as the court of justice) as a means to evaluate the consequences of political interventions and review these consequences on the four key criteria (checks and balances).

§7 Positive and negative case studies are effective means to inspire global learning.

It is well known that we learn best from failures (negative case studies). It is also well known that success (positive case studies) triggers excitement and motivation – most important preconditions in the process of finding and implementing solutions of burning problems. Obviously, we need both positive and negative experience to drive learning processes, to get in the position to create innovative thinking and thus respond proactively to changes of the conditions we get confronted with.

However, negative outcomes of case studies are often associated with the presumption the persons in charge (scientists as well as entrepreneurs and politicians) would be unable to perform properly. Subsequently, negative experiences are rarely presented as an opportunity to learn from. Worse than this, negative results tend to make the public concerned, often bewildered, even paralyzed. Press media use this effect to enhance audience rates and sales figures. Consternation, however, does not contribute to the solution of problems and to progress in learning. In a time of rapid global changes it appears of upmost importance to take any possible attempt to raise awareness of the importance of case studies that should not be a priori expected to deliver positive results only. It is the responsibility of academia to convey the knowledge that enables decision makers as well as the general public to draw the right conclusions from positive and negative cases. Only then humanity gets in the position to overcome global as well as local threats.

A crucial measure to minimize or avoid fundamental errors and mistakes that are based on ignorance is education. Therefore, countries are encouraged to establish sound and efficient education systems for teachers, children and adults (including the use of internet and new ICT) to increase ecological and social competence.

§8 To avoid depletion of material resources, violation of ecological values and loss of cultural diversity the trend towards globalization must be broken and replaced by new economic approaches (e.g. circular economy) tailored to local conditions.

Since economy is the key driver for human activities, a paradigm change needs to be initiated and directed towards sufficiency. Quantitative growth (e.g., human population) and qualitative growth (e.g., wealth) are subject to natural laws and cannot be unlimited. Technical efficiency cannot compensate excessive growth. Our ecological footprint needs to be significantly reduced. Non-monetized natural values (ecosystem services) must be defended against economic pressures as they are needed for human well being. Some principles such as polluter/causer pay, precaution, solidarity, fight cause instead of effect, recycling, and public participation should be applied. We need to work with, and not against nature.

Faced with increasing resource prices and dwindling reserves, different economical approaches have already been suggested. Among the most discussed are the bio-economy, the blue economy, the circular economy, decentralized water management, zero waste economy, the economy for the common good and the factor-10-economy. However, these approaches should be moved from the exclusive academic/political/industrial arenas. They need to be properly discussed in and by the public with the aim of reaching a broad consensus. This step should include local, national or global networking in the fields of knowledge, ecology, technology and finance, representing real decentralization. At the same time, the consensus reached will be democratically legitimized by design, which will facilitate the implementation of a novel economic system by political leaders.

The issue here is "how to get an optimal division of responsibilities, given an agreed standard of optimality?" Arrangements have to be made at the various levels of responsibility (up to the global level) in such a way that each participating agency sees it as its advantage to work towards that optimal solution which actually may change and evolve over time. There are two sides to this issue: at each level, control measures have to be appropriate for that level, and benefits and profits have to be shared between all participating agents (including the consumers), in proportion to their efforts. One cannot avoid making intelligent blueprints that can be understood and underwritten by all concerned needing honest thinking at all levels, so it is a primordial ethical issue.

Modern water management can serve as such a blueprint, as these new concepts and strategies are integrative, transdisciplinary, often transboundary and complex, encompassing whole river basins. They need to be properly designed, operated and maintained.

§9 Product functions should gain priority over product ownership.

The value of functionality over ownership is to be favored in both, a centralized or decentralized environment. Selling the service that reliably functioning products provide over adequate and clearly communicated defined use periods (performance leasing e.g., mobility of a car, manufacturing robots, mobile phones) instead of turning over the ownership for the product materials, will incentivize cleaner production, use of better materials and improving holistic product quality.

By keeping the ownership over materials, the current incentive for increased material turnover rates will be replaced by a strong incentive to become a material steward aiming at the return of every ounce of material and re-using the resources in new products. In combination with decentralized service, repair and upgrading enhancement of the advantage of regions and local communities (e.g., workplaces, income, tax revenues etc.) is to be expected.

Sometimes concern is voiced that product owners take more care of it than mere product users. However, this could be overcome by applying the highest possible fraction of recyclable products where the recycling process is also driven by renewable energy generating materials, as well as the return logistics.

Another approach could be to implement incentives that reward longer service contract. In this model the consumer would pay less and less per month, while continuation of driving the leased car, and using laptop, mobile phone etc. is secured.

Ownership of things is traditionally valued as an expression of independency in using and caring for goods once purchased. Shift from ownership to leasing bears the risk of losing liberty while becoming overly dependent on service providers. Those concerns must be treated with absolute carefulness. Strengthening competition between product producers (soft- as well as hard-ware) and service providers appears to be an important control mechanism.

§10 To ensure that anthropogenic systems become and remain sustainable requires a tight interplay of all major societal resources: ecology, economy, science and technology, politics and civil society. Each has to play a specific role in achieving effectiveness, efficiency, social cohesion and resilience, while providing legitimacy to the overall process.

Centralization is driven by the role capital plays in our societies - capital not only in monetary terms but also in terms of land and physical resources. Ever since the globalized bank system has been largely decoupled from real-world assets or even real economic growth, the physical limitations for centralization do no longer exist. Hence, to achieve a balance between centralization and decentralization it is now high-time for re-orientation towards decentralized solutions in all sectors of our economy.

As mentioned in §1 free will, but moreover impatience and greed dictate the general behavior of humans. This often leads to corruption and illegal connections, since money and wealth provide power. The embedded self-regulation capacity of economic and societal systems is often hampered by the lack of empowerment and solid knowledge at the local level. Control by central authorities therefore seems as inevitable as control by an independent law authority. The alignment and empowerment of independent and potentially hostile agents may be facilitated through advanced network technology. This is a field that needs considerable further development. While decentralization, besides responding to local concerns in a more effective manner, would be a powerful tool to get the local voices and concerns heard at the national and global level, it is difficult to ensure equity without a framework for guiding the future developments of science and technology at national and global level. Thus, there is a strong case for designing an institutional and legal system for guiding the future developments in this area.

The foundation of sustainable development is the need for a well-rounded balance between effectiveness, efficiency, resilience and social cohesion as explained in §6. Within the macro-organization of modern societies, these four functions are predominantly handled by different societal systems: economy, science (expertise), politics (including legal systems), and the social sphere. Another way to phrase these differences is by distinguishing among competition (market system), hierarchy (political system), and cooperation (socio-cultural system). These insights suggest that for complex policy decisions that are crafted to enhance the sustainability of society, representatives of all four sectors of society need to be included in order to ensure that decisions are effective, efficient, resilient and fair.

Network technology, similar to ecosystem networks, has the great potential to combine efficiently decentralized local concerns and demands with centralized national and international interests. Thus, guiding the future developments of science and technology is required, together with a global framework of an institutional and legal system to provide more equity between nations.