

# From the Natural Sciences to Economics

A glimpse of what is to come at the World Resources Forum (WRF)

16<sup>th</sup> September 2009, Davos, Switzerland

Lorenz M. Hilty, Thomas F. Ruddy, Empa, Swiss Federal Laboratories for Materials Testing and Research; Friedrich Schmidt-Bleek, Factor 10 Institute

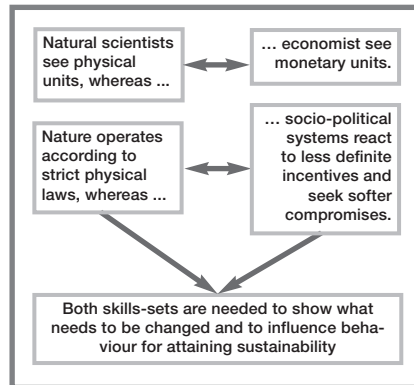


Factor Ten Institute

## Procedure

Finding a consensus on the resources problem among natural scientists and economists has proven difficult; their respective communities do not have a common language. Therefore in the run-up to the World Resources Forum (WRF) to take place on the 16<sup>th</sup> September 2009 in Davos, the following preliminary steps are being taken to initiate a dialog between leading natural scientists and leading economists:

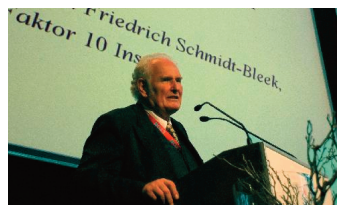
1. A declaration on the resources problem has been drafted by the Factor 10 Institute and scientists at Empa, the Swiss Materials Science and Technology Institute.
2. This declaration is currently being finalized in a consultation process involving scientists, economists and politicians who are working on the resources problem.
3. In parallel, a small group of economists has been set up, called the Lindau Circle, who are having in-depth discussions on the resources problem and are preparing additional input to the WRF.
4. The WRF will eventually produce a common message from natural scientists and economists to politicians and the media.



## WRF Declaration

**1. The global consumption of limited natural resources is rising at a fast pace, as is ecological disruption.** Our current environmental and economic policies have not been able to stop these trends. As a consequence, we are losing the freedom to shape the future of humanity.

**2. All raw materials extracted from the earth are potential wastes and emissions to air, water and soil.** More than 100 billion (1011) tons of materials are extracted and displaced each year to feed the global economic system, and a considerable portion of these are dumped without having acquired any economic value of their own. A large part of this material – including fossil fuels, sand, gravel and rock – is returned to Nature in a chemically and mechanically degraded or mobilized form within a short time. Only a small fraction is preserved in a useful form.



F. Schmidt-Bleek, initiator of the WRF Declaration

**3. This disruption of environmental resources and processes affects the life-sustaining services of Nature, which are not replaceable by technical means.** This impact is beginning to be reflected in economic terms. The insurance market is already responding to the increasing frequency and severity of natural disasters such as storms, floods and droughts by raising premiums sharply.

**4. The economic trend is going in the wrong direction.** The level of economic activity in Western countries is still correlated to their per capita consumption of natural resources. If we do not succeed in changing this correlation, we will be losing the life-sustaining services of Nature. Globalizing this traditional model of economic growth would require several planets earth as its resource basis.

**5. There is no fixed relationship between the total value of economic activity and the total material throughput of the economy.** The highest possible productivity of materials is the key to a sustainable economy. Today, less than 10 percent of the resources extracted and translocated are embedded in final products, without counting the frequently extravagant use of water.

**6. Key technologies for the transition to a sustainable economy depend on geo-chemically scarce elements.** These include Cu, Ga, Ge, In, Nb, Pt, Ru, Sb, Se and Te, which are particularly important for information and communication technologies (ICT) and emerging energy storage and supply technologies. Even without assuming absolute scarcity, we must expect that the economic, ecological or social consequences of maintaining the supply of these elements will become unacceptable. Efforts to increase materials' efficiency and design for recycling measures are needed today to preserve the supply of scarce elements.

**7. We cannot change the way in which Nature provides us with her life-sustaining services.** However, we can improve the productivity with which natural

resources are used: creating more welfare with less resource use. Beyond the traditional model of economic growth, many opportunities exist for increasing the productivity of materials and energy without sacrificing real human welfare. The level of productivity in the use of natural resources will have to be increased by at least a factor of 10 during the next 40 to 50 years. This is technically feasible if we mobilize our skills and know-how.

**8. This process of 10:1 dematerialization will involve a shift in thinking toward the life-cycle approach.** Long-lived products and lean services, entirely new product-service-systems, as well as new methods of production, distribution and consumption have to be developed.

**9. Major increases in resource productivity would occur if all relevant markets operated perfectly, and if there were no barriers to entrepreneurial innovation.** However the markets are not operating perfectly: The prices are wrong due to externalities, much relevant information is not available to the actors, and barriers do exist. Furthermore, the time horizons employed by decision-makers are usually too short.

**10. Numerous subsidies and other interventions still reflect the traditional view that exploitation of natural resources – in particular fossil fuels – is the key to economic growth.** These interventions have distorted the market profoundly, and are preventing it today from reacting adequately to already noticeable shortages of natural resources and an oversupply of labour. Subsidies that increase the consumption of natural resources must be eliminated.

**11. The politically defined economic framework conditions have to be adjusted to protect the services of Nature and to preserve resources for future generations.** These conditions must include incentives to make planned transitions now, rather than being forced later to change suddenly.

**12. "Getting the price for Nature right" is one of the most urgent challenges.** The relative cost of labour will have to decrease in industrialized countries, while the relative cost of natural resources will have to increase. This will be possible by taking the opportunity inter alia to revamp subsidy systems and by shifting the tax burden from labour to natural resources.

**13. The current financial markets enforce the accelerated consumption of natural resources.** More sustainable forms of trade and investment are necessary to stop the current self-destructive trend.

**14. Welfare is more than material wealth and consumption.** Besides income, welfare includes factors such as employment, education, health, safety (freedom from violence), environmental quality, social security, leisure, and equity. Many factors that constitute welfare have not increased in industrialized countries since the mid 1970s – or are even declining.

**15. Society must be better informed about the incompatibilities between daily life and the ecosphere, about the consequences of these incompatibilities and about measures and methods that can effectively counteract the problems.** There is a lack of awareness of the fact that globalizing the traditional resource intensive model of economic growth would require several planets earth as its resource basis.

**16. Governments and industrial leaders**

**must base their decisions on the knowledge that eroding the life-sustaining services of Nature would ultimately destroy all economic and political freedoms.** Creating jobs by encouraging increased consumption of goods currently available is not a solution. Governments can provide the necessary framework in which ecologically sound investment decisions become economically rewarding. Firstly, it must become more attractive to decision-makers at all levels to put tons and kilowatt-hours out of work instead of people. Secondly, producers must be held responsible for the material fate of their products beyond the point of sale (Extended Producer Responsibility, EPR).

**17. International agreements on world-wide per capita consumption targets (sufficiency levels) should be sought, such as:**

- Emission of greenhouse gases in CO<sub>2</sub> equivalents: max. 2.0 tons/year;
- Non-renewable material resources other than fossil fuels and water: max. 5-6 tons/year;
- Direct and indirect land use: max. 1.8 ha.

All these values are to be understood from a life-cycle perspective, i.e. they include what may be called "ecological rucksacks", "grey energy", or "footprints" – but methodological differences in assessing per-capita resource consumption should not divert decision-makers from the aim of bringing down the currently high consumption levels in the industrialized countries.

Energy is not mentioned in the above targets because the relevant ecological impacts of energy supply and use depend upon the material intensity with which the energy is made available. The per-capita targets would give the societies of the less industrialized world a valuable breathing space to increase material flows and energy consumption in order to meet their needs. If world population continues to rise, the targets should be reduced accordingly.

**18. Key sets of indicators for human welfare beyond GDP and for the use of natural resources must be internationally agreed to.**

For the latter purpose, TMR (Total Material Requirement) and MIPS (Material Input Per unit of Service) as well as "footprints" and "rucksacks" are already in use. In order to support rational and reproducible progress in increasing resource productivity, a publicly accessible registry must be established that generates, collects and validates the appropriate data and information.

**19. For public authorities, it must become mandatory that only considerably dematerialized goods, infra-structures, and services are purchased.** Preference should be given to the import of goods and services from countries that respect the global necessity of preserving the services of Nature. Public procurement of goods and services is a relevant market force, because it amounts to 15-20% of final consumption.

**20. Accomplishing a 10:1 dematerialization must be expected to take a generation, because major technical changes often take 10-20 years to diffuse throughout society.** Therefore we must begin without delay. But as recent history has shown, the technical underpinnings of industrial societies can change radically, as in the case of Information and Communication Technologies (ICTs).

March 2008

## People

The following persons in their personal capacity have given valuable advice on how to improve the WRF Declaration as a work in progress. Such improvements will be included in future versions over the course of the consultation to arrive at the definitive "WRF Declaration 2009".

- Bierter, Dr., Willy, Director, Institut du Long Duree, Geneva, CH
- Bringezu, Dr. Stefan, Dir., Material Flows and Resource Management, Wuppertal Inst. D
- Cheng, Dr. YiHeng, CEO, Shanghai, CN
- Crutzen, Prof. Dr., Paul, Director, Max Planck Institut fuer Chemie, Nobel Laureat, D/NL
- Edelmann, Dr., Xaver, Empa, CH
- Hawken Paul, Director, Natural Capital Institute, USA
- Faulkner, The Honorable C.Hugh, PC,CND/F
- Fussler, Claude, Director, World Business Council on Sust. Development, F. CH
- Gallehr, Sebastian, Managing Director, Gallehr GmbH, D
- Gottstein, Doris, Redacteur en Chef, "MARKET", CH
- Hawken, Paul, Director, Natural Capital Institute, USA
- Hinterberger, Dr., Friedrich, Pres., SERI, A
- Holoubek, Prof. Dr., Ivan, Dir., RECETOX, CZ
- Homer-Dixon, Thomas, professor and best-seller author on resource problems, Univ. Toronto, CDN
- Hrebicek, Prof. Dr., Jiri, Director, Inst. Biostatistics and Education, Masaryk Univ., CZ
- Kassenberg, Prof. Dr. Andrzej, Director, Inst for Sust. Devel, PL
- Khosla, Prof. Ashok, President, Development Alternatives, IND
- Lehmann, Dr., Prof. and Director, Harry, Umweltbundesamt, D
- Meyer, Prof. Dr., Bernd, University of Osnabrueck, D
- Rademacher, Prof. Dr. Dr., F.-J., President Global Economic Network, Global Marshall Plan, D
- Ruddy, Thomas, Empa, CH
- Schmidt, Axel, Managing Director, Wacker Chemie, D
- Scholz, Prof. Dr., Roland W., ETH, CH
- Stahel, Prof., Walter R., Geneva Association, Geneva, CH
- Wackernagel, Prof. Dr., Dr. hc, Mathis, Exec. Director and Founder of the Ecological Footprint Network, USA/A
- Wallbaum, Prof. Dr., Holger, ETH, CH
- Weidema, Bo, managing director, Ecoinvent database, CH
- Weizsaecker, Prof. Dr. Ernst Ulrich von Takeda Prize Laureate, Dean, U of California at Santa Barbara, USA/D
- Wrage, Dipl.-Ing., Stephan, Founding Partner, SKYSAILS, D
- Yamamoto, Prof. Dr., Ryoichi, Tokyo University, JPN

## Contact

Prof. Dr. Lorenz M. Hilty  
Head of Laboratory, Technology and Society  
Empa, Swiss Federal Laboratories  
for Materials Testing and Research  
Lerchenfeldstrasse 5  
CH-9014 St.Gallen, Switzerland

Phone +41-71-274 73 45  
Fax +41-71-274 78 62  
wrf@empa.ch