

# FORE • SCENE

Report of the

**FORESCENE Workshop**

**„Industry/Economy“**

**Part 1: Workshop summary**

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## 1 Introduction

This workshop was part of work package 2 of the FORESCENE project. In work package 1, the environmental problem issues to be further dealt with in detail in this project, such as water, biodiversity/soil/landscape, and resources/waste were selected and defined.

Work package 2 then shifted the perspective from the problem-oriented topics towards activity fields (sectors, policy fields). Three workshops were organised by different partners of the project, focusing on the three issues of agriculture, infrastructure/land use, and industry/economy.

For those three activity fields the essential elements of sustainable development were defined in a positive manner, i.e. not only in the sense of avoiding and mitigating current problems, but also through answering what the desired future should look like and which prerequisites are deemed essential for sustainability.

This workshop focused on the activity field “industry/economy”. It was held as a two days event, which took place on 23th and 24th of October, 2006.

Key guiding questions for the workshop were:

- What could a desired long-term vision of sustainability for the activity/policy field “industry/economy” look like, considering essentials of environmental, economic and social development?
- Which essential elements of sustainability that are integral part of the vision can be defined for the purpose of developing sustainability scenarios?
- Which requirements and potential measures can be described that are deemed promising to reach the defined sustainability scenario?
- Which measures address activities or driving forces that show cross-sectoral impact and hence are potentially of multi-beneficial effect without shifting problems?

The workshop brought together 15 international experts in different fields relevant to sustainable development of the European economy plus selected stakeholders from industry and public administration (see full list of participants in Annex 1 to this report).

Each expert was asked prior to the workshop to provide an input paper of around 10 pages and a presentation at the workshop for around 10 minutes, highlighting the key points. Thereby, knowledge on existing scenarios relevant for the activity field of „industry/economy“ and important related scenario elements could be collected and evaluated.

This report summarises the main outcomes of the workshop and provides a comprehensive and coherent compilation of main targets, main sustainability scenario elements and key (policy) measures to reach the envisioned future. The report has the following structure: Section 2 summarises some key developments in European industry and selected results from outlook studies from the literature. In Section 3, we present the contributions from the various experts in the form of input papers in condensed form. Sections 4 to 6 deal with the three major scenario issues, which were elaborated during the workshop based on the expert inputs: goals and targets (Section 4), main scenario elements (Section 5) and measures and instruments (Section 6). In

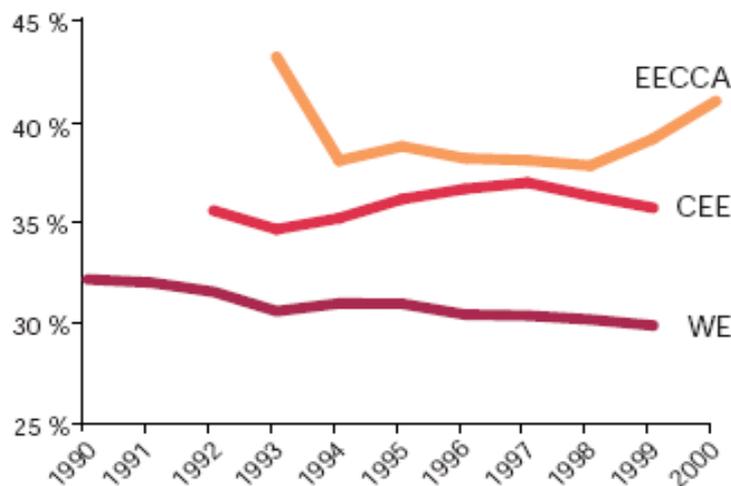
Section 7 we present the outcomes of the discussions in small groups. Section 8 draws the conclusions.

## 2 „Industry/Economy“ and sustainable development

The industrial sectors are a crucial component of the European economy, providing an important share to GDP and total employment. The main objective for the European Union is to maintain competitiveness in global markets and to meet the environmental protection goals at the same time.

From 1993 to 2003 the total industrial output has increased by 10 % in the Western European Countries, but although total output is increasing, industrial employment is decreasing (EEA, 2003). Nevertheless, industrial sectors provide a major share to the European GDP, which is shown by Figure 1, demonstrating the development of the GDP generated by the industrial sector for the Western European countries (WE), the Central and Eastern European countries (CEE) and the countries of Caucasus and Central Asia (EECCA).

Figure 1: The share of the industrial sector in total GDP



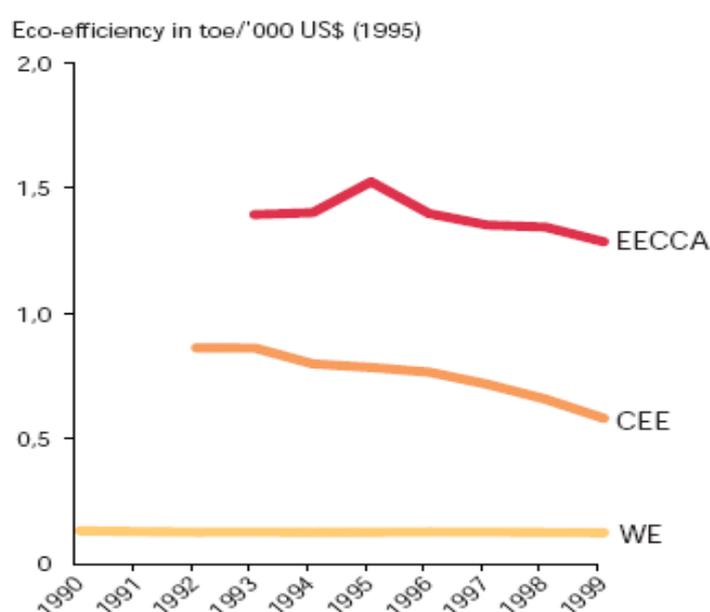
Source: EEA, 2003

It has to be noted, that these data add mining and electricity production to the manufacturing industry, therefore this figure refers to total industry activities. In the CEE and EECCA countries the major part of industry relies on electricity and heat production, which are very pollution-intensive sectors. The WE countries also operate in some pollution-intensive sectors, for example the mining and chemical production in Italy and Great Britain.

Although industrial pollution has decreased in the last decades due to structural changes in the manufacturing industry, industrial sectors in Europe cannot be judged as sustainable so far. Considering the manufacturing industry, a commonly used indicator for environmental pollution is the industrial energy use, which is related to important air pollutants, such as CO<sub>2</sub>, SO<sub>2</sub> or NO<sub>x</sub>.

Energy use of the WE countries has increased by more than 1% per year, but since GDP from the industrial sectors increased even more rapidly, a relative decoupling of industrial growth and energy use has been obtained, resulting in improved energy efficiency. Main drivers for this development are structural changes between industrial sectors and the shift to “cleaner technologies”. Improvements in energy efficiency are most considerable in the CEE countries, with more than 30% reduction since 1992 (EEA, 2003). Still, industries in CEE are three times more energy intensive than that in WE, and the figure is seven times more in the groups of EECCA countries.

Figure 2: Energy efficiency in Europe



Source: EEA, 2003

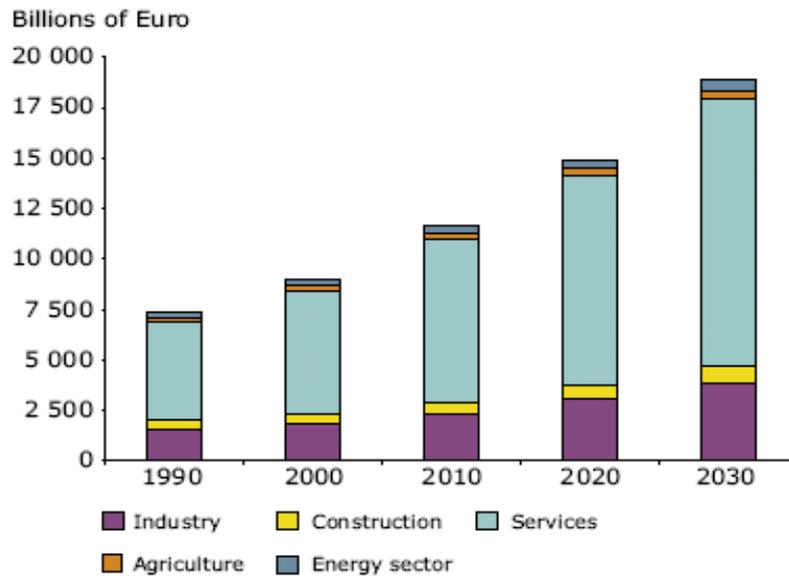
The trend towards cleaner technologies is supported by higher growth rates of the economy, which enables the necessary investments for the development and implementation of new technologies. In addition, this development is supported by environmental policies of the European Union.

In recent years, a new industry sector has emerged, the so-called “Eco-industry”, which produces goods and services to measure, prevent and minimize the environmental pollution. Between 1994 and 1999 the value added from eco-companies has increased from 35 billion Euro to 98 billion Euro. This sector might provide a future comparative advantage for Europe in the global economy, since global demand for these technologies is rising (EEA, 2005).

A main share of future European GDP is expected to be generated by the service sectors, which already contribute 70% of the current economic activities of the EU. With an expected growth rate of 2.7 % per year, the service sector is expected to be the future predominate sector of the European economy. Compared with this significant growth, the industry sector growth seems to be modest (see Figure 3). The industrial sectors “pharmaceutical and cosmetics” and “engineering”

are expected to be most dynamic, whereas the energy, construction and agriculture sector are expected to decline. This possible restructuring of Europe's economy might have positive impacts on the environment, since a shift from the industrial to the service sector could be one key part of a strategy towards sustainable development.

Figure 3: Outlook (projection) on the development of gross value added by sectors



Source: EEA, 2005

In another scenario study carried out by the Institute for Prospective Technological Studies (IPTS, 2003), several scenarios on the future of manufacturing in Europe were formulated and evaluated with regard to their possible impact on sustainability. The study shows that future manufacturing industry in Europe will be shaped by a variety of factors, including globalisation, new technologies, market demand, fiscal measures and regulations as well as overall societal change. The study emphasises that many of these driving forces are possibly being shaped by European policy efforts, thus providing the possibility to reconcile manufacturing trends with goals stated in the European Strategy for Sustainable Development (European Council, 2006).

Conclusions of the IPTS study hold that transformation of the manufacturing sectors towards sustainable development is less a question of technological opportunities alone than a question of the implementation of adequate policy strategies and future market developments. The realisation of sustainable manufacturing will only be possible, if lead markets of sustainable product and services will be created. Without new market and policy incentives, manufactures will likely continue concentrating on short-term economic performance improvements, rather than pursuing long-term oriented sustainability objectives. European policies could foster the creation of new markets for sustainable products and services through stimulating demand, fiscal incentives,

environmental regulation and by reducing market uncertainties.

Concerning the future developments of resource efficiency and new materials, the study (IPTS, 2003) states that improvements in industrial resource efficiency would be likely even if energy and resource prices would remain on low levels over the next fifteen to twenty years. In contrast, raising the use of renewables would likely depend on high energy prices. The transition towards renewables would also require strong public commitment, especially to finance infrastructure, and is likely to continue far beyond the 2020 time horizon. In the medium term, bio-resources would more likely substitute non-renewables in existing production chains rather than building the starting point for radically new manufacturing processes.

### **3 Summary of expert contributions**

The following summaries of the presentations illustrate the main topics and arguments brought forward by the different experts. Content from the presentations that focussed on scenario development and policy recommendations is not included in these summaries, but presented in the following chapters of this report.

#### **Rui Frazão, INETI/CENDES. Resource efficient technologies and eco-design.**

Rui Frazão presented several projects dealing with cleaner production, eco-design and the development of product service systems (PSS). He regards sustainability as a process of change for everyone and everywhere, today and tomorrow. According to his definitions, (eco) efficiency means to “do more with less” and (eco)innovation regards to “do it in a different way”. His presentation introduced two Portuguese cleaner production programs. Furthermore he presented projects on eco-design of pressure cookers, cleaner design in the concrete production, PSS solutions in the housing industry and the SusProNet project. The latter examined result-oriented PSS, which need to be designed as sustainable as possible and have to be stimulated by well-designed framework conditions.

#### **Sebastian Gallehr, e5. Energy efficiency and leap-frogging.**

In his presentation, Sebastian Gallehr focused on recent developments in the European energy sector. He emphasized that the challenge of the last century was to provide reliable energy sources to everyone. He pointed out that at least since the beginning of the 1980s, building-up of the energy infrastructure has been finished in the EU and that with the end of 1980s the liberalisation of the electricity sector stopped every investment in the infrastructure. Today, the energy market sees a hand full of well financed European players in the market who are making high profits through business as usual. These companies are highly influential in policy making, by economic independence and in an oligopolistic market. Furthermore, these European energy technology and infrastructure companies are market leaders in the global economy.

**Stefan Giljum, SERI. MOSUS - Modelling scenarios towards a sustainable use of natural resources in Europe.**

Stefan Giljum presented the results from the EU project MOSUS - Modelling scenarios towards a sustainable use of natural resources in Europe. The project developed policy scenarios for energy and resource use of the EU until 2020, which were modelled with the multi-country, multi-sectoral input-output model „GINFORS“ (Global Interindustry Forecasting System). The project results demonstrated that with six packages of policy measures, European CO2 emissions could be brought below the Kyoto targets by reducing them by about 13% compared to a baseline scenario. Also domestic material extraction could be reduced by more than 7% compared to baseline. The project also showed varying scales in the degree of reducing CO2 emissions and material extraction depending on the policy measures chosen and that resource intensive imports from other countries are expected to increase.

**René Kemp, ICIS, MERIT, DRIFT. From visions to action. The model of Transition Management.**

René Kemp presented a Dutch model of Transition Management which “is a deliberate effort to work towards a transition in a stepwise, adaptive manner, utilising dynamics and visions and in which different visions and routes are explored: system innovation and optimisation”. Key elements of the model are: the directed evolution with top-down and bottom-up elements; simultaneous exploration of its visions of sustainability through adaptive policies; bifocal instead of myopic, as it is oriented towards long-term sustainability goals and visions and is iterative and reflexive. In the model, different visions and routes are investigated, decisions are made in an interactive and iterative way, support is temporary and adaptive, each option has to prove its worth and policy change is seen just as important as technical change.

**Angela Köppl, WIFO. Dynamics in the Environmental Industry: The Case of Austria.**

In her presentation, Angela Köppl gave a description of the dynamics of the Austrian environmental industry between 1993 and 2003. During this period the number of companies in the environmental industry increased. Also grew their turnover, exports and employment as well as the share of the environmental industry in total GDP and in turnover and employment of the manufacturing industry. Between 1997 and 2003, one could observe a shift within this industry from end of pipe technologies to clean technologies. The biggest sector within the environmental industry is the energy sector showing a strong increase in its share between 1997 and 2003. The presentation concludes that integrated technologies – especially clean energy technologies – are gaining in importance and that Austria’s early specialisation in environmental technologies translates into a good competitive position.

**Michael Lettenmeier, The Finnish Association for Nature Conservation. Resource efficient transport.**

The presentation of Michael Lettenmeier focussed on the Material Inputs per Service Unit (MIPS)

of the transport sector. Transport is responsible for around 25% of our total material requirement and for around 30% of emitted CO<sub>2</sub>. These numbers along with the fact that transport is linked with practically all other economic activities, leads to the conclusion that there is no sustainability without sustainable transport. If industrialized countries want to reach a Factor 10 dematerialisation by 2050, this requires an increase in eco-efficiency of 4.5% per year. Michael Lettenmeier presented MIPS values for goods and passenger transport. The numbers illustrated that the share of infrastructure is very high especially for abiotic materials and water use. A comparison of different modes of transport also reveals that “speed consumes resources”, which means that modes of transport that allow us to travel faster show a higher material intensity than slower alternatives.

**John Manoochehri, University of Surrey, UK (Royal Institute of Technology, Stockholm). Sustainable Production and Consumption Systems: Key Elements.**

John Manoocheri presented a model for sustainable production and consumption systems. A main challenge with regard to sustainable consumption from current research is that there is no agreement on what sustainable consumption and production systems are and how these systems are defined. Current research focuses mainly on material flows, actors or institutions. Manoocheri presented elements how to formalise systemic consumption and highlighted research needs and confusions arising around some concepts and notions in current research.

**Oksana Mont, IIIIEE, Lund University. Sustainable consumption perspectives: progress or digress?**

In her presentation, Oksana Mont focused on challenges and needs for sustainable consumption and sustainable consumption policies. Environmental improvements in pollution prevention, waste minimization and eco-efficiency are largely offset by changes in consumption patterns and levels leading to rise of aggregate environmental impacts and resource consumption. Mont presented endeavours for sustainable consumption of the public sector, businesses and consumers. She also presented various impediments to further progress in sustainable consumption, such as consumption complexity, limitations of information tools, consumption levels and rebound effects, and deliberate support of unsustainable consumption.

**Thomas Ruddy, EMPA. International Trade, Investment and Sustainable Production.**

Thomas Ruddy focused on the Sustainable Development Strategy (SDS), the network for the development of Sustainable Development Indicators (SDI) and the relation of EU SDS to Impact Assessment (IA) in the European Commission. Concerning the sustainability impacts of trade, one could see that overall economic and social impacts are positive, but environmental impacts negative. Trade’s direct environmental impacts (goods transport) are associated with energy resources and trade magnifies unsustainable consumption and production patterns, thus producing indirect environmental impacts. Ruddy talked about product-related WTO court rulings and stated that the next major test case may be, whether countries are allowed to prefer sustainably produced biofuels. He concluded with the question how research could “foresee beyond” or catch up with

political decisions made in Brussels.

**Craig Simmons, Best Foot Forward. Creating LOW footprint enterprises – a consulting perspective.**

The presentation started with global environmental trends, such as increasing material and energy consumption, increase in climate change related natural disasters, decreasing biodiversity and developments of the global Ecological Footprint. The second part of the presentation focused on communicating these targets and limits, and applying them to business by linking these data to sectors, consumption categories, and per capita targets. An open question remained how to integrate measures for quality of life into these analyses. In the third part of his presentation, Craig Simmons introduced case studies on Ecological Footprints of nourishment, travel and housing. One thread is e.g. that the Footprint for biofuel needed for the UK by shifting completely to biofuel would exceed the land area of the UK. However, the case studies illustrated that CO<sub>2</sub> emissions in all three areas could be reduced significantly (by 80-90%).

**Karin Tschiggerl, STENUM. ECOPROFIT® by preventive environmental management - The ECOPROFIT® project.**

Karin Tschiggerl presented the Cleaner production / Ecoprofit project which is a preventive strategy to minimise the impact of production and products on the environment and is conducted with companies in the city of Graz/Austria since 1991 as well as in a large number of countries in Europe and worldwide. The programme consists of three elements: Common workshops on environmental issues for companies' representatives (cross-sectoral learning), individual consulting with special technical and administrative support in companies and an Ecoprofit Award. The programme includes consulting on environmental policy, a legal compliance check, documentation of the environmental performance of the company, the development of an environmental program for the next year and the elaboration of an environmental report. This allows companies to reduce the use of materials within the production process by up to 95% for single substances. A so-called „Ecoprofit Club“ built an organisational platform of cooperation and exchange for companies. The program helps companies, suppliers, cities, regions, and communities to reduce costs and environmental burdens.

**Arnold Tukker, TNO. Sustainability Scenario's: Priority Areas and Strategies for Decoupling. Lessons from SCORE, EIPRO and SusProNet.**

The presentation of Arnold Tukker was based on the three EU projects SCORE, EIPRO and SusProNet, all dealing with sustainable production and consumption. After giving a definition of sustainability based on the SCORE project he presented results from EIPRO. The project analysed environmental impacts for different consumption categories. A main finding was that food (meat and dairy), mobility (car and air transport), and housing/energy are responsible for 70% of the life cycle impact at 50% of expenditure (see also chapters below). Food products show the biggest impacts. As the impacts between different product categories vary strongly, sustainable consumption policy should focus on those 20-30 categories with the highest impacts. A Factor X

potential in addressing sustainable consumption exists, if the issue is addressed in the right way. This could mean avoiding 'limits to growth' or 'restricting consumption' notions, but finding organising patterns of consumption so that maximum quality of life is realised while using the same or less resources. Governance for sustainable consumption is confronted with three tasks: Optimising systems, redesigning systems and inventing new systems.

**Paul M. Weaver, Wolfson Research Institute. Role of Sustainability Assessment.**

In his presentation, Paul Weaver sets out that first of all we have to define relevant questions for sustainability and have to overcome unsustainable elements of the current economic system. We need to imply a new development paradigm and a new policy regime and need to explore alternatives together with stakeholders and policymakers. This also requires methods and tools for participatory exploration, social learning, capacity building, transformation, and transition management. Paul Weaver states the necessity to imply an integrated sustainability assessment which should be implemented in a cyclical process. This process should involve science, policy and public and should consist of the following steps: 1) Problem definition and contextualisation, 2) Arriving at a shared understanding and at common goals, 3) The conduction of experiments and analyses of trade-offs, and 4) Policy evaluation and mutual learning. Integrated sustainability assessment is seen as a paradigm-exploring process, as an assessment process that seeks to address persistent problems that cannot be solved within the prevailing policy paradigm. It should simultaneously define acceptable solutions to problems and the policy paradigm with which these would be consistent and implemented feasibly.

**Jan Rosvall, Chalmers University of Technology, Göteborg. Towards 'sustainable conservation' and use of materials in built environments.**

In his presentation, Jan Rosvall emphasised the need to further develop and implement the concept of „sustainable conservation“ of the built environment. From the viewpoint of sustainable development, „conservation“ should be defined in a broad sense as the *dynamic management of change*, including both tangible and intangible aspects of cultural, historic and natural resources. Jan Rosvall illustrated that cultural heritage conservation and its processes are an integral part of the natural and built environment and can be seen as systems, which must be dynamically stable. Using a number of examples, he illustrated the multi-parameter effects of various types of material flows in built environments and of forces acting on and within materials. He concludes that only by bringing a totally different approach to the conservation of the natural and built environment, i.e. its processes and care, we can do more than pay lip service to the notion of sustainability in the broadest sense. Integration of those two cultures is required as well as education of policy and decision makers at various levels and the general public.

## **4 Goals and targets**

### **Emphasising the need for targets**

Some experts emphasised that the first step is not to already define quantitative targets, but to get recognition that these are needed *at all*, which is still a challenge. Whether there is a need for

disaggregated targets in addition to aggregate targets would depend on whether the targets are put into effect through regulatory instruments or through market mechanisms. The latter would offer greater scope for flexibility in responding to aggregate targets.

It was mentioned that a positive („sexy“) formulation or even visualisation may help to achieve progress in the direction of the targets (examples: „a journey to the South“ or „man on the moon“) - and that they should be ambitious („overcoming business as usual“).

### **Happiness/well-being as overarching goal**

Besides environmental, economic and social targets of sustainable development as well as targets of institutional and cultural sustainability, experts stressed the importance of an overarching goal from which more concrete targets can be derived. Maximising individuals' happiness/well-being was seen as such an overarching goal.

### **Priority areas for production and consumption policies**

Tukker et al. (2005) investigated a large number of studies, which assessed the environmental impacts of different products and product groups. The authors concluded that the studies deliver in most cases similar results: the **three categories of transport, housing and food** contribute to around **70% of total environmental impacts**. Thus, the target areas for policies addressing unsustainable production and consumption patterns, are: car and air transport, heating and electrical energy using products in housing, and consumption of meat and dairy products with regard to food.

### **Develop action plans for sustainable consumption**

One recent suggestion for concrete action towards more sustainable consumption patterns is to develop **National Action Plans for Sustainable Consumption** (see UNEP, 2005). These plans should be coherent with regional-level developments in sustainable consumption and production, such as the EU Action Plan on SCP that is currently in preparation. The National Action Plans for Sustainable Consumption should comprise not only **strategic long-term goals**, but should contain **short-term tactical steps**. To ensure that goals and targets are being met **indicators** for measuring progress towards sustainable consumption and production should be developed and used. There should be minimum requirements for what National Action Plans should contain and what kind of goals they should strive for. Some governments may need help in developing the National Action Plans for Sustainable Consumption and assistance should be available from other governments with development and especially implementation of the Plans.

### **Energy and climate**

With regard to the energy sector, the main long-term target for 2050 is to secure access to power and heating for private and industrial use for a feasible price by **not overshooting global warming by more than 2°C** (mean annual temperature). This target has also been confirmed by

the EU Council. Given current paths of increases in CO<sub>2</sub> emissions, such a global increase in temperature could already be expected as early as in 2035, with a concentration of 550 ppm CO<sub>2</sub>. Many climate experts state that this would require a **reduction of greenhouse gas emissions by industrialised countries of up to 80%** up to the year 2050, or **less than 2 tonnes** per capita, in order to slow down climate change.

The EU goals of increasing energy efficiency by 20% up to 2020 and to produce 15% of energy consumption from renewable sources up to 2015 can serve as short-term guidance for businesses. However, more emphasis should be put on further increasing the share of renewable energies considering the whole product or service life-cycle (**at least to 50% renewables in 2050**).

### **Resource use and biodiversity**

A radical reduction of impact per consumption unit should be reached in the European Union. No incremental, but a radical change is required, i.e. a reduction by a '**Factor X**' (for instance, Factor 10), which has to be specified per sector and impact category.

One expert suggested that these **targets** should be defined **by need area and not by sector**, as it is traditionally done. These need areas would be, for example, mobility, housing/shelter, food, health, clothing, communication, education, safety, entertainment and leisure, for example, instead of transportation, construction, textiles, chemicals, agriculture or other sectors. This new approach has more potential to flood the market with new solutions oriented to fulfill the needs of consumers, thus leading to the uprising of new business models.

In addition, targets for a progressive **substitution of non renewable resources by renewable alternatives** should be defined, considering the availability and regeneration capacity of renewable resources. These goals could provide a useful guidance for companies' goals in the design of new products and services related to the avoiding of scarce materials, fossil fuels and material intensive solutions. Definition of these targets should involve organisations such as the UN, OECD and WTO.

This reduction can also be expressed in terms of the indicator **Ecological Footprint**. The average Footprint of one inhabitant on this planet should be equal to, or less than, **1.8 global hectares** (gha), or the **Earth Share**, which can be calculated by dividing the total global Footprint by the biological capacity available in the different ecosystems on the planet.

Furthermore, targets should be set for the proportion of European land set aside to **protect biodiversity**.

### **Creating a new transport culture**

Increasing speed is usually considered desirable and useful. However, numerous research studies indicate that speeding up traffic increases natural resource consumption in the form of energy consumption and/or infrastructure material inputs. Thus, decisions by consumers and planners to prefer **lower speed transport modes** would save resources. Goals and targets for a new transport culture, built on **proximity, slowness and sufficiency**, are therefore required.

## **Water consumption**

Absolute aggregate reductions targets are also required for Europe for **water use** or minimum flow and water quality standards for discharges from river estuaries. Considering that fresh water is a strategic resource, efforts should be put in the minimization of water consumption in manufacturing processes. By 2050, only **water losses of less than 0.5% per year** should be accepted, independently from the water source.

The lack of fresh water is also considered by many authors in the political field as a potential cause for wars in many regions of the world. Considering that **safety** is a necessary condition for sustainable development, a special effort must be put in a more effective sustainable management of water resources worldwide.

## **Toxic substances**

A clear goal of **zero emissions of toxic substances by 2050** will be a driving force for an effective circulation of information on non toxic alternative substances at reasonable prices (for instance, using EU's REACH scheme), as well as for the design of new products with no toxic substances incorporated (such as electronic devices).

Following the model of the setting of nuclear free regions, an effort could be put in the definition of a **model for free toxic regions**, to be applied in areas committed to consume only products and services which life-cycle is totally free of toxic substances and hazardous waste. In addition, WTO regulations should be modified accordingly to allow these initiatives to influence the global market.

## **European self-sufficiency and balanced physical trade**

One key target, covering several environmental dimensions, is to achieve a greater European self-sufficiency, including in primary materials and energy. This implies significant progress towards a **net trade balance** on visibles, including raw materials, mass commodities and final products (neither surplus nor deficit).

## **Targets for investment flows**

The target areas of investments are one key issue with regard to the transformation towards a more sustainable European economy. The following targets should be set:

- Targets for investment in **public infrastructures** that replace the need for private goods
- Targets for investment in **ecosystem restoration**
- Targets for investment in improving **resource efficiency** and developing alternative resources that are more abundant or renewable and/or whose use is less threatening to the environment and human health

## Corporate codes of ethics

Especially after the Enron case, efforts have been put on business management by ethical values, which imply the stakeholders' involvement in the elaboration and implementation of codes of ethics. Values such as trustworthiness, responsibility and citizenship are often listed on codes of ethics of companies worldwide. Examples of expected behaviors related to these values are the avoiding of misleading advertising, the taking of responsibility to ensure misconduct is not repeated, and effective measures to protect the environment. Thus, one possible goal could be that corporate codes of ethics include companies' commitments to contribute for targets defined at the macro-level, as well as a commitment to meet society's needs and expectations avoiding the creation of new needs through the use of marketing techniques as is often the case nowadays.

## Global (re)distribution of the gains from globalisation

Distribution of the gains from globalisation is far from equitable on the global level. The Millennium Development Goal No. 1, i.e. halving the proportion of people living on less than one dollar a day up to the year 2015, should be supported without restriction.

Given the physical limits of the earth-system, further growth in GDP might become a zero-sum game, which implies that the wealthier part of world population gives up some affluence to benefit poorer segments of world population. One possible way to implement minimum guaranteed standards of basic income could be to apply a system of **tradable resource or pollution permits**.

## 5 Scenario elements

There are several shifts that would be required to deliver progress towards a more sustainable economy. These transitions should be covered in sustainability scenarios for this thematic field:

- shifts in the structure of production and consumption away from resource-, waste- and risk-intensive activities in favour of less environmentally damaging activities;
- shifts to cleaner and more abundant resources (resource switching/substitution);
- shifts to leaner and cleaner production;
- shifts in the utilisation rates of products;
- shifts from selling products to selling services;
- shifts from individual to collective provision;
- shifts from economies of scale to economies of scope;
- shifts from paid employment as the means for allocating GDP to alternatives (citizens' income, individual tradable resource permits);
- shifts to more flexible working arrangements
- shifts in patterns of time and space use;
- shifts toward greater local and regional self-sufficiency;

- shifts in the use of capital (for example, to restore and augment ecological capital and resource stocks)

In the following we describe in more detail selected specific elements, which were emphasised by one or several experts:

### **Energy and climate**

In the current situation, the energy sector is mainly dominated by a centralised fossil fuel-based supply chain. The economic structure in the EU-25 is a oligopoly with a handful of well-financed and strongly influential private and public companies. At the same time, European sustainable energy technologies and solutions are well established on the global markets, with both small and medium-sized enterprises and big multinationals, such as Siemens, contributing to this market.

The constraints from the FORESCENE scenarios do not allow solutions, which shift problems regionally and in time, and thus exclude technologies such as nuclear power and clean coal technologies with carbon capturing and storage (CCS), which represent the main technological paths for business-as-usual actors. Therefore, sustainable energy scenarios have to focus on **renewable energies** and **energy efficiency options**.

The increasing use of renewable energies is still too much dependent on energy efficiency and demands-side measures at the customer end. Future **energy infrastructures** will need to be designed from the beginning to **accommodate renewable energy effectively at a high level**, in order to support business efforts to achieve these goals.

### **„Sustainable conservation“ of the built environment**

Current unsustainable patterns of natural resource use stress the **need for a systemic approach**, including national and international effort and transdisciplinary collaboration, including the development of new R&D projects, to **support regional development** and efforts to minimise energy-use and waste through unnecessary interventions – e.g. by fostering a “preventive attitude” and by promoting the use of low-energy compatible and environmentally friendly substances and processes – not only for conservation purposes, but **for new construction** and **sustainable development planning and processes** at large; including social and economic planning and production, such as e.g. sustainable industrial processing of materials, construction processes, education and workforce development, urban regeneration and development to the benefit of citizens and society at large.

One approach, far too little taken into account today in the context of urban and sustainability planning - is the **incorporation of preventive measures and long-term maintenance**, conservation, restoration, rehabilitation, creative and adaptive-reuse of existing structures, environments and related resources – especially with regard to “ordinary” buildings (i.e. not necessarily historic buildings) without destroying or manipulating their original fabric, various components, functions or inherent qualities – especially those structures that are well preserved or in a relatively good condition, of high quality construction and materials, that are easy to maintain,

and adaptable to modern standards and requirements. This alternative approach - earlier the predominant way of handling urban planning, construction and development (i.e. the production and utilisation of both existing and planned for resources), was historically much based on the **valorisation of costs of manpower, materials, traditional knowledge, techniques and low-energy modes of transportation**, compared to modern circumstances.

### **Resource consumption of transport and related infrastructure**

The amount of and the absolute and relative resource consumption by infrastructure is a central point in terms of resource efficient transport. With an **increasing total and specific resource consumption of transport infrastructure** so far, this aspect is also related to the other parts of this stage of the FORESCENE project (e.g. landscape or infrastructure).

In addition to the amount of infrastructure, also the amount of **traffic performance** is crucial in terms of sustainability. Reducing the total consumption of natural resources by transport is only possible if the growth in traffic performance ceases. Increases in the relevant eco-efficiency by a, for instance, lower energy consumption will not be sufficient in terms of overall sustainability. The modal split of transport is one interesting aspect, but from the viewpoint of total resource consumption there is no single transport mode above all the other modes in all categories of natural resources. Thus, for instance, a general shift from road and air transport to rail and water transport cannot ensure that problems are not just shifted from one aspect to another. Hence, there should be given **special attention to the overall amount and resource consumption of traffic performance**.

The air consumption of different transport modes is mostly related to the fuel or electricity use of the means of transport. E.g. the hybrid car (a combination of internal combustion engine and electric motor) saves fuel but requires fitting with an electric motor containing a lot of copper (which has a high abiotic material intensity). While it is fair to assume a decline in air consumption by this kind of engine, owing to the increased use of copper the overall abiotic natural resource consumption is unlikely to decrease.

### **Environmental technologies**

In long term scenarios for the environmental industry, those factors have to be addressed that shaped the development of this sector in the past. A key driver in this industry is environmental legislation. Environmental policies have been at the centre of attention in various facets for several decades. In the early phase of the environmental movement, the evolving of the environmental industry was closely related to domestic environmental legislation with an emphasis to end of pipe technologies whereas the changing focus in environmental policy in recent years pushed the development of integrated technologies.

In the medium to long term, legislation and policy goals on an international basis foster the development of integrated technologies. Furthermore an accelerated diffusion of environmental technologies to less developed countries takes place. Suppliers of environmental technologies thus can enter new markets and the sector increases its share in revenues and employment within the manufacturing sector. Users of integrated environmental technologies comply with legislation and

are in a good competitive position due to the use of resource efficient technology.

### **Efficiency and sufficiency**

It was also discussed that scenarios can be formulated in a structured way as in the **IPAT formula** by Ehrlich et al or by decomposing „productivities“/“intensities“ from scale figures. In general: The amount of resource consumption equals resource use intensity of average activity times no of activities. This identity can be disaggregated and broadened in a number of ways. **Sufficiency aspects** were mentioned as **equally important as (eco-)efficiency**.

### **Land ownership in developing countries**

Land ownership and **reconciliation of the informal with the formal economy** are major issues in world regions outside Europe, as emerging economies such as China and Brazil struggle with internal migration and new-found power in the global political arena. This measure comprises a key linkage between economic targets and other target areas of the FORESCENE project such as agriculture.

## **6 Measures and instruments**

### **Energy and climate**

The main barriers, which hinder a broad application of renewable energies and energy-efficiency solutions are: (1) the strong influence of the business-as-usual actors on the energy markets (political barriers); (2) the inertia to shift investment capital from centralised to decentralised/diversified solutions (economic barriers); and (3) the missing innovation environment for smart solutions.

A large number of policy processes and initiatives with regard to sustainable energy and energy efficiency exist on the EU level (see Rocholl et al., 2006). The most important policy measures are to **harmonise these existing policies** and to **set ambitious and mandatory targets** for the European energy sectors. Guiding paper, such as the '**Green Paper on Secure, Competitive and Sustainable Energy for Europe**' released in March 2006 by the Commission, must be substantially improved. In its current form the paper fails to make energy efficiency a core element. The paper **lacks visions, targets and concrete proposals** and misses the chance to propose an integrated strategy centrally focusing on energy and resource efficiency and savings.

An **ecological tax reform** (ETR) - shifting taxes from labor to energy and natural resources – is one of the most effective ways to boost eco-innovation and energy efficiency while creating jobs and economic benefits at the same time. The European Union must start an ecological tax reform and at the same time **reduce environmentally perverse subsidies**, specifically for **fossil fuels** (e.g. non-taxation of kerosene). Both an ETR and a restructuring of the subsidy system could be elements to **internalise external costs** more effectively.

To effectively reach this aim the unanimity requirement for environmental taxation must be abolished. The **open method of coordination** and a **border tax adjustment** are promising

approaches which should be tested and applied.

### **Influencing prices of transport**

Influencing prices e.g. by means of **taxation and subsidies** can influence the daily choice between different modes of transport. However, it can also have influence on the complete transport system. Aggregate taxes can lead to less material-intensive infrastructure construction. For a stop in infrastructure construction, incentives towards decreasing traffic amounts and more efficient capacity use should be created.

Pricing can also influence the quantity and quality of fuels or other energy sources in transport. However, changes in the quality of fuels have only a relatively small impact on the overall resource consumption.

The principle aim of pricing transport should be a **reduction of traffic volumes**. A reduced traffic volume would also reduce the need for additional infrastructure, which has turned out relevant in terms of resource consumption. Also a road pricing differentiated on the basis of infrastructure capacity (the higher the traffic performance the higher the price) could help to reduce pressure on infrastructure. Capacity use is a basic pricing element of airlines and some railway companies. Applied and functioning with vehicular traffic it might be a relevant incentive towards sustainability as vehicular traffic covers the greatest share of traffic performance.

### **Environmental technologies**

For further development and expansion of environmental industries, **all standard policy instruments** that increase demand for this sector are suitable. These include:

- Technological standards
- Emission standards
- Market incentives and economic instruments (taxes and emissions trading)
- Information
- International agreements

On the supply side policy measures could include mission-oriented technology programmes. Technology programmes could constitute an incentive for innovation and thus ensure ongoing improvement in the performance of environmental technologies. Export programmes subsidised by the government could foster the growth potential for the environmental industry but also would be beneficial for technology diffusion.

### **Sustainable public procurement**

As major consumers EU and Member-States governmental organizations must play an exemplar role, through the implementation of sustainable public procurement practices. These practices will constitute a strong signal to the market as a commitment to meet the goals and targets defined in

the EU Sustainable Development Strategy.

### **Standards in international supply chains**

On key field of action are international supply and trade chains. Setting minimum standards such as those of the EU IPPC Directive and best available technology (BAT), and minimum social standards should be allowed under WTO rules.

It should be ensured that compliance with basic environmental and labor/social standards in supply chains (e.g. in developing countries) is compensated.

For companies there are plenty of possibilities for improvement of the environmental and social performance, especially in their operations and markets that are situated in less-industrialised countries. One possibility is to ensure that similar environmental and social standards are being followed in all countries where companies operate. Such standards can include rules for extraction sites, responsibility in terms of reducing impacts on the environment and responsibility to conduct remediation activities after the extraction site is closed. Other possibilities is to develop alternative ways for collecting and recycling of products that are subject to European extended producer responsibility legislation in countries where there is no EPR legislation in place and where there is lack of infrastructure for taking care of end-of-life products.

### **Individual tradable permits**

The implementation of a system of individual tradable resource or pollution permits tied to consumption could be a key measure for a transformation towards sustainability. This measure has a high potential in addressing simultaneously many of the concerns expressed above. It may be some time before individual tradable permits are introduced and they may need to be accompanied by many flanking measures, but their potential makes them very suitable candidates for exploration through integrated sustainability scenarios.

### **Training and education**

Sustainable development themes seem to be part of post-graduation courses in universities all over Europe. However, they must become part of education *curricula* at all levels and in all courses. Otherwise they will continue to have an appearance of marginal themes and not of mainstream themes as they should be. This task is not easy as schools and universities seem to be still resistant to the adoption of multidisciplinary building of knowledge schemes like the ones that are needed to deal with sustainability challenges in an effective way.

Long-life training courses are one trend under the Bologna process. Existing training tools for sustainable development must be widely provided to schools and universities to be more and more used in this framework as well.

## 7 Outcomes of small group discussions

On the second day of this FORESCENE workshop, participants split into three sub-groups, elaborating on three specific issues of importance for scenario building:

1. Market and power structures
2. Creative approaches
3. Priority setting

Here we provide summaries of the discussions in the three sub-groups.

### 7.1 Market and power structures

The sub-group on „market/power structures“ started from the statement that both technologies and institutions (hierarchies, networks, etc) resulting from past development trends (such existing energy grids or the Bretton Woods system) result in power structures that do not justify to think in theoretical ideas such as „free actors“ unbiased in choosing from sets of alternatives. Power limits/narrows effective choices. The ways power is exerted can be very different in different systems/countries. A role of government is to counteract this system bias (countervailing power). On the other hand, also governments are biased by vested (and powerful) interest. The same holds for the media.

Civil society, including the labour movement, has an important role in countervailing power structures. The special role of prominent persons („pop stars“) was also discussed. Important concepts are accountability, transparency and responsibility as well as the representativeness of civil society organisations. Democratic control, e.g. of WTO negotiations, is needed

Another key issue here is the tension between democracy/freedom of choice on the one hand and increasing fear of terrorism, system break down etc, that seems to weaken the potential for change. Multilateral institutions should play an important role, but also local initiatives should be strengthened.

Future research calls/proposals/projects should deal with these issues.

### 7.2 Creative approaches

The following issues were discussed in the sub-group on “creative approaches”.

#### Challenging uncreativity

One main result of this discussion group was that uncreativity needs to be challenged and measures to promote creativity implemented. This means also to enable a diversity of views and ideas. A main topic was how creativity and innovation within the research community could be raised. Challenging uncreativity sometimes might involve “breaking the rules” and ignoring well known functions.

#### Frameworks and institutions

Creativity and the promotion of creative processes requires time and financial resources (funding). The group brought up the idea of “time flows instead of material flows”. Creativity needs community

engagement and interaction. Encouraging creativity has to be integrated into the education process (such as done e.g. in alternative teaching methods in Montessori schools). An interdisciplinary post-graduate school, learning centers or an institution such as the Gordon club (as an incubator for researchers) could provide the institutional framework for creative processes. People to be involved are those already playing with new ideas and concepts such as creative communities, eco-villages, car sharing, flexible work, or (self-)service economy. However, businesses, universities and governments also have to be addressed.

### Methods

Society (research, schools) have to think about “methods for creativity”, methods that help to promote creative approaches. We should develop a creativity package of such methods, a shopping list of creative approaches. In order to change society and behaviour we have to personalize our message according to single stakeholders. It is important to address individuals.

## **7.3 Priority setting**

The sub-group on priority setting elaborated a number of key points, which should receive priority attention in the development of sustainability scenarios and sustainability policies on the European level. In a second step, each participant was asked to vote for his or her personal priorities, in order to receive a ranking of issues and related policy measures.

The following aspects were presented by the sub-group:

### Target setting

There was agreement in the group that the setting of concrete long-term targets for reducing human resource consumption was one key issue, in order to provide long-term guidance for investment decisions in business and for consumption behaviour of individuals. These targets are largely missing on the EU level, for example, in the Thematic Strategy on the Sustainable Use of Natural Resources (European Commission, 2005). On the one hand, these targets should be specified at the EU, the national and the sectoral levels. On the other hand, they should be specified for the different categories of resource use.

### Coordination & streamlining policy processes

Another key requirement is the necessary streamlining, coordination and integration of the enormous number of policy processes and initiatives with relevance to sustainable development. As recent reviews (for example, Rocholl et al., 2006) illustrate, more than 30 policies and legislative initiatives can be identified, which have relevance for the issues of energy and material efficiency. The number of policy processes should be reduced, while the concreteness in terms of clear targets and policy instruments must be improved, in order to trigger necessary changes.

### Improvement of monitoring systems

Europe requires improved monitoring systems to evaluate, whether or not progress towards sustainable development can be observed. A particular focal point should be put on the issue how to measure quality of life (and “happiness”) of European citizens, as pointed out as the overarching goal in the revised EU Sustainable Development Strategy. Several experts involved in the FORESCENE project are part of an initiative aiming at setting up an EU Sustainable Development

Observatory, with initial funding from DG Research / 7<sup>th</sup> Framework Programme.

#### Shifting of costs from labour to natural resources

The implementation of an ecological tax reform, which shifts costs from labour to the use of natural resources (material, energy, land, emissions, etc.), has been identified as one key policy issue, which should receive priority attention in EU policy making (see also chapter 6 above).

#### Main policy instruments for the different categories of resource use

The preferable policy approaches to reduce resource consumption in the different categories were the following:

- **Biomass:** elaboration of a comprehensive Biomass-Strategy on the EU level, including the aspect of expected limits to the production of non-food biomass and expected consequences for changing land use patterns
- **Fossil fuels:** the sub-group agreed that an effective and restrictive carbon-trading system was the most promising policy instrument to reduce the use of fossil fuels
- **Minerals** (metals, industrial and construction minerals): the implementation of „Efficiency Agencies“, which support enterprises to identify and exploit existing potentials for increasing resource efficiency and thereby reduce costs, in all European countries was regarded as an important measure; with regard to construction minerals, the implementation of aggregate taxes or land-fill taxes, would be an important policy instrument.

#### Balanced resource trade

There was agreement in the group that EU external trade patterns and trade policy must be changed, in order to reduce the current imbalance between resource imports and exports. The import surplus of the EU with regard to natural resources should be reduced and higher autarky with regard to energy and resource supply should be achieved.

#### Resource security

The security of supply with natural resources (including water) for production and consumption activities should be increased. This links to the issue of balanced external trade in terms of resource flows (see above).

#### Deposit schemes

The introduction of deposit schemes, which foster closing of material cycles, was introduced as one key measure.

#### Quality vs. quantity

Other measures that were mentioned by the experts, which could increase the quality of resource use, while reducing its quantity, are increasing the durability and reparability of products.

#### Life-time responsibility

Several experts emphasised the need to implement policy measures, which force producers to take a life-time responsibility on their products, e.g. through the implementation of the „Extended Producer Responsibility (EPR)“.

Distributional impacts of policy instruments

Experts emphasised that more knowledge is required with regard to the analysis of the distributional consequences of the implementation of various policy instruments and their relation to income, capital and power structures.

Reducing the impacts of hazards

The impacts of hazards should be better monitored and reduced and safety for humans and materials should be increased.

Property rights / ownership

Lack of property rights (and thus ownership) of (global) environmental goods is one of the key causes for market failures and overexploitation of natural resources and ecosystem services.

These key points identified by the sub-group were then ranked by all participants of the workshop. The following table provides the top 10 measures and instruments.

Table 1: Measures and instruments with highest ranking by experts

<b>Measure</b>	<b>Points</b>
Targets for resource consumption	13
Labour/resource cost shift	13
Property rights / ownership	11
Life-time responsibility	7
Deposit schemes	7
Carbon trading system	7
Capacity building	6
Durability & repairability	6
Efficiency Agencies	5
Biomass Strategy	5

**8 Conclusions**

This FORESCENE workshop was part of work package 2 of the FORESCENE project. The scope of this workshop, covering the field of „Industry/Economy“, was very broadly defined. Several of the invited experts expressed the view that it proved very difficult to cover such a range of issues and sectoral developments (energy, transport, construction, environmental technologies, consumption, etc.) in a 2-day workshop. On the other hand, it was the explicit target of the workshop to identify possible solutions, which avoid shifting of environmental problems between different groups of actors in society (e.g. different sectors) or between countries. From this perspective, the comprehensive design of the workshop was justified.

Some experts criticised that it was impossible to provide a comprehensive assessment of goals and targets or policy instruments for the activity field „industry/economy“ through questioning 15 experts in a 2-day workshop. It was stated that e.g. the activity of defining targets would be a study in itself of the size of FORESCENE. It was also suggested that in future scenario exercises, targets and elements should be developed with a larger group of stakeholders from different parts of civil society.

The main outcome of the workshop was that experts and invited stakeholders reached full agreement on the necessity to set ambitious targets, to implement policy measures, which send clear long-term signals to actors in different industrial sectors (in particular, through a cost shift from labour to natural resources) and to develop new resource-extensive life-styles, as eco-efficiency improvements on the micro level alone will not be capable to reach ambitious reduction targets on the macro level.

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## **Annex 1: Workshop participants (experts and stakeholders)**

### **Participants from the project team**

Project coordinator: Wuppertal Institute for Climate, Energy, Environment:  
Stefan Bringezu and Christian Radtke

Project partner: Sustainable Europe Research Institute  
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### **Participating stakeholders**

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Szilvia Gärtner, Denso Manufacturing Hungary Ltd.

Christoph Haller, Austrian Federal Economic Chamber

Wolfgang Pekny, Greenpeace CEE

Ilse Schindler, Federal Environment Agency, Austria

## Annex 2: Workshop agenda

### 23<sup>th</sup> October, 2006

10.00 Registration

#### **Morning session: Chair: Stefan Giljum (SERI)**

10.30 Welcome (Friedrich Hinterberger, SERI) and introduction round

10.45 Presentation of the FORESCENE project and structure/objectives of the workshop (Stefan Bringezu, WI)

11.00 Presentation session I (6 focus presentations à 10 minutes)

*Rene Kemp*: the concept of transition management

*Paul Weaver*: sustainability impact assessment

*John Manoochehri*: sustainable production and consumption systems

*Oksana Mont*: sustainable consumption perspectives

*Thomas Ruddy*: international trade and sustainable production

*Angela Köppl*: environmental technology development and application

12.10 Discussion of presentations in session I

13.00 Lunch

#### **Afternoon session: Chair: Stefan Bringezu (WI)**

14.15 Presentation session II (4 focus presentations à 10 minutes)

*Jan Rosvall*: sustainable use of materials in built environments

*Michael Lettenmeier*: resource efficient transport

*Arnold Tukker*: environmental impacts of products (EIPRO)

*Rui Frazao*: resource efficient technologies and eco-design

- 15.00 Discussion of presentations in session II
- 15.30 Coffee Break
- 16.00 Elaboration of key long-term sustainability goals and main scenario elements in small groups (around 5 people each)
- 17.15 Presentation of small group results by rapporteurs (5 minutes each)
- 17.45 Wrap-up of results of day 1 (Friedrich Hinterberger, SERI)
- 18.00 End of day 1

**24<sup>th</sup> October, 2006**

***Morning session: Chair: Friedrich Hinterberger (SERI)***

- 9.00 Re-visiting goals of workshop and outline of day 2 (Friedrich Hinterberger)
- 9.15 Presentation session III (6 focus presentations à 10 minutes)  
*Stefan Giljum*: results from policy modelling project „MOSUS“  
*Craig Simmons*: low-footprint enterprises: a consulting perspective  
*Burcu Tuncer*: international supply chain management  
*Sebastian Gallehr*: energy efficiency and leap-frogging  
*Renate Tschiggerl*: Eco-profit projects
- 10.20 Discussion of presentations in session III
- 11.00 Coffee break

- 11.30      Elaboration of key instruments and policy measures in small groups (around 5 people each)
- 12.45      Presentation of small group results by rapporteurs (5 minutes each)
- 13.15      Lunch

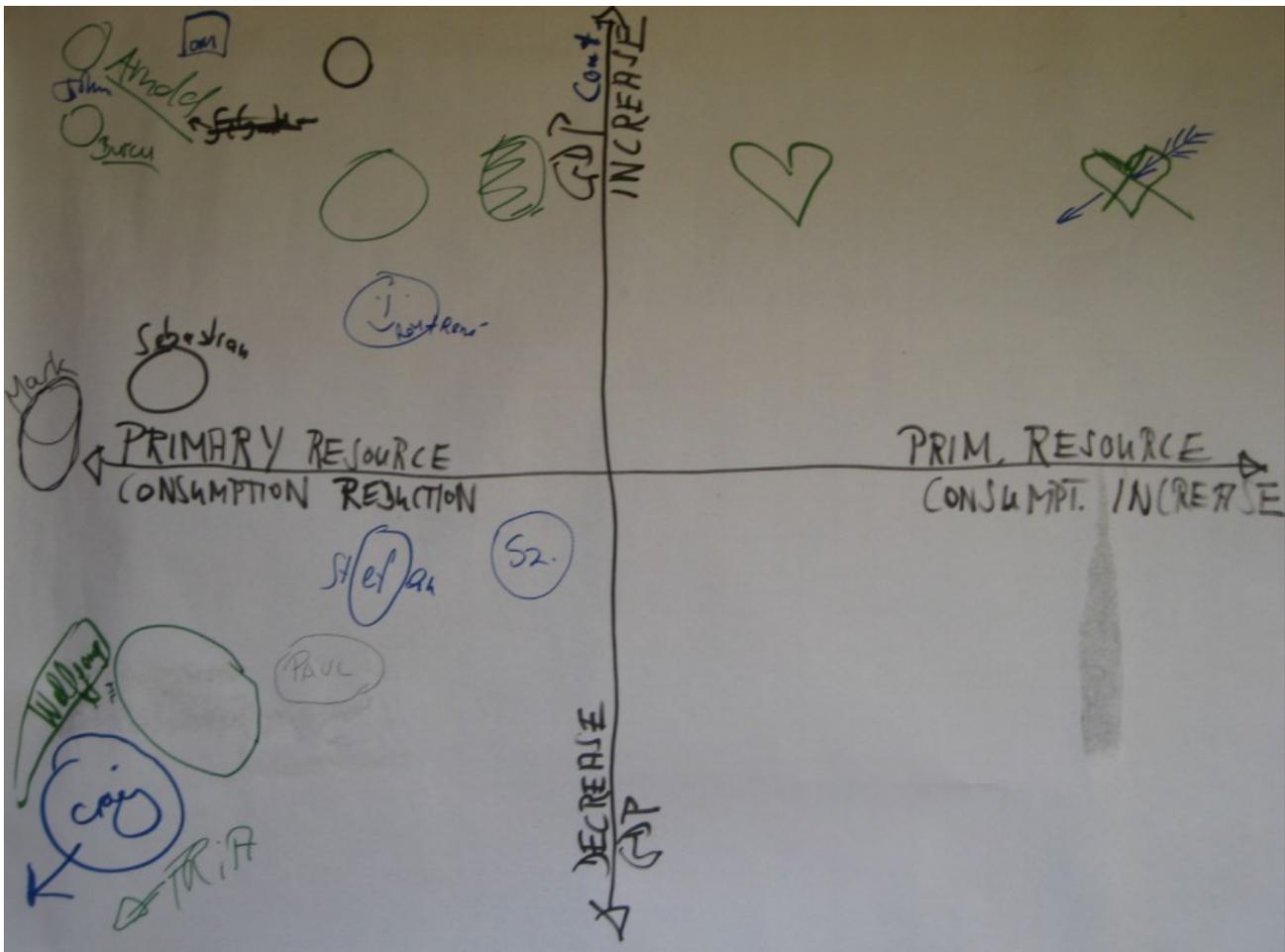
***Afternoon session: Chair: Friedrich Hinterberger (SERI)***

- 14.30      Integration of small group results and general discussion on key scenario elements and measures
- 16.00      Wrap-up of key results (Stefan Bringezu; WI)
- 16.30      End of day 2

### Annex 3: Documentation of discussion on „coordinate axes“

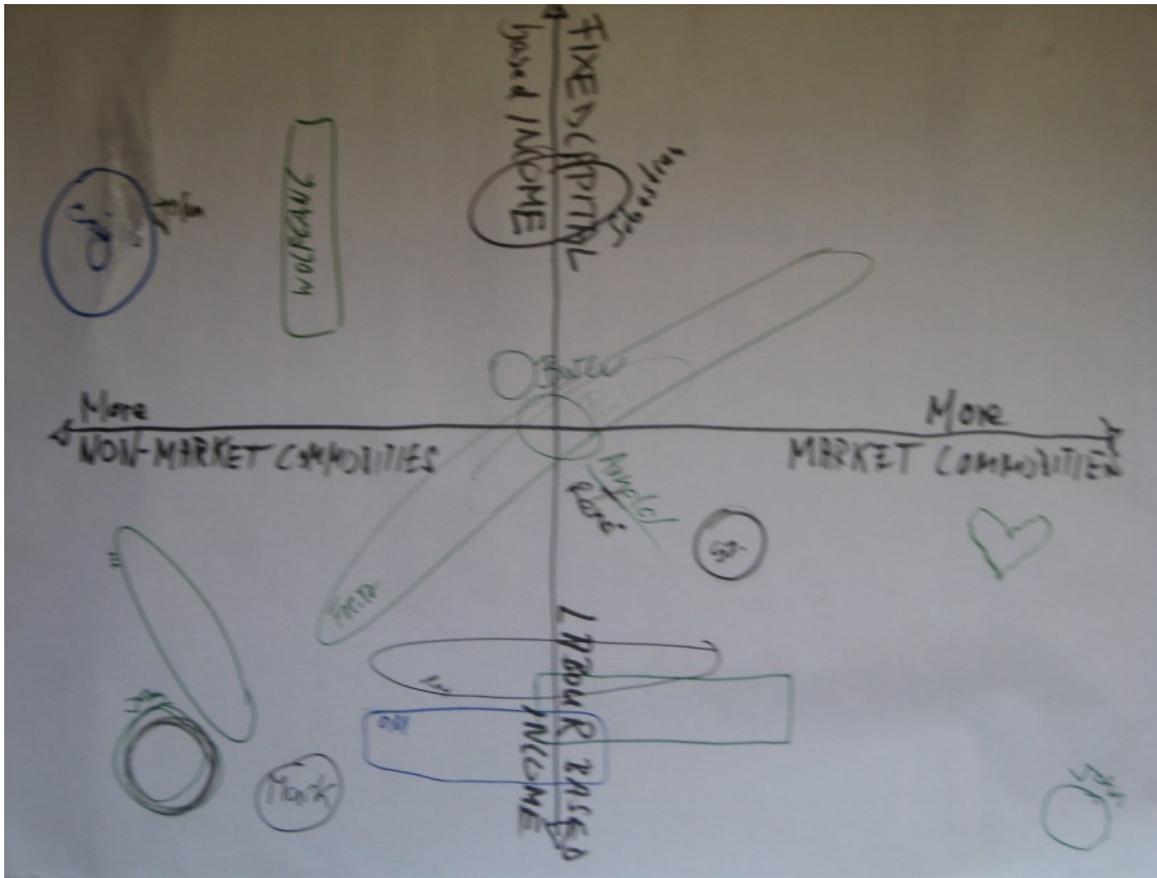
In this section, we document the outcomes of the group exercise on „coordinate axes“, which was introduced by the project coordinator, Stefan Bringezu, in order to illustrate graphically, how the workshop participants would judge different trade-offs, which have to be taken during scenario building.

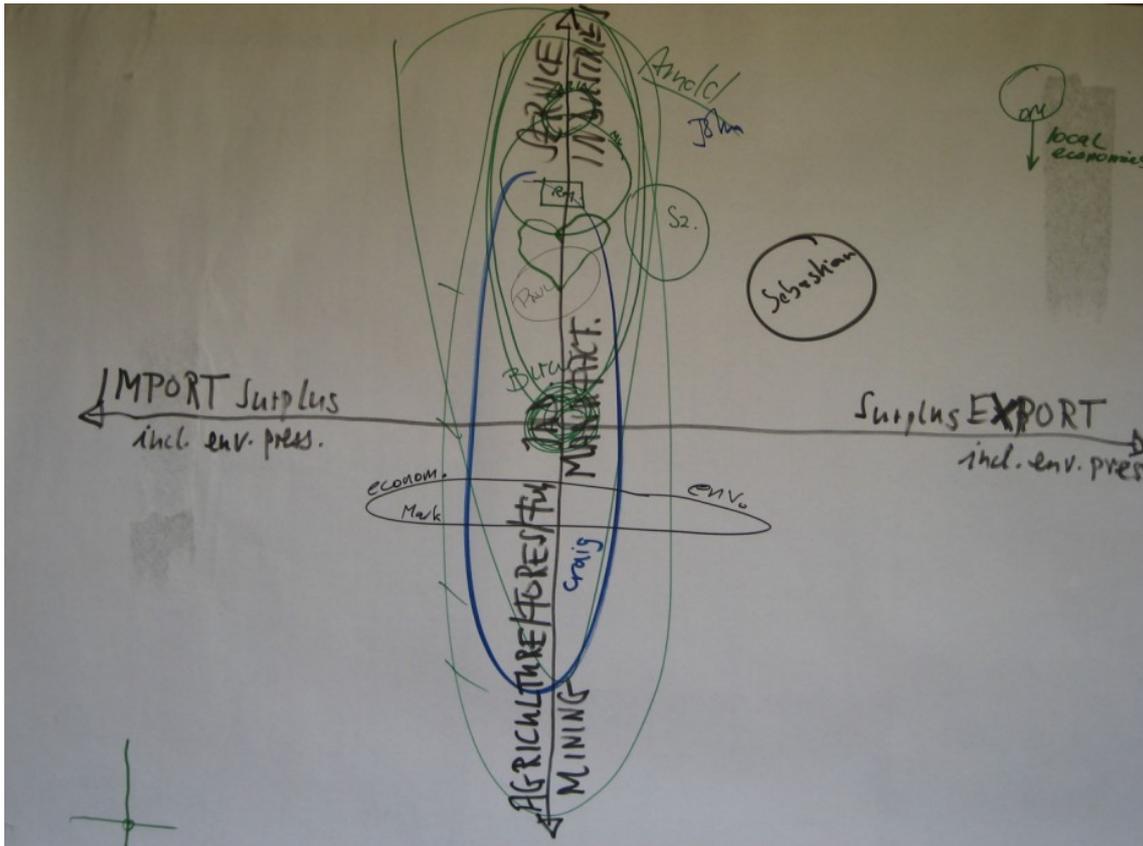
The first trade-off discussed was the one between GDP increase/decrease and primary resource consumption. While complete agreement was achieved that a reduction of primary resource use is needed, experts' views widely disagreed on whether this would go along with increasing or reduced GDP.



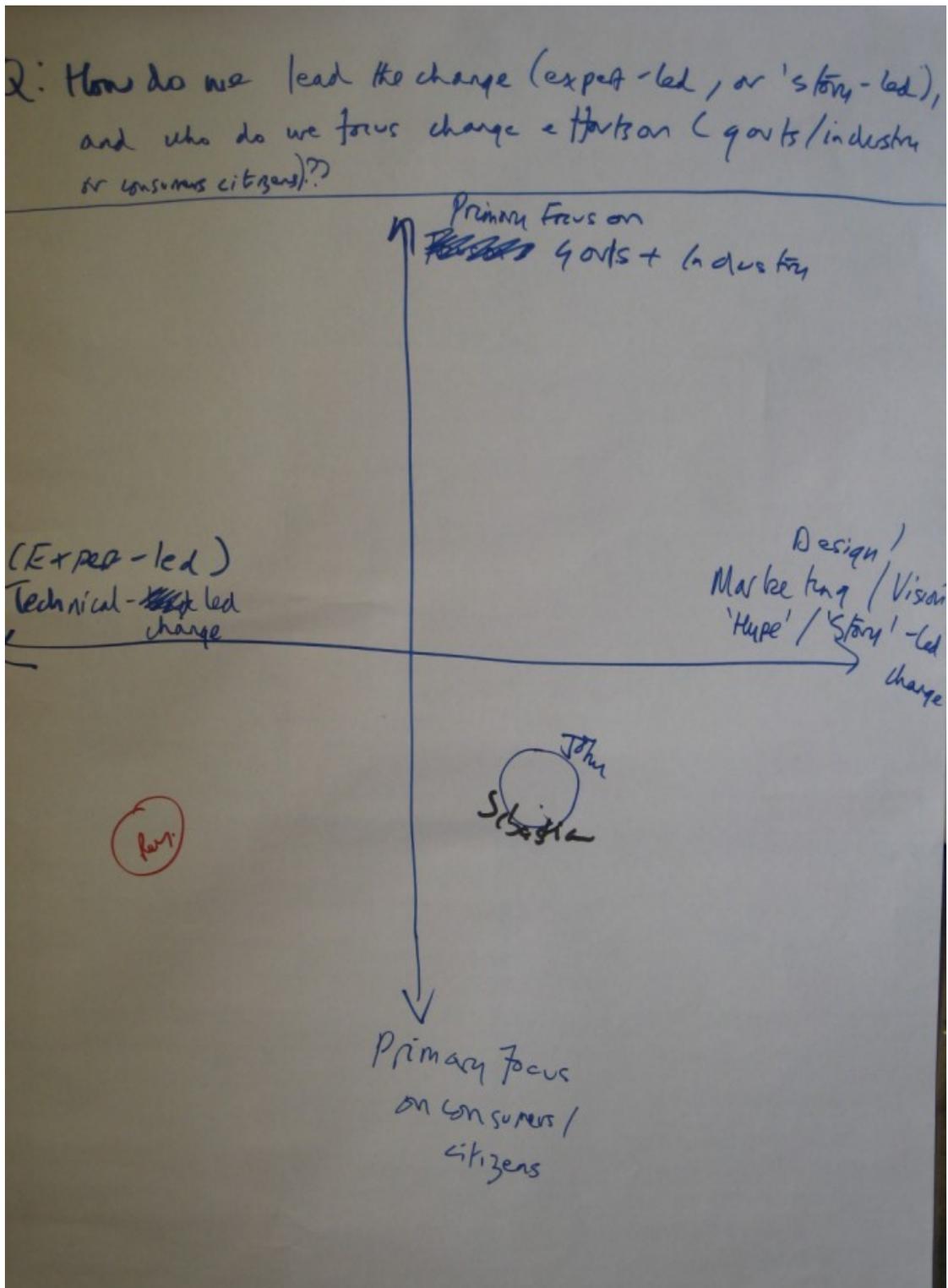
Another question was on whether the future would bring a shift towards non-market activities or further increase the role of market commodities on the one hand while on the other hand whether future income would be based more on fixed capital or labour. Here, no clear tendency can be derived from experts' evaluation except that the combination of fixed capital based income and

more market commodities was seen less likely by almost all experts.





A relatively clear answer was given to the question whether an import or export surplus (associated with environmental pressure) should be part of future scenarios: both of them were denied as valuable features of future scenarios (see above)



Finally, a number of additional trade-offs were explored with interesting questions with some clear-cut results in terms of agreement among experts on what elements future sustainability scenarios should include:

- quality of life/Happiness/wellbeing is an important issue to be looked at



## Annex 4: Copy of flip charts

In this section, we document the notes taken by the organisers of the workshop on the flip charts, in order to collect presented and discussed issues with regard to the three priority fields of goals/targets, scenario elements and measures/instruments.

### Goals / targets / visions

Journey to the “south”

Investigate different visions

Well-being

“biophysical degradation”

gap between rich and poor

welfare / jobs / competitiveness

systems integrity

social learning / capacity building

environmental impacts (direct and indirect)

consumption levels are still a taboo

dematerialization & eco-efficiency

rebound effects

impact / vs. intensity

Targets vs. day to day problems

Social equity

Long-term should be “long” !

Good governance

Holistic world view is needed

Should be “sexy” for everyone (like ‘man in the moon’)

Individual desires

Constraints

Jobs people like

Jobs that “make sense”

Work less than 40h / 45 weeks / 40 years

Reform economic system

Long term view

Respect for the original / long period of service life

Reduce negative factors (environmental pressures; use of building materials)

Jobs

Factor 10

Demand orientation (e.g. mobility, « no need to travel »)

“low” infrastructure

decoupling

“solution of everything”?

small is beautiful

democratisation of technologies

ending poverty

X %, factory, z Euro....

Targets for regions, individuals, companies...

Holistic-systemic

Multiple visions

eco-efficiency

alternative lifestyles

better services

meaningful jobs

affecting value / happiness

affecting the environment

how well are these visions being captured?

not a vision for everything; evaluate them

Health environment

Being happy as goals / ends

economy as means

happiness per unit of resource use

Recovering of resources

Pictures / images

450 ppm CO2 max.

zero emission in the electricity sector

leap-frogging

“using clever”, “using less”

overcoming business as usual

who should take action?

## **Scenario Elements**

Top down as well as Bottom up (business alliances, experiments)

Interactive development of scenarios

Normative - prescriptive

Codes of ethics

Policy / Technical / (Systems) Innovations / learning / culture

Development policies

International trade / investment

Governance / institutions

How to overcome inertia

Type of technology (integrated(chemical, physical), end of pipe)

Production factors: nature, capital, labour, ideas

R&D, environmental technologies

Market potentials

Policy elements

Demand / supply

Political / public will

Education

Economy/economics as drivers

Mystery of efficiency

Sub-optimizing processes

Institutions & inertia, cultural aspects

Constraints – environmental, social, economic (especially supply side)

Stocks and flows

Deterioration factors

Translate: what does it mean for actors

Risks

Metamodelling / modelling

Intervention, Leadership

Life-cycle-thinking

(Global) carrying capacity

Problem shifting

Infrastructure

Efficiency versus consumption level

Speed / slowness

Locality / decentralisation

Pricing / planning

Traffic volumes (persons / freight)

Convenience (e.g. of transport systems)

Leapfrogging?

I, P, A, T

Use intensity of products

Redistribution

happiness -> income -> footprint – relation

Footprint / \$ intensities of sectors, consumption, ...

I / R , R / P , P / FS , FS / UC , UC / U

sufficiency / life styles

environmental impact / Euro spent (-> highest for food stuff)

meat consumption

definition of limits

process / change

water / waste / energy

health

economic savings

framework conditions

micro-macro levels

flows & stocks / actors / institutions

Sectors / Countries

Consumption behaviour

Technical change / transport costs

Recycling / emission trading

Growth & rebound effect

Resource prices

Ecosystems / biodiversity

Renewable energy capacity (e.g. Biodiesel)

Land allocation

Liberalization (of sectors)

Market structure

Money investments

Transition paths

Mandatory targets -> could trigger innovation

Business accelerator approaches

Funding of innovative SMEs

IPCC as role model for scientists

Advising politicians (based on values of broader civil society)

### **Instruments / Measures**

Transition management

Experiments / learning / reflexivity / cyclical

Integrated sustainability assessment

Tradable permits

Stakeholder participation

Green procurement

Sustainable consumption policies

Organic / eco-label / fairtrade

Life-cycle costing

Creating markets

Individual / collective actor by consumers

Information tools

Marrakesh

National action plans

Indicators

Sustainability impact assessment

Cooperative systems

Awareness -> voluntary initiatives

Pricing

Training / Education / skills

“low” infrastructure

social / environmental standards

set priorities (food, mobility, energy, housing)

money for advertising

PSS

Stimulation of sustainable product design (framework conditions)

Zero emission

Merge EU SDS with Lisbon

Impact management / demand (intensity) management

Ecological tax reform

Reduction of harmful subsidies

Support to public transport

Carbon trading (proper!)

Improvement of houses

Supply chain management

large number of contracts! – 400-2000)

product chain management

finding priority areas for action

labelling / codes of conduct / resource efficiency

Trading / procurement / internationalisation

Initiatives (Marrakesh)

Mix of instruments

“don’ts” (e.g. nuclear energy)

CCS carbon capture sequence

Diversified / decentralized investments

Training / trading / awards

(company) networks

Technology transfer

Environmental / sustainability reports

Certification of green power

Pick & influence individuals (business leaders)

Supporting creative communities / design

Help creating stories and messages

Help companies to identify new profit centers (from products to services) not linked to material / energy consumption