

## **The new industrial revolution, eco-innovation and the Humboldtian approach**

Preliminary reflections on a novel model for a green global “knowledge explosion”

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Since the dawning of the industrial age, one key element of modern economy is the enormous extent of energy consumption and the equally enormous quantity of natural resources that are employed and used up for industry. The smoking chimney has been rightly used as a symbolic icon for industrial strength and economic abundance. In the global comparison, the “western” approach has been far more successful in the past 200 years than any other economic model. This is one of the reasons why the rest of the world is copying our “proven” strategy now. But there are other reasons, too. Emulation of the western industrial paradigm appears to be the swiftest and surest road out of poverty and dependence for non-western countries, and many developing countries face the choice between rapid industrialisation along “traditional” western parameters or the looming collapse of their societies. The global food crisis in spring 2008 illustrates the vulnerability of poor countries – and particularly their poorer inhabitants – to global market shifts.

At least since 20 years the EU has become aware of the fact that resource shortages may eventually turn out to be a major risk for continuing to build economic welfare by abundantly using natural resources. In other words, this core element of “traditional” industrialism may turn out to be its stumbling block. European stakeholders have become aware of two major factors that indicate a need for change. First, a reliable and cheap flow of natural resources from non-industrialised countries can no longer be taken for granted. Second, the negative impact “traditional” western industry and its complementary lifestyle have on the environment bring about serious global threats. Climate change is the most eminent among them. Although climate change, like global economic phenomena, is and will be most devastating in the poorest regions of the globe, both its direct and the indirect impacts on Europe will be serious. How serious they will be depends on the degree of success of the struggle against climate change.

There are several compelling economic and political reasons why a future-oriented policy could hardly over-emphasize the importance of increasing resource productivity:

- Rising raw material and energy prices are the fastest growing cost factor in the production sector today. As exemplified by mineral oil, continuing vast consumption leads to alarming economic and political consequences. The degree of dependence on a given natural resource determines the vulnerability of an economy to shortage and depletion. There is one notable exception: renewable energy which cannot be exhausted.
- Globalising western lifestyles with a business as usual approach would require at least two planets as resource basis. Developing countries do not consent to remain poor in order to support ongoing prosperity in industrialised countries based on vast consumption of natural resources. Thus, increasingly dangerous conflicts about access to resources threaten the economy of industrialised countries.
- So the global region which will invent and implement alternatives without losing quality of life will be the most successful region in the global economic competition. Furthermore, it will be able to contribute significantly to the struggle against poverty in other regions of the globe without sacrificing its own abundance. Thus, it can de-escalate global conflicts, establish stability and safeguard its own ongoing prosperity.

Climate change is a global threat and must be tackled on a global scale. Obviously, the growing impetus of eco-innovation in Europe cannot stem the tide alone if the major part of the world does not provide significant contributions to the struggle of climate change. Emission reduction and mitigation measures in Europe, for example, do have an impact on the speed of climate change. But compared to the steadily growing quantities of greenhouse gases emitted by newly industrialized countries (NICs), emission reduction in Europe, important as it is, loses significance within a global scenario. It has to be kept in mind, however, that it is neither feasible nor recommendable to try to deny the desire for development brought forward by developing and NICs.

Having to combat both poverty and climate change, they face a dilemma. Subtracting capacities from their endeavours to develop in order to mitigate CO<sub>2</sub> emissions and to adapt to the manifestations of climate change threatens to undermine their basic needs, particularly development. But they cannot refuse to employ adaptation

measures because of the dramatic impact climate change will have – and in some cases already has – on their lands and populations. For the same reason, NICs cannot refuse to mitigate greenhouse gas emissions, and furthermore they are urged to do so at the international climate negotiations. But doing so endangers their economies. At the international climate negotiations in Bali (COP 13), NICs and developing countries stated their willingness to join the struggle against climate change. A considerable number of their representatives, however, pointed out that, in order for their countries to be able to act as intended, massive transfer of sustainable technology from industrialised countries has to take place. But although the most significant decision of the negotiations, the Bali Action Plan<sup>1</sup>, acknowledges and affirms this necessity, up to now there is very little tangible progress. However, for NICs and developing countries, the procurement of technology which can be employed to meet the requirements of development without accelerating climate change is crucial. The swift and broad implementation of these technologies in these countries is indispensable for the global struggle against climate change.

The combined endeavours which are necessary to get a decisive grip on climate change and resource shortages can be summed up as **a new industrial revolution**. This revolution has to dwarf its precursor in two respects: it has to happen thrice as fast and it has to take place on a global scale.<sup>2</sup>

Eco-innovation is both the keyword and the key of this new industrial revolution. From a European perspective, this means employing a bundle of already proven policies, lessons learned and best practices on the global scale. It means accelerating European eco-innovation – and, thus, supporting Europe's competitive edge – by a continuous stream of knowledge dividends resulting from the implementation of European sustainable technologies in NICs and developing countries. It also means safeguarding the future of Europe both from the impacts of climate change and the turmoil of global economic and political disruptions.

„The EU-Innovation Panel<sup>3</sup> has defined eco-innovation as follows:

***Eco-Innovation aims the creation of novel and competitively priced goods, processes, systems, services, and procedures that can satisfy human needs and bring quality of life at life-cycle-wide minimal use of natural resources (material including energy, water and surface area) per unit output, and a minimal release of toxic substances”.***

1. The concept of eco-innovation should be supported as a cross-cutting issue with an adequate focus on knowledge / learning gaps, good practices and opportunities in each sector.
2. The logic of public support for eco-innovation should be different, to include different calculations of the cost of innovation. Hence, public policies should support eco-innovation taking into account its integrated costs, which implies that even if innovation is not cost effective under the current market price regime, it will become profitable under a global competition aspect.
3. The European Commission is asked to support actions on awareness raising, capacity building, demonstration projects identifying and disseminating existing good practices in the field of eco-innovative products and services.<sup>4</sup>

As the McKinsey-Report states: „Productivity growth, such as occurred in the Industrial Revolution, is largely a microeconomic phenomenon. New technologies are developed and deployed, new investments made, new infrastructure put in place, and changes occur in the decisions, practices, and behaviours of millions of business managers, workers, and consumers“ (McKinsey 2008: 12f).

This is what will happen in Europe both as a result of the new industrial revolution and as its core characteristic. Thus, European business will transcend the satiated markets of the industrialised countries. Instead of stagnating, European business will grow and multiply in order to satisfy both new customer demands at home and those of the emerging markets which will appear in countries whose populations currently cannot afford European products. There, Europe-based global eco-innovation will provide sustainable energy and sustainable, reliable logistics, the core elements of stable, growing economies of the future.

1 Decision 1/CP.13; in: UNFCCC: Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007; Addendum; Part 2: Action taken by the Conference of the Parties at its thirteenth session, 14 March 2008, p. 3ff.  
 2 McKinsey Global Institute: „The carbon productivity challenge: Curbing climate change and sustaining economic growth“ (June 2008); [http://www.mckinsey.com/mgi/publications/Carbon\\_Productivity/index.asp](http://www.mckinsey.com/mgi/publications/Carbon_Productivity/index.asp)  
 3 <http://www.europe-innova.org> - „Europe INNOVA is an initiative for innovation professionals supported by the European Commission under the 6th Framework Programme. The fundamental objectives of this initiative fall in line with the policy direction set out within the FP6 priority of "Structuring the European Research Area". In acting as the focal point for innovation networking in Europe, Europe INNOVA aspires to inform, assist, mobilise and network the key stakeholders in the field of entrepreneurial innovation, including firm managers, policy makers, cluster managers, investors and relevant associations.  
 4 This paragraph: Schmidt-Bleek, Friedrich/ Hinterberger, Friedrich/ Gallehr, Sebastian (Europe INNOVA Eco-Innovation Panel): Eco-Innovation as the most efficient cross-sectoral driving force for a competitive EU in the global economy

The new industrial revolution also has to transcend the established patterns of development policies and North-South-relations in general. The global struggle against climate change is a challenge to mankind and requires the willing participation of humans from all continents. Hence, antiquated concepts and approaches have to make way for innovative ones. Particularly, in order to develop and implement technologies which are adapted to the needs and demands of the populations in NICs and developing countries, a top-down approach does not appear to be advisable. Diversified, regional and local demand will remain a vastly unknown factor. It is necessary to speedily allocate locally adaptive, technological and economical intelligence and creativity. To date, companies have erected research departments in urban regions of development countries which appear to be or to become attractive markets. These research departments are expected to study local markets and wants and, thus, to initiate technological innovations. But bottom-up approaches like these have to proliferate if we take the right to develop and the willingness to develop climate-neutral ways of life and the economic opportunities of emerging markets seriously. About half of the human population of the planet lives in rural areas, approximately one billion people live off less than \$1 per day (purchasing power equivalent). In order to fully max out the innovation potential, the necessary technological innovation thrust has to reach the particular conditions of rural and sparsely developed areas, and it has to be complemented by a thrust of lifestyle innovations. This is only feasible given a vast network of supporting institutions, structures and basic technologies.

Evidently, both spheres of action – accelerating European eco-innovation and transforming economic development in NICs and developing countries towards a sustainability path - demand a vast range of Green Skills and a huge number of people possessing them. Although the basic conditions in these two spheres differ drastically (and differing conditions in different European countries as well as significant differences between NICs and developing countries are to be considered as well), there is one question that has to be faced. Is there a basic approach that meets all requirements that are to be taken into account? Even for the strongest national economies in Europe, this revolution of knowledges and skills is a daunting task. Do institutions already in existence have the necessary capacities? Can the costs be reduced to reasonable amounts that do not endanger national economy in the process of transition? Are traditional methods and structures of knowledge transfer fit to enact a knowledge revolution? How is structural inertia and the efficiency loss caused by it to be overcome? How can recipients of training and teaching be motivated to invest time and effort? How can the necessary high quality of Green Skills be safeguarded? As all these questions can and must be answered in respect to the new industrial revolution both in Europe and in NICs and developing countries, it becomes apparent that, in spite of the differences, the problem is basically the same.

About two centuries ago, Prussia had to face the challenge of being scientifically and technologically backward compared to the neighboring principalities, and answered the challenge by erecting an education system wherein students, by participation in research processes, were expected to learn process-oriented knowledge generation. This approach was opposed to the established practice to convey knowledge based on a top-down model. Self-reliance, independence, critical and theoretical reflexion, interdisciplinarity and a cosmopolitan attitude were intended to enable and accelerate scientific productivity. This Humboldtian ideal of education caused an academic generation to appear which was already used to rational and autonomous production of knowledge. The unfolding of knowledge structures based on this phenomenon and its basic and accompanying technologies initiated an innovation thrust in catching-up Germany which safeguarded its technological and scientific top position.

In 2008, Narahari Rao elaborated an approach to apply the Humboldtian model to eco-innovation and a New Green Global Deal. In a workshop with e5 in March 2008, this approach was underlaid by applying e5's expertise regarding European eco-innovation, the international climate negotiation process and the issue of technology transfers from the point of view of climate-friendly business:

If an innovation thrust comparable to Prussia's advancement sketched above is to take place today in order to initiate a new industrial revolution, the Humboldtian approach should widen its base. It should once again become the core structure of learning and teaching, but this time throughout Europe and throughout society. High-level skills and profound knowledge have already ceased to be the status privilege of a minority in Europe. This tendency should be strengthened, and opposite tendencies like efficiency loss of public education should be eliminated. It is very important point out a crucial difference between the Prussian model and the current scenario. In Prussia, the Humboldtian model was restricted to an elite, which was perceived as supportive pillar of the state, and to particular institutions - the universities. Today, in a democratic Europe, the role of supportive pillar of society is no longer restricted to an elite. Accordingly, the Humboldtian approach should reach and reform all strata of society and each and every relevant economic, educational and administrative institution in order to initiate the new industrial revolution. In order to truly become knowledge societies, European countries and the European Union could achieve significant progress by applying the Humboldtian approach.

At the same time, the rewards for the efforts invested should be made transparent and tangible – for institutions,

especially those involved with education, businesses of every size, and last not least for individuals. This is necessary in order to ensure that all stakeholders understand both the nature and the necessity of the profound change that is taking place and their own auspicious prospects in this scenario. A core element of the European Green Skill Revolution is willing and eager cooperation of all stakeholders, and this can only be safeguarded by providing a clear and convincing perspective for all of them.

There can be no doubt that the costs of this transformation process will be considerable. But Europe should perceive this process and its costs as a rational and calculated investment that will bear fruit both in the near and in the far future. Particularly, a well-educated, highly skilled population is a powerful asset for every national economy, and also for democracy. Business, especially Green Business, thrives on proficient employees and farsighted corporate leaders, and as Green Skills require, among other things, self-reliance, continuous adaptation and learning and innovative models of thinking, European business will radically transform and prosper. Public institutions will reform and improve, and public life in Green Europe will be shaped and conducted by well-informed, considerate and cultivated citizens.

In NICs and developing countries, the Humboldean approach should be applied by establishing novel knowledge centres for grown-ups situated in diversified urban and rural areas. There, the local population, guided by experienced teachers, researches how local ways of life can be transformed into sustainable lifestyles which at the same time provide prosperity. Like in Prussia long ago, the aim is the emergence of creative, autonomous subjects of research which enable the constitution of a network of institutions and knowledge areas. Local needs and demands are connected with a global perspective characterised by resource effectiveness and climate protection in order to develop local solutions for adaptation and mitigation in everyday activities like cooking, transport, waste disposal et cetera. Research in these post- or rather para-academic knowledge centres for sustainable lifestyles, helpful technologies, solutions, institutions and abilities takes places employing the principle of participation. That means, research and teaching are one and the same. And this process has to be comprehensive, theoretical reflexion and interdisciplinarity are as important as the broadness of the subjects of education which must not be limited to technical disciplines.

For these knowledge centres, service centres for dissemination of technologies (biogas, solar cooking gear, solar panels et cetera) and consultation centres for other skills (cultivation methods, husbandry and others) could serve as a base. The internet provides fast cross-linking of knowledge centres, for example by generating special online platforms. Solutions and ideas developed in a suburb of Bangalore may prove useful for a local group in the area of Rio de Janeiro, and similar phenomena might occur when knowledge generated by a rural community in Kenia proves helpful in Bangladesh. For companies participating in these research processes there will be a direct knowledge dividend, i.e. innovations. Taking into account the comparatively small investment cost for innovation cores in developing countries the knowledge dividend may be much higher than from comparable projects in industrialised countries.

Thus, employing the Humboldtian approach in NICs and developing countries would not only be a significant step in the struggle against climate change. It would be an important step towards a New Global Deal. Identifying and employing climate change as a mega-driver, initiating the new industrial revolution and applying the Humboldtian approach would also transform the relations between Europe and NICs and developing countries. Being perceived and recognized as a fair, reliable partner in global regions that are currently facing dramatic threats would be a very auspicious outcome for Europe.

It is becoming clear that both spheres of action – accelerating European eco-innovation and transforming economic development in NICs and developing countries towards a sustainability path – are complementary. The new industrial revolution has the potential to initiate a global synergy that would provide auspicious prospects for Europe in this century.

The core elements of eco-innovation, namely sustainable energy, sustainable technology and the vast and ever-increasing knowledge base related to them are Europe's strongest assets in the new millenium. Hence, it is of utmost importance for the future of Europe in a changing world how this asset is employed<sup>5</sup>.

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5 This paragraph: Schmidt-Bleek, Friedrich/ Hinterberger, Friedrich/ Gallehr, Sebastian (Europe INNOVA Eco-Innovation Panel): Eco-Innovation as the most efficient cross-sectoral driving force for a competitive EU in the global economy, Manuskript