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## EDITORIAL

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### Factor 10: The future of stuff

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#### Old and New Policies

Given current economic and environmental policies, nature's life-sustaining services will continue to decline at a rapid pace. "Business as usual" may put human life on Earth eventually into question. Meanwhile, economic options will become limited and world peace more fragile.

Traditional *environmental* policies focus on dealing with specific problems. In certain respects, this approach has been quite successful. For instance, it has cleaned up water pollution, taken dangerous goods off the market, recycled certain products, and slowed the acceleration of climatic change.

However, since traditional problem solving begins *after* recognizing a problem's existence, such policies are neither helpful on a systems level, nor are they preventive in a general sense. Solving individual problems can even exacerbate other problems, in particular those as yet undiscovered.

*Internalization of the environmental costs* of individual known problems among millions of possible destructive interactions between hundreds of thousands of different pollutants and the highly complex ecosphere *cannot* be relied upon when seeking sustainable solutions.

Lately, *recycling* appears to be experiencing a policy revival—except that its administrators and practitioners now call it "resources policy." While recycling can contribute toward saving natural resources, there is no evidence that this "end-of-the-pipe" approach could ever lead to sustainable conditions. Much of the damage to the services of nature has been done *before* waste treatment can begin. Typically, national recycling policies can cover only a few percent of total materials flows. In Germany, about 1% of the total resources flow is recycled today—at a yearly expense of several billion Euros.

At present, more than 95% of the resources lifted from nature are wasted before the finished goods reach the market. And many industrial products—such as cars—demand additional natural resources while being used.

*It is high time to eliminate the systemic root cause for the incompatibility between today's economic activities and the continued functioning of the life-sustaining services of nature, without which humans cannot survive. For survival on planet Earth, the time has come to implement truly damage-preventing strategies.*

*Today, the fundamental physical flaw of human activities is the enormous consumption of natural resources per unit output of value or service. This observation applies to all renewable and nonrenewable materials, domestic animals, water, soil, and land use.*

*The key for sustainability is to radically increase the resource productivity of all economic activities, including energy generation.*

While it may seem obvious, it is nevertheless worth repeating that climatic change, too, is the consequence of enormous flows of human-induced carbonaceous material and of large quantities of N<sub>2</sub>O emissions originating from the technical fixation of millions of tons of nitrogen from the air in the production of fertilizer.

It has been widely accepted that to be successful in approaching sustainability an average minimum *tenfold dematerialization* of the Western style of life in absolute terms has to be achieved.

Today, the environmental safety threshold has already been surpassed, as is evident from such developments as climatic change, widespread water shortages, desertification, disease proliferation, massive erosions, and increasing natural catastrophes such as hurricanes and floods. And yet, only some 20% of humankind enjoys the full benefits of our economic model, while *all* human beings—and in particular the poor—have begun to suffer the consequences of its flaws.

But even if one were to ignore the ecological problems caused by the overuse of nature, globalizing the western lifestyle is *not* possible, because it would require more than two planets as a resource basis. Rapidly rising raw material prices testify to this fact.

## Technologies for Tomorrow

To translate the findings just outlined into a general guideline for policy development, the European Union's Panel on Eco-Innovation has recently concluded:

Eco-Innovation means the creation of novel and competitively priced goods, processes, systems, services, and procedures that can satisfy human needs and bring quality of life to all people with a life-cycle-wide minimal use of natural resources (material including energy carriers, and surface area) per unit output, and a minimal release of toxic substances (Schmidt-Bleek, 2007).

This observation suggests that continued reliance on traditional "environmental technologies" is no longer enough. Many examples exist where incremental improvement of existing technologies has increased resource productivity two to four times. However, sufficiently decoupling production and consumption from nature requires new systems, goods, services, processes, and procedures for meeting human needs. One such novel solution is to propel ships by "sky sails," potentially saving up to 60% of fuel for 50,000 freighters at competitive costs. To such solutions, the markets of the future will belong.

The development of as-yet-not industrialized countries is impossible without dematerialized solutions. Entrepreneurial success on all economic levels—including exporting goods, blueprints, and services—will also depend on striving for maximum resource productivity, as will gaining independence from those possessing raw materials—including energy carriers—and preventing armed conflicts over access to natural resources.

While increasing material productivity, reducing erosion, and using land optimally are necessary for moving toward sustainability, they are not the only conditions. Welfare is more than material wealth and consumption. Welfare includes factors such as employment with adequate income, equity, education, health, safety (freedom from violence), environmental aesthetics, social security, and leisure.

## Goals for Sustainability and Suitable Indicators

Creating new values for civil society will require the casting of goals with a definite time frame. Wherever possible, these goals should be encapsulated into measurable physical terms so that development can be managed. To the extent that value creation requires natural resources, the goals have to respect the laws of nature.

Specifics, including policy instruments, for protecting nature's services may vary for differing geographic and geological conditions. However, since humankind has only one planet, the fruits of the commons and its protection must be shared fairly.

Scholarly literature has suggested the following global goals for the target year 2050:

- The ecological footprint per person should not exceed 1.2 hectares.
- The worldwide per capita consumption of nonrenewable resources should be less than five to six tons per year. (This goal implies a tremendous increase in resource efficiency in industrialized countries. In Germany, for instance, it means a Factor 10 increase, requiring a yearly absolute improvement in resource productivity of almost 5%, starting now. In the United States, the reduction of resource use would have to amount to about a factor of 15, and in Finland close to a factor of 20).

These goals must be discussed further. If the dematerializations indicated above for industrialized countries were achieved, this would allow developing countries to increase their use of natural resources without jeopardizing the overall goal of global sustainability.

Because it is impossible to manage a system without metrics, we must agree on appropriate indicators. These must satisfy six criteria: 1) they must be based on measurable quantities; 2) they must be generally applicable on a "cradle to grave" basis; 3) they must be directionally true; 4) they must be cost efficient in their application; 5) they must be based on scientific evidence and on broadly accepted guidelines such as the above definition for ecoinnovation; and 6) they must respect and relate to the laws of nature (for instance, economic indicators must go beyond conventional measures of gross domestic product (GDP)).

As to the ecological dimensions of sustainability, calculations of total material requirements (TMR), material input per service-unit (MIPS), and ecological rucksack measurements satisfy these criteria.<sup>1</sup> In addition, the value/weight and labor input/weight of industrial goods have been suggested as initial indicators. Furthermore, great need remains for indices that reflect the resource implications of progress in the institutional, social, and economic dimensions of sustainability.

<sup>1</sup> "Ecological rucksack" refers to the total material input for manufacturing a product, from cradle to the point of sale in kilograms (kg), minus the mass of the product, itself (in kg).

## Economic Policies

No incentives or policies currently exist for a sufficiently resource-efficient economy. Adjusting the economic and fiscal framework is therefore the most fundamental and urgent prerequisite for moving toward sustainability.

For this shift, a strong preference seems to be emerging for economic instruments, such as environmental tax reform and market-creation policies, including tradable permits. Instead of value-added taxation, for instance, it may be more efficient to tax natural resource use before goods for final use have been produced, while lowering taxation of labor accordingly. But, because of market failures, economic instruments may not work in all cases; therefore other instruments and measures should be considered, such as information and coordination instruments and command-and-control mechanisms, for instance, adjusting norms and standards.

The choice of policy options should depend on their efficiency in dematerializing goods and services at the least possible cost to civil society.

Today, the public procurement of goods and services amounts to some 15–20% of final consumption. Preference for dematerialized goods, infrastructures, and services could give the manufacturing sector a powerful incentive to increase resource productivity. In Germany, this may be a particularly attractive option as it has been shown that some 20% of resource input production costs could be saved on average without negatively affecting outputs.

Agreement has also emerged in civil society that improving education and training on all levels, as well as enhancing the public availability of relevant information, will play a central role as part of a progressive strategy.

## Basics for Approaching Sustainability

1. The key flaw of the present mainstream economic model is its lack of incentives for increasing the productivity of natural resources.
2. This flaw creates a dangerous situation because the present rate of resource use:
  - Cannot be globalized since at least two planets would be needed as a resource basis
  - Does not permit the fair development of poorer countries
  - Increases the potential for worldwide conflict
  - Increases the dependence of many countries on others that are more blessed with natural resources

- Can deplete or exhaust nature's services without which humankind cannot survive.

3. Among the policies that governments can institute to improve the situation, preference is emerging for economic instruments, *inter alia*, aiming simultaneously at dematerialization as well as at job creation by shifting taxes and overheads from labor to natural resources.
4. During the next few decades, the productivity of natural material resources has to be improved by at least a factor of ten compared to current resource consumption in western countries.
5. The use of fossil-energy carriers must be abandoned as rapidly as possible through a switch to inexhaustible sources of energy with the help of dematerialized technology.
6. Goals for sustainable value generation, expressed in measurable terms, are required for monitoring and managing progress toward a future with a future.
7. Indicators related to resource saving have to be set for monitoring ecological, economic, social, and institutional developments.
8. As new technical and societal developments tend to require ten to twenty years to take hold, dematerialization must commence immediately.
9. A single country cannot bring about the needed changes, but Europe with its historic experiences, economic power, and technical skills has a realistic chance to lead humankind to a more promising future.

## Author's Note

The first World Resources Forum will be held in Davos, Switzerland on September 16, 2009. Consult also "Future: Beyond Climate Change," position paper 08/01 at [http://www.factor10-institute.org/files/FUTURE\\_2008.pdf](http://www.factor10-institute.org/files/FUTURE_2008.pdf).

## References

Schmid-Bleek, F. 2007. *Nutzen wir die Erde richtig? (Let us use the earth?)*. Frankfurt: Fischer Verlag.

## About the Author

Friedrich Schmidt-Bleek is a physicochemist who has been responsible for administering the federal environmental research program in Germany and for developing the German Chemical Act. He advanced the concept of Factor 10 dematerialization of the economy for reaching economic and ecological sustainability. Schmidt-Bleek also advises the European Commission on sustainable development and has published some twenty books on eco-economic issues.

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