# 4th European Resources Forum, Berlin, 27/28 November 2018

**Minutes**

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**Minutes by:**

**Dr. Henning Friege, Peter Wolfmeyer**

N3 Nachhaltigkeitsberatung Dr. Friege & Partner

Scholtenbusch 11 D-46562 Voerde

Tel.: +49 2855 3037311

Email: Friege@N-hoch-drei.de

## Day I, 27.11.2018

Conny Czymoch introduced herself as moderator of the 4th European Resources Forum. The forum has meanwhile established itself as an internationally renowned event that brings together experts not only from Europe but also from other continents with the aim of seeking sustainable solutions for the future consumption of resources. She expressed her appreciation of the high number of participants and especially welcomed Maria Krautzberger, President of the German Environment Agency and the forum's host.

## Opening Session: Sustainable Resource Use – Driving the Transition

The opening speeches of Maria Krautzberger (President, German Environment Agency), Svenja Schulze (Federal Minister for the Environment, Nature Conservation and Nuclear Safety, Germany) and Karmenu Vella (European Commissioner for Environment, Maritime Affairs and Fisheries) via video message were followed by a panel discussion.

Conny Czymoch introduced the panellists: **Brendan Edgerton** (Director Circular Economy, World Business Council for Sustainable Development – WBCD), **Astrid Schomaker** (Director, Directorate Global Sustainable Development, DG Environment, European Commission) and **Jeremy Wates** (Secretary General, European Environmental Bureau - EEB).

In his statement, Brendan Edgerton referred to the "Factor 10" programme, which was developed by the Business Council together with 35 private companies with the objective of proving the economic benefits of the circular economy concept. The life

cycle analyses carried out show how beneficial a circular economy is for these companies' business operations. These analyses proved very promising. The questions for each company involved are: How to re-invent their business and how to integrate the circular economy concept into corporate strategy. Brendan Edgerton listed the eight largest resource streams and their flows into specific socioeconomic systems, building materials being the largest by far. He pointed out that convincing consumers of resource-efficient products is an enormous challenge: In short, consumers like green houses, but they do not buy them. He called for more transparency regarding products and processes and emphasized the importance of producer responsibility. He also called for greater consistency in legislation, e.g. in the definition of waste within the circular economy approach.

Astrid Schomaker said that the transition to a sustainable use of resources requires systemic thinking in policy-making, a conducive environment for innovative business models and sustainable finance as well as a profound shift in individuals' mindsets. A circular economy model is in a good position to implement these. The transition to a circular economy is indeed one of the current European Commission's priorities and an integral part of the EU's efforts to build a more resilient, sustainable and stronger European Union. Transition to a circular economy means the transformation of the economy as a whole and not the creation of yet another niche segment. Astrid Schomaker highlighted a few significant figures: According to the International Resource Panel, in a business-as-usual scenario the global use of materials will more than double by 2050 and annual resource use per capita will grow by 70 % by mid-century. By the same date, demand for food could increase by 60 %, for fibre by 80–95 % and for water by 55 %. These trends are clearly unsustainable. Astrid Schomaker said that if we want to be true to our commitments under the 2030 Agenda and the Paris Agreement, we urgently need to change the way we use our resources. More needs to be done. The circular economy of the future will need new concepts and actions tailored to the specific needs of countries and regions. She particularly mentioned a more strategic approach for product groups with policy instruments, such as the assessment of the environmental footprint of products, services and organizations, ecodesign, ecolabels or green public procurement. Furthermore, she stressed the need to move the debate from generic recycling targets to the quality of recycling, remanufacturing and retaining value in the economy. Additional action is necessary in specific resource-intensive sectors, such as construction, textiles, IT and automotive. In addition, it will be important to make full use of the potential of digital tools. Developments in big data, platforms, blockchain and mobile communications hold tremendous potential for transforming the way both producers and consumers operate and contribute to a circular economy.

In his initial statement, Jeremy Wates introduced the EEB. The organization has 140 members who represent 130 million people in Europe. For him, four points are crucial: 1. Ecodesign is the key for a resource-efficient future because most decisions for a product's lifetime are taken in the design phase. Good tools are already

available but not often used. 2. Role of consumers: There is a gap between consumers' willingness and their actual behaviour. According to Jeremy, this is partially due to lack of information. He referred to a study that indicates changing consumer behaviour towards "circular products". If information was provided about product circularity, e.g. the possibility to repair the product in question, consumers would prefer the "circular product". Other key drivers for consumer behaviour are a product passport, availability of repair option and fiscal measures: making it cheaper to do the right thing. 3. Jeremy Wates called for the advancement of a circular economy through more fiscal benefits and more binding legislation. 4. Toxic compounds should be completely eliminated. In this context, digitalization can be very useful for their identification in products.

After the introductory statements, the moderator opened the discussion to the audience. Questions were submitted via the conference app and displayed to all participants.

The first question referred to the WBCD's statement on the companies engaged in the circular economy analysis: What about the activities of the mining industry? Brendan Edgerton explained that no mining countries were in the group but instead primarily chemical firms.

The next participant asked whether jobs will be lost in the case that more durable products are manufactured. Brendan Edgerton gave the example of more durable cars, which according to a recent US study will lead to a 50 % decrease in jobs in production and repair. Jeremy Wates estimated, on the other hand, that more jobs will be created by a circular economy in comparison to jobs lost in other areas.

The discussion then turned to the framework necessary for sustainable development: Efficiency is not the only possible solution. What about sustainable lifestyles? This question led to a debate between Brendan Edgerton and Jeremy Wates with regard to consumer behaviour: While Brendan Edgerton referred to Apple's investment in the recycling of its own products (e.g. by robots) and lamented that products are not brought back for recycling because consumers keep their old mobile phones, Jeremy criticized Apple for its non-repairable devices. However, it was common understanding that the re-use of products only pays for companies that also sell other services to consumers.

The last question was concerned with the tools needed for the transition to a more sustainable economy: Nudging or convincing? Astrid Schomaker made clear that both strategies are necessary.

The session closed with a poll on European resource policy and the involvement or affiliation of the participants in European innovation or resource networks.

## Plenary Session "Transformation Pathways – the Nexus between Resource and Climate Protection"

The moderator introduced **Harry Lehmann** (General Director, Division Environmental Planning and Sustainability Strategies, German Environment Agency) as the "spiritual father" behind the European Resources Forum.

Harry Lehman presented first findings of a recent research project called "Greenhouse gas neutral and resource efficient Germany" conducted by the German Environment Agency and a number of other renowned research institutions. The purpose of the project is to define the interrelationships between raw material use and climate protection with a focus on the following questions:

- What possible interactions are there between climate protection and resource efficiency policies?
- How will the use of raw materials develop in a greenhouse gas neutral - Germany up until 2050?
- How can we design the pathway(s) resource efficiently?
- Are barriers already observable?
- Do we have resource-efficient approaches suitable for achieving a climate-neutral economy?

For this, five scenarios are developed in the project. They share the assumption that greenhouse gas emissions in Germany are reduced by 95 % in 2050 compared to 1990 emission levels. Raw materials demand and the GHG emission reductions up to 2050 vary between the scenarios. One of the scenarios (GreenEe) has already been completed. The GreenEe scenario describes a development path where energy is generated/used in the most efficient way possible. Harry Lehmann concluded that a 95 % reduction in greenhouse gases until 2050 is possible, accompanied by a decrease in material input of 60 %. One of the main problems connected to the realization of this scenario is the enormous demand for materials needed for the transformation of the energy system (e.g. copper for windmills).

Conny Czymoch then asked **Hans Bruyninckx** (Executive Director, European Environment Agency) for his statement. Hans Bruyninckx pointed out that "good life for all humans within the limits of our planet" requires a radical shift in resource consumption. Although policy has tried since 1992 to overcome many global problems, the figures for resource consumption, nitrogen emissions, greenhouse gas emissions, biodiversity loss etc. prove that this has not been successful. The 7$^{th}$ European Environmental Action Plan (7$^{th}$ EAP) comprises some goals and strategies that complement each other:

- Circular economy
- Low-carbon economy
- Conservation of biodiversity

The "litmus test" for European policy will not be to pay out the same money to farmers everywhere as before, but instead for Europe to be successful in

transforming the economy and industry. Using some examples from European countries, Hans Bruyninckx argued that enormous progress with respect to climate and resource conservation can be achieved through circular economy strategies. More integrated and coherent policies are necessary if the 2030 targets are to be met.

Conny Czymoch introduced **Helga Weisz** (Professor of Industrial Ecology and Climate Change, Head of Research Domain Transdisciplinary Concepts & Methods, Faculty of Humanities and Social Sciences, Humboldt University, member of UNEP International Resource Panel). Helga Weisz explained that she could not present extensive figures because the final report by the International Resource Panel (IRP) on the interrelationships between resource and climate issues is still in progress. She outlined that greenhouse gas emissions are still rising by about 2 % per year, leading to over 400 ppm $CO_2$ in the atmosphere. This concentration has not been reached since about 4 million years, i.e. before the Holocene. It can be concluded from the current IRP study that resource efficiency is also a key for climate mitigation. The model used by the IRP also promises less poverty, i.e. a win-win-win situation. How can this result be achieved in reality? An ambitious set of measures is necessary, including taxes on carbon and other resources and changes in consumer habits (e.g. less meat consumption in Europe). Helga Weisz lamented society's only slight readiness to accept drastic measures.

Helga Weisz was followed by **Sangwon Suh** (University of California, Corporate Environmental Management, Industrial Ecology, Life Cycle Assessment). He cited the recently issued U.S. 4$^{th}$ National Climate Assessment, saying that "evidence of human-caused climate change is overwhelming" and that "[…] annual losses in some economic sectors are projected to reach hundreds of billions of dollars by the end of the century." A number of reports indicate that high investments are needed for low-carbon infrastructure. It is therefore important to assess the life-cycle implications of a transformation to a low-carbon economy. About 60 reports and calculation models conclude that most indicators are shifting towards better environmental quality, less greenhouse gas emissions etc., but there is a considerable increase in the consumption of metals, e.g. for LEDs, batteries, electric vehicles, windmills etc. Sangwon Suh mentioned the vastly increasing demand for neodymium as an example. The demand for metals, including "basics" such as copper and steel, will lead to a number of problems in fields such as geo-strategy and human rights. Dependence on special metals, such as rare earths, platinum and lithium, will grow. Technological progress must therefore be accompanied by an intelligent pricing of resources, more innovation and regulatory measures. He cited Tesla as an example: The demand for cobalt has already decreased from 11 to 4.5 kg per car.

Conny Czymoch started the panel discussion with the question: "Why do we not get traction into action?" Hans Bruyninckx highlighted the overwhelming importance of financial questions and capital; political coherence is needed as well. Harry Lehmann lamented that externalities have not been included in the economy. Helga Weisz has

identified increasing inequality; in her view, elites are becoming smaller worldwide, but their dream of everlasting prosperity hampers transformation.

In the second panel round, the moderator asked if communicating the nexus between climate and resources would be helpful for the political discussion. Helga Weisz reminded the audience that the situation has changed for many people, who cannot rely on greater prosperity as they could do some decades before. The transformation needs a “redistribution” of resources. Is this a political impossibility? Sangwon Suh added that this transformation process affords a large empathy of people for the next generation. Harry Lehmann called for the immediate internalization of external costs by a group of national forerunners. Teaching people to change their lifestyles is also necessary. Disruptive changes cannot be avoided because there will be losers in this transformation. The cynical thinking of some very rich people (1 %), who are able to find an oasis of health and wealth for themselves, is deplorable. Hans Bruyninckx lamented that most people are only aware of climate change, while biodiversity and other problems might be even more important but attract little attention. The interconnections between environmental quality (soil, water, air), biodiversity, greenhouse gas emissions and resource conservation are manifold und must be addressed in the framework of coherent policy.

To conclude, Conny Czymoch asked about the “low-hanging fruits” of climate and resource conservation. Helga Weisz proposed less consumption of meat, cycling in inner cities and changing old habits. Sangwon Suh argued that there are no low-hanging fruits, only adequate pricing will help. This is, however, an ambitious policy decision. Hans Bruyninckx recommended concentrating on what locks in and locks out sustainability. Harry Lehmann identified regenerative energies as low-hanging fruits because of their low price.

## Plenary Session “Getting the Price Right - Strengthening Fiscal and Financial Instruments”

The session opened with a presentation by **Paul Ekins** (Director, Professor of Resources and Environmental Policy, UCL Institute for Sustainable Resources, member of UNEP International Resource Panel, United Kingdom). Paul Ekins focussed on the internalization of external costs as a serious issue. He called for an Environmental Tax Reform (ETR). Considerable valuable experience from national tax systems (e. g. UK, Germany, Denmark) is available that can be used to draw up an ETR. How petrol and electricity consumption have developed following the introduction of carbon tax on electricity in Australia demonstrates the effectiveness of an ETR. Interestingly, increasing energy prices through an ETR has no critical impact on GDP in contrast to high energy prices worldwide. He pointed out that low-income households need special compensation when an ETR is introduced. Furthermore and up to now, many governments subsidize carbon consumption and by that climate change.

Conny Czymoch introduced **Shardul Agrawala** (Head of the Environment and Economy Integration Division, OECD Environment). Shardul Agrawala stated that we still lack sufficient insight into the economic drivers of ecological issues and their specific effects on national and international economy. One important question focuses on the type of resources consumed: Statistics prove that consumption (OECD countries) of minerals (sand, gravel) is increasing (by a factor of 2.5) and of metals (by a factor of 1.5) but not of fossil fuels. Instruments should focus on the most important materials. Although positive experience with environmental taxes (e.g. landfill taxes) has been gathered, it is difficult to introduce such taxes. The current French example of higher taxes on electricity and diesel fuel demonstrates the social and political problems that can accompany such reforms. France followed the system proposed by the OECD. Shardul Agrawala concluded that there is a large gap between theory and politics.

The next speaker, **Dominic Hogg** (Founder and Chairman of Eunomia Research & Consulting), presented the results of a study on taxes (only Member States) connected to resources (aggregates, peatland, plastic bags, port reception, landfills…). He proposed a mechanism to subsidize secondary raw material (rebates for users of secondary materials) which is financed from charges for the consumption of primary materials.

**Klaus Jacob** (Research Director, Environmental Policy Research Centre, Freie Universität Berlin) pointed out that there is time to change tax policy on resources. This is underpinned by existing experience with taxes on construction material in over half the EU Member States. The positive effects of environmental taxes for fiscal policy are manifold:

- Securing income for the state (critical because of unknown consequences for other environmental issues)
- Economic stability
- Distributive justice (tax should not produce more inequality)
- Steering by taxation (political decision – is not really preferred by fiscal policy)

Momentum is gained either through demographic challenges or from climate change.

As the last speaker in this session, **Carola Maggiulli** (Head of Sector, Directorate-General for Taxation and Customs Union, European Commission), pointed out that Member States have sovereign rights when introducing and raising internal taxes, provided that they comply with EU rules. With regard to energy taxation, a harmonized framework is in place, but this is not the case for resources. However, harmonization is necessary for internal market purposes if taxes are to influence consumption of resources at European level and not only at local level. To date, environmental taxes (with the exception of energy taxes) represent < 0.1% of GDP. How environmental taxes are structured in the Member States varies greatly. Concerning the Energy Taxation Directive, it should be stated that this tax does not meet current requirements regarding the internalization of external costs. Carola Maggiulli appreciated the important role of taxation for internalizing environmental

costs. Contribution to more growth oriented tax systems would be another advantage of expanding environmental taxation. She also mentioned taxation as a necessary complement to the measures already adopted in the circular economy strategy.

The first discussion round focussed on the increase in fuel taxes in France. How could the French administration have handled it better in order to avoid the backlash? The panel had no clear answers…

The moderator chose an interesting question from the audience: What about an ETR in developing countries? Paul Ekins argued that it is easier to tax goods rather than income and that environmental taxes are therefore of interest for emerging and developing countries, since they lead to calculable tax income for the state.

The first day of the conference closed with some **Comments from the Student Reporters**, presented by **Laila Darouich** and **Erik Daber**. "For many of us students, the ERF 2018 is the first conference we have attended and it is extremely interesting for us not only to listen and follow the discussion but also to contribute directly to the event. The atmosphere during the sessions was very productive, problems were highlighted and feasible solutions presented. Governmental regulations need to encourage a sustainable transition via environmental taxation, product passports and further CE supportive measures. As Astrid Schomaker highlighted, we need to make CE mainstream and not only a niche business line. However, one major issue we all face will be the practical implementation of our theoretical and framework-driven solutions. As part of the young generation, we would also have appreciated a more controversial discussion, including companies' points of view on these issues."

The first day ended with a "get together" featuring a vegetarian buffet.

**Day II, 28.11.2018**

**Key Note**

Conny Czymoch welcomed the participants of the 4th European Resources Forum and introduced **Ugo Bardi** (Professor in Physical Chemistry, University of Florence, Member of Club of Rome, Italy), who gave a keynote entitled "The Long Term Cycle of Mineral Resources - Is a Completely Circular Economy Possible?" Ugo Bardi reminded the audience that the discussion on resource depletion already began with the "Limits to Growth" in the 1970s. The models used at that time were too simple, but we should bear in mind that a slow but steady motion towards a catastrophic event results in a sudden fall: A phenomenon that he has named the "Seneca Effect". He pointed out that talking about circular economy means talking about resources. Traditional economists, such as Solow, defined production as a function of labour, capital and technology. They forgot natural resources as well as environmental pollution and waste. We know from statistical data that if GDP increases, resource consumption increases as well. Ugo Bardi argued that real decoupling did not

happen until the last years. His main message was: Transformation is feasible. And "energy is a key parameter in this game." To achieve transformation, the substitution of fossil fuels is urgently required. Metals and especially rare metals with a high carbon footprint from mining and production are however needed for a number of energy facilities based on renewables. Can these elements be substituted, e.g. by the "elements of hope" which are important parts of the Earth's crust, such as Na, K, Al? At first, therefore, transformation demands a lot of fossil energy. This also means that the transition is expensive: For investors, the energy return on investment (EROI) is high and consumers must be convinced of the future benefits of the transition. However, stopping the transition would lead to a collapse. Ugo Bardi cited some indications of a slower transition, namely the increase in renewable energy has been very low for some years compared to the development in the first decade. He is convinced that a circular economy is possible if abundant energy resources are used, resource consumption is minimized and recycling is substantially increased. He finalized his keynote with the remark that even if we cannot be sure of avoiding a collapse, we should at least work against it.

## Plenary Session "Resource Efficiency Worldwide – the International Dimension"

At the beginning of the session, each of the panellists provided some short input.

**Regina Maria Dube** (General Director, Department Water Management, Resource Conservation, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany) stated that 12 of the 17 SDGs are related to resource efficiency, showing that it is an important cross-cutting issue. She highlighted the importance of international co-operation for resource protection. Resource efficiency is now on the agendas of the G7 and G20 processes. This is a great step forward and very much welcomed by the German government. With respect to resources, Germany has to do its homework just as do other countries as well. This is not only a technical matter, but necessary in order to bring the problems from the minds to the hearts of the people, since otherwise we cannot bring transition forward.

**Janez Potočnik** (Co-chair of the UNEP International Resource Panel, former European Commissioner for R&D and Environment, Partner SYSTEMIQ) said: "We all want changes, but we don't want to change." The human economy is now using the full world for the first time in history. This situation needs a comprehensive approach worldwide. International co-operation is urgently required. Transition is only possible through joint efforts, i.e. we have to make sure that the transition is fair and inclusive, also for those who are amongst the losers in this transition. Otherwise we will be confronted with riots and violent resistance. We should continue working actively to bring together leading corporate stakeholders. Many businesses state that they are not afraid of more regulation but of unfairness, free riders and uncertain risk. With respect to international co-operation, this means introducing more sharing sovereignty instead of owning sovereignty.

**Tracey Spack** (Directorate Environment and Climate Change, Director of Products Division, Government of Canada) introduced the viewpoint of the Canadian government. Canada, with the high share of natural resources in its GDP (25 %), is a strong supporter of the resource issue within the G20. Tracey Spack presented some key requirements:

1) Clearly define the issues that need to be addressed
    - Rationale for action
    - Clear and common definitions (different regional views on resource efficiency)
2) Create capacity to target gaps in national measures
    - Limited technical capacity and data
    - Limited reach of market mechanisms
    - Environmental policies, regulations and compliance
3) Determine areas for necessary international co-operation and action
    - Global monitoring, indicators and best practice standards
    - Addressing barriers to value recovery
    - Mobilizing action

She pointed out that there are many successful examples of international co-operation on environmental issues: OECD, IRP as generators of evidence and policy analysis, international conventions such as the Montreal Protocol as an example for global implementation, the World Economic Forum (WEF) as an organization responsible for boosting momentum for international action, such as the G7 Ocean Plastic Charter. As one of the most important mining countries, Canada has started a Green Mining Initiative that enhances mine productivity, manages water in the mining cycle, minimizes and manages mine waste, and addresses energy efficiency in mining.

**Shigemoto Kajihara** (President, Japan Waste Research Foundation) introduced the latest developments in Japan's 4th Fundamental Plan for Establishing a Sound Material-Cycle Society and reported that Japan's resource productivity improved by 58 % and landfilled waste decreased by 74 % from 2000 to 2015. He highlighted some special activities by the Japanese Government, such as efforts for disaster waste management, which is underestimated in countries not affected by earthquakes and other natural disasters. Concerning urgent tasks for the international community, he emphasized the development of common visions for resource efficiency and circular economy, which should be shared among developed and developing countries. He also called for clear, comprehensible and common targets or yardsticks, which are applicable to all individual actions in the area of resource efficiency and shared by all stakeholders, in order to take as many countries

as possible on board, namely the development of a future international resource convention.

**Rachna Arora** (Deputy Team Leader, European Union – Resource Efficiency Initiative for India) reported on experiences from some important resource efficiency actions in India, which have been supported by Germany or the EU. Building blocks for a coherent environmental law in India are now in the making. She highlighted the problems of consumption policy for a billion people in very different living conditions. Many tools introduced or tested in Europe might also be implemented in India in the next years and are under discussion. The role of the poor as active stakeholders in the "informal sector" is very important for India

In the first round, the demand for a Resource (Efficiency) Convention was discussed. Is such a convention necessary? And if so, is it achievable? Regina Dube is greatly in favour of a Resource Convention because resources are a cross-cutting issue and indispensable for successful climate policy too. Shigemoto Kajihara pointed out that the G7 summit agreed on a common pathway towards resource efficiency, but in order to build up a circular economy and to arrive at standards within the G7 common definitions must be found. In view of the lack of data and standards, Rachna Arora was not sure if a convention would be helpful. Janez Potocnik underlined that sustainable consumption and production are essential to achieving the SDGs; this means a different type of economy. According to Harry Lehmann, we should not postpone action until we have signed a convention. Ugo Bardi distrusted in the prospects of a global convention because of so many conflicting national interests.

The moderator then asked about the role of national discussions on resources and sustainable consumption. Regina Dube affirmed that working for global justice means that resource efficiency is a "must". However, the discussion is difficult even in Germany. Shigemoto Kajihara pointed out that resource efficiency is a part of Japanese culture that comes with the Buddhist faith. Tracey Spack reported on the Canadian standpoint: Resource efficiency is linked to business opportunities, this is of importance for policy.

With respect to the plastics issue, which has gained a lot of attention recently, the question arose of whether this is an example of an issue that triggers a response in people, because everyone can avoid plastics. Janez Potocnik welcomed this question. He outlined that this is a good example because we all feel guilty. The same is true for food waste. That is the reason why this type of issue touches the heart.

One participant expressed his/her distrust in "green mining". It is just green washing? Tracey Spack explained Canada's situation: It is a country with a big mining industry and therefore "greening" is necessary in order to define goals for more efficiency and less environmental damage.

## Parallel Session 1: "Resource Efficiency in Practice – Examples from Central and Eastern Europe"

This session was chaired by **Martin Vogt** (Director, VDI Centre for Resource Efficiency, Berlin). He welcomed the possibility to present and discuss practical examples as a substitution for mere policy discussions, which are often very abstract. He appreciated the work on resource efficiency being performed especially in Eastern European countries, which contributes important experience on industrial resource efficiency.

**Branko Dunjic** (Cleaner Production Centre of Serbia) introduced the Cleaner Production Centre, which was supported by UNIDO for the first three years and is now self-sustaining. He presented chemical leasing as an interesting business model for the chemical industry as well as for clients and consumers, since it delivers a win-win situation with respect to economic interests and environmental protection. In this special case, trichloroethylene was substituted by tetrachloroethylene as a cleaning agent for safety-relevant parts in the automobile industry. Through chemical leasing, i.e. buying the cleaning process as a service provided by a specialist for solvent management and recycling instead of buying the chemicals themselves, the amount of solvents used could be decreased by about 70 % and process temperature could also be lowered, thus saving energy and costs. To conclude, Branko Dunjic introduced RECPnet, a global network (UNIDO/UNEP-sponsored) for resource-efficient and cleaner production.

**Jaana Merisaar** (Project Manager, Environmental Management Department, Ministry of the Environment, Estonia) presented a resource efficiency project in Estonia which is a support measure for the manufacturing industry. She introduced the national programme for efficiency measures in industry which receives financial support (€ 100 million) from the Commission. Estonia is one of the three leading countries in Europe with regard to resource efficiency. Raising awareness numbers among the tasks of the project. There are 40 trained specialists (background: mostly engineers), who are working as consultants for the about 200 companies involved. The funding mechanism comprises a 50 % contribution from the government and 50 % from the industrial partners. The processes and topics supported in the project include environmental management systems, ecodesign, production automation and waste as a resource with a special focus on production residues. A quarter of project funds have been so far been invested, mostly in the wood industry. Examples are:

- Wood chips produced from wood stumps
- Optimization of gravel and sand washing
- Modern glass-tempering furnace

**Pavel Růžička** (Senior Consultant, ENVIROS, Czech Republic) gave an overview for the Czech Republic. In the Czech Republic, about 21 million t of industrial waste (mostly from construction) are produced per year plus 4 million t of municipal waste, of which 61 % and 57 % respectively are landfilled. Despite official statistics on recycling, it should be clarified that most recycled material is down-cycled. To date, there is no comprehensive national resource efficiency strategy. A national end-of-waste criterion has been developed for recovered asphalt: The mixture is categorized in four quality classes depending on its polycyclic aromatic hydrocarbon content. More end-of-waste criteria are under discussion, i.e. for concrete from demolition, excavated soil and bricks. The "Horizontal Card" for secondary raw materials is part of public procurement, i.e. product cards are issued to encourage the use of secondary materials. To improve environmental conditions in the Czech Republic, landfill prices need to be increased, as they are currently among the cheapest in Europe.

**Aida Szilagyi** (President, National Centre for Sustainable Production and Consumption, Romania) introduced her organization, which was not founded by the government, but is instead based on several NGOs. It receives no financial support from the government. Waste production in Romania is high due to the country's extensive extractive industry, whereas domestic material consumption is low compared to other European countries. Resource and energy productivity is also low, although energy efficiency has increased remarkably in the last ten years. Aida Szilagyi identified some barriers for companies, especially SMEs:

- High cost of environmental actions
- Difficulty of adapting to legislation
- Lack of specific expertise
- No demand for resource-efficient products and services
- Difficulties in the supply chains

More technical assistance and a clearer environmental policy are urgently needed. She presented some successful examples for bringing resource efficiency policy into practice, which are partially supported by UNIDO.

The moderator opened the discussion by asking for the main barrier and the main driver for resource efficiency. Jaana Merisaar identified money as the main barrier and also as the main driver. Know-how transfer is therefore of key importance. Branko Dunjic agreed with Jaana Merisaar and lamented the lack of environmental awareness amongst executives. Similarly, Aida Szilagyi identified people's personal awareness as the main barrier. Pavel Růžička lamented client pressure and problems in the supply chain, which mostly hamper eco-innovation.

The discussion then focussed on the question whether European programmes are helpful. The answer was yes, although there is room for further progress. Branko Dunjic reported that Serbia had received some support from the European Commission although Serbia is not a Member State. The structure of governmental assistance for companies is similar to that in Estonia. Aida Szilagyi lamented low

technical advice capacities, which lead to sub-optimal use of funding. Pavel Růžička welcomed the EU's structural funding. European-level policy documents are also of value because these can be used as arguments for better national activities.

## Parallel Session 2 "Resource Efficiency and Business Innovation – Start-Ups by European "Ecopreneurs""

The session was moderated by **Conny Czymoch**.

**Klaus Fichter** (Director, Borderstep Institute for Innovation and Sustainability and University of Oldenburg, Germany) provided a theoretical view of different modes of change in transformation pathways. From 'Invention - Innovation - Diffusion - Exnovation' he explained at which step he sees start-ups struggling. From his point of view, diffusion is the major problem because nearly two thirds of all start-ups remain a niche product or service and gather on average only 10 % of market share. For him, the Community and available resources are key to the success of a start-up.

Following this introduction to the topics of innovation, start-ups and success, three start-ups introduced themselves to the audience. First, **Maija Itkonen** (CEO, Gold & Green Foods Ltd, Finland) shared her personal history from the initial concept of alternatives for meat consumption to the firm's major success in producing plant-based protein sources from pulled oat as meat replacements. Food ranks as the No. 1 opportunity to fight climate change. "Think about it! You are eating your one steak and watching 2000 l of water run away".

She was followed by **Hubert Rhomberg** (CEO, Rhomberg GmbH, Cree GmbH, Austria). The company is active in the construction industry, with a focus on lowering the respective environmental impacts, reuse of materials at the end of their primary use and adoption of digitalization as a tool for sustainable and long-lasting buildings. His approach was to rely on wood. Contrary to the common opinion that you cannot build a high building from wood, Cree GmbH is proving the opposite by already having a very large building built in Switzerland in a very short time.

**Klaus Wiesen** (Co-founder and CEO, sustainabill GmbH, Germany) pointed out that we have to change our mindset and open up to a shared and open source community. The start-up sustainabill tackles the problem of corporate supply chains being a "big black box" and how to make them transparent. He states that most companies only know the first tier of their supply chain and nothing about the rest. For just and sustainable business, this would have to change.

**Eva Revilla** (Policy officer for cluster internationalization, DG for Internal Market, Industry, Entrepreneurship and SMEs, European Commission) closed the session. She talked about the different stages in obtaining EU funding for business innovations and which clusters are in place to support them.

Key findings of this session were:

- A lot of innovative ideas and start-ups exist, but many of them lack a sound financial footing.
- The EU offers many possibilities for the support of innovative ideas, but funding is only available for the top 5 % of them.
- It is not about technology, it is about culture: People have to be willing to share knowledge.

**Parallel Session 3 "Green and Circular Economy – Network Activities of European Environment Agencies"**

**Bettina Rechenberg** (German Environment Agency) welcomed about 70 delegates and moderated the session. It focussed on a green and circular economy from the perspective of the network activities of European Environment Agencies.

**Pawel Kazmierczyk** (European Environment Agency) introduced the EEA network. Only six countries have adopted a resource efficiency strategy, for example the Netherlands, France and Flanders (Belgium). There are no common targets in the EU. He made reference to France with its aim of 100 % plastic recycling by 2025. The number of countries involved is growing and this offers good potential for learning from each other. A member of the audience asked whether this situation would not lead to increasing inequality between countries and if the Eurostat figures presented did not reflect differences in the composition of the economies, for example in the case of Switzerland. Pawel Kazmierczyk confirmed that the gap between countries in resource productivity is increasing. However, the statistics are important because they reveal development trends.

**Ines Oehme and Herwig Unnerstall** (German Environment Agency) reported on the findings of a discussion paper of the interest group on green and circular economy on obsolescence and presented six core measures to increase the lifetime of products: 1. Minimum lifetime, 2. Information on reparability, for example on availability of spare parts, 3. Guarantee statement by manufacturers, 4. Framework conditions for repairs, 5. Taxation (VAT and labour), 6. Strengthening of product appreciation. One interesting question from the audience focussed on statistics: How many repair shops exist in each Member State? Is there evidence of decreasing product durability?

**Riina Antikainen** (Finnish Environment Institute) reported on the results of a study on national activities aimed at turning waste into raw materials. The study comprises examples from five countries with activities in the food sector, two in the construction and demolition field, one in plastics and another in iron and steel. It was found that there is market demand for secondary materials and that quality assurance in the recycling chain is key. The discussion highlighted the importance of labelling, the use of recycled material in food packaging and problematic "waste tourism" from the EU to developing countries.

**Aldert Hanemaaijer** (Netherlands Environmental Assessment Agency) contributed to the discussion on the data and indicators needed: What do we want to know and what do we need to know? He made reference to an EEA discussion paper from 2017 and presented his approach. His motto was: “Accountability breeds response – ability”. Or in other words: “What we can’t measure we can’t change”. Aldert Hanemaaijer highlighted the steps necessary for successfully implementing a circular economy as a mainstream business line: Create a framework, set targets, monitor progress and use the findings to steer further policy-making.

## Parallel Session 4 “Circular Economy - the Consumer Perspective” (in Cooperation with World Resources Forum)

The session was moderated by **Bas de Leeuw** (World Resources Forum).

**Lieze Cloots** (Head, International Policy Unit, Public Waste Agency of Flanders - OVAM) pointed out that procurement policies have great potential to create demand for the right products and services by channelling money for innovation and creating employment. The aim is Circular Procurement (CP): Consuming in a circular way leads to reduction of virgin inputs and materials, maximizing the reusability of a product or component, more reusability of products and components, and through this to postponing the end-of-life phase (e.g. extended warrantee/guarantee, repairable design). Producers still have no good insight into CP and lack resources as well as awareness amongst and support from management. The Green Deal CP 2017-2019 is running with 200 test cases with the objective of creating a learning network and crossovers of private and public sector, to convince executives independently of governmental regulation. It offers exclusive education for Green Deal members and aims at an upscaling of CP in the EU.

For Rolf Buschmann (Policy Officer Technology & Environment, BUND, Friends of the Earth Germany)**,** sufficiency is more important than efficiency. What is the consumer´s role? We should rethink our behaviour, especially consumption, and seek the main problems. A circular economy must help to find a balance. A policy mix will be more successful than a single policy (e.g. reduction of working time, income cap, universal basic services).

**Markus Terho** (The Finnish Innovation Fund Sitra) expressed the opinion that consumers are hunters and gatherers by nature, who developed from food to goods. Markus Terho recommends the following changes:

- Shifting behaviour to hunt/gather experiences and reducing ecological footprint
- Adopting new solutions, minimizing negative aspects and promoting ecological sustainability
- Use motivation to encourage better habits by increasing appeal
- Step-by-step, little-by-little changes and avoidance of radical approaches

- Promotion in communities to invoke major political changes (e.g. avoiding single-use plastic)
- Make circular economy more “sexy” (e.g. Macklemore’s “Thriftshop”)

**Vanessa Timmer** (Executive Director of One Earth, Canada) asked how to transform the world into a sustainable daily living under the condition of a growing population and while respecting human nature. Sustainable lifestyles (e.g. food, mobility, consumer goods, housing, leisure), reducing waste, car sharing, public transport and smaller houses are important. A holistic approach should be followed: From consumption to sustainable living, with a focus on life stages and transitions (e.g. support for sustainable living options). She recommended changing the nature of working life and mobility in order to achieve a different attitude towards time. Sustainable living in green and smart cities means expanding our understanding of sustainable living and shifting needs and preferences in order to obtain better solutions.

The topic of the discussion was how to improve the involvement of consumers in the circular economy and how to bring the general public on board. The following points were mentioned:

- Less effort for the consumer eases accessibility
- Increase awareness through direct contact to the consumer
- Education of next generations
- Transparency of ecological footprint of products (e.g. recyclability, use of precious metals)
- Prolonging of product life cycle (e.g. new software for old hardware, easier access to repairs)
- Rewarding of ecologically sustainable behaviour
- Address the price politics of industry (e.g. less cheap products with short lifespan)
- Appeal through mainstream media and well-known personalities

Before starting the next plenary session, the moderator interviewed two student reporters. They highlighted that all speakers had stressed the urgency for change. However, the goals should be clear. They quoted one of the speakers in this context: “If you don’t know where to go, you end up somewhere else”. The chairpersons then summarized the main results of their sessions (see above for the reports). In the discussion following the reports, Martin Vogt said that Germany can learn a lot from experiences in other countries. Bettina Rechenberg underlined that European co-operation is valuable, but more best practice examples should be collected and published. Only if resource efficiency appeals to their hearts will it influence people’s actions. Indicators and clear targets as well as fiscal instruments, legislation and regulation are needed. Bas de Leeuw urged for action and “to sell better”. A policy mix is needed. He also promoted the next World Resources Forum (24.-27.02.2019 in Antwerp, Belgium).

**Plenary Session "Digitalization and Sustainable Resource Use - Opportunities and Challenges"**

Conny Czymoch introduced the panellists, who each presented some thoughts on the session's topic.

**Dirk Helbing** (Professor of Computational Social Science, Department of Humanities, Social and Political Sciences, Computer Science Department, University ETH Zurich, Switzerland) made reference to SynerGin and Synergetics: What will happen? As the amount of data doubles every year, we need tools to keep control and to prepare decisions on the basis of this enormous volume of data. Big data are an enabling factor for everyone. Dirk Helbing proposed the construction of "Peace Rooms" to experience and to train matters of transparency, decision making, and participation. To reduce the misuse of personal data, informal self-determination is necessary. Information, innovation, production and service ecosystems can be combined. This leads from centralized control to decentralized control and self-organization. One main benefit of digitalization is real-time feedback. This enables us to steer complex systems such as traffic. With the assistance of blockchain technology, the tracing of materials and products will be possible, thus enabling efficient resource recovery.

**Maja Göpel** (Secretary General, German Advisory Council on Global Change) said that the human being should be at the centre of all considerations regarding digitalization and sustainability. Digitalization should foster sustainability as defined by the SDGs and needs systematic design on the basis of societal requirements. This should also be a guiding principle for industrial development and implementation of digitalization.

**Martin Vogt** (Managing Director, VDI Centre for Resource Efficiency, Germany) presented the results of a report based on 10 case studies on the digitalization of small and medium enterprises and the recommendations for the companies and politics that can be derived from it.

The moderator chose some questions from the audience for the panel discussion. One participant asked: "What is the success of controlling anything? Is it desirable to optimize motorway traffic instead of really saving resources?" Dirk Helbing replied that co-operation is the goal, not control. Democratic structures, neighbourhood organization etc. have to be experienced. There is a need to seek synergetic effects between digitalization and resource management. The view of industrial companies, especially SMEs, is quite another, as Martin Vogt said. Companies have to make use of digitalization. This means that they must learn to locate, accumulate and use their data. Companies always fear that they are not as fast as their competitors. Dirk Helbing expects that digitalization will change the entire economic framework. A way of thinking based on yesterday's experience is dangerous because then the new rules are not understood. Maja Göpel called for a re-invention of manufacturing: There is enough for everyone, but it must be shared. Martin Vogt described the approach to step into digitalization on the product stage and in the relation to their

clients. It is time now to shape this technology; this is an opportunity as well as a challenge for companies. In a more and more controversial discussion, Maja Göpel criticized the lack of sustainability orientation in the industry's attitudes for digitalization towards sustainable solutions. Martin Vogt replied that companies fear losing their customers, who might buy the products from platforms, and they try to preserve client loyalty. These problems have not been addressed in the discussion so far. Dirk Helbing called for a new financial system to be installed instead of the existing one leading to a number of bubbles and catastrophes. The question is who should install this new system. Maja Göpel warned the panel not to mix up macroeconomic and microeconomic issues.

In a last round, two questions were discussed: 1) Do we need more creative disruption? The panel agreed that digitalization cannot be stopped, meaning that the only possibility is to make use of it. According to Dirk Helbing, the internet of things can be used to involve more people in democratic decisions. Decentralized approaches and higher efficiency are among the most important benefits from digitalization. Maja Göpel asked for a redefinition of national wealth besides GDP. 2) What impact will digitalization have on climate change? Dirk Helbing expects digitalization to reshape our society.

## Closing Session: Outlook and Next Steps

Before starting the final session, **student reporters Sibylle Simon and Farhan Ahmad Butt** commented on the second day of the conference: "It was quite inspiring to see a holistic picture from wearing lenses of history, present and future while considering planetary boundaries. In the international arena, the debate started with the argument that economic growth is the solution for all planetary problems and then the debate shifted from economic growth to limits to growth. Moving further, it arrived at sustainable development and today we are going a little further and discussing circular economy, bio-economy and resource efficiency. These discourses show how far we have come until now, but after listening to the experts here at the conference it is clear that we still have a long way to go. There are so many things that still need to be done on an urgent basis and we are not left with much time. It seems that all the messages from the experts speaking at the ERF complement each other. The speakers all stressed the urgency for action, the importance of sharing knowledge and of a long-term approach. We need to take action now and we need to do it together. Currently, our economy is not only inefficient in its use of resources but it also lacks a framework for implementing the necessary degree of sustainable practices throughout all industries. The matter of rethinking the economy's linear model entirely and replacing it by a circular one was therefore ubiquitous. In conclusion, the experts' messages were as crucial as they were stirring and in general there was a high information content."

Conny Czymoch concluded her task as moderator with an outlook for 2050. The conference proved that a vision is needed as well as urgent action in personal consumption, individual professional life, and in policy.

**Bruno Oberle** (Professor for Green Economy and Resource Governance, École Polytechnique Fédérale de Lausanne, President World Resources Forum, member of UNEP International Resource Panel, Switzerland)

Many changes are currently underway: The centre of the developed world is no longer Europe and North America as it was 70 years ago, but China, India, South America. The new generation has quite other visions, new mindsets and patterns of behaviour. The world is no longer governed only by white men. This makes a difference which we should not forget when we discuss the future management of resources.

**Harry Lehmann** (General Director, Division Environmental Planning and Sustainability Strategies, German Environment Agency) took the floor. His final conclusions:

He welcomed the growing number of countries in the EU and worldwide that are introducing resource efficiency programmes and policies. In most companies in Europe, resource efficiency is daily business not only in production but also with regard to energy-efficient products and services.

Resource-efficient products are gaining ground, but only slowly. This is a pity. The interrelationships between resources and waste, which are now linked by the European Circular Economy package, will hopefully accelerate this trend. It is necessary to value the longevity, reparability, re-use and recyclability of products.

Harry Lehmann remind Minister Schulze's speech the day before, when she mentioned in her introduction that we have to give priority to the useful life of products and look for longevity and re-use.

One of the main problems to be solved in the short term is the amendment of the Ecodesign Directive so that it integrates further resource indicators besides energy.

The nexus between climate change and resource management is now widely understood. We see a number of very important links between both issues, as has been demonstrated by Sangwon Suh, Helga Weisz and Janez Potocnik during the ERF.

This is in line with the results of the UBA project “Greenhouse gas neutral and resource efficient Germany” presented yesterday.

The resource issue is now on the global policy agenda. 40 years after “Limits to Growth”, this is a great success for all those from science, administration, NGOs and industry who worked in this area. But the question is: How much time is left to draw the consequences from these findings?

An international resource convention is therefore urgently needed in order to bring the world together for joint action, even if there are many contradictory national interests. But it is time to start. As Maria Krautzberger, President of the UBA, pointed out at the first ERF day, only a limited number of objectives should be targeted in a first attempt: formulation of overarching goals, guidelines for resource use and minimum standards for the use of raw materials.

The International Resources Panel of the UN has developed a model for establishing resource efficiency as a key even for climate conservation. This model also promises less poverty and thus a win-win-win situation. How can this be achieved in reality? An ambitious set of measures is necessary, including taxes on carbon and other resources and in addition, a change in consumer habits.

An Environmental Tax Reform (ETR) is necessary. Sufficient experience from national tax systems is available (e. g. UK, Germany, Denmark) for introducing taxes of this type. How petrol and electricity consumption have developed following the introduction of carbon tax on electricity in Australia is a good example of the effectiveness of an ETR.

Digitalization can help to reach some important goals, although there is also a risk of high resource consumption by information technologies (IT).

There is no free lunch! The transition of the world's economy from fossil fuels to renewable energy and from wasting resources to sustainable resource management will not be cheap. The enormous volume of metals needed for the construction of energy-efficient machinery, especially in energy conversion from solar and wind power to electricity, leads to vast costs. No other technical solutions will be available in the short run, although we can at least rely on widely available elements from the Earth's crust such as Fe, Al, Si, K, which will be available as long as mankind stays on earth.

High costs and who will pay? The German "Energy Transition" is being paid for by consumers and industry to the tune of about € 25 billion (2018). Taxes on resources will hit all consumers and it is likely that poorer social strata will suffer from higher resource and energy taxes more than privileged ones. Resource efficiency is therefore not only a technical issue, but instead it is necessary to bring the problems to the hearts of the people, since otherwise we cannot advance the transition. The current French example of higher taxes on electricity and diesel fuel demonstrates the social and political problems that can accompany such reforms. Even if we are sure that we are going in the right direction, we need to convince our fellow citizens.

International co-operation is a key to success. The OECD, UNEP, UNIDO and other international organizations are working on different resource-related tasks. These efforts are a reason to stay optimistic. In addition, this ERF is not a mere European discussion forum. It is tremendous that participants from 45 countries have attended this 4$^{th}$ ERF.

Harry Lehmann closed the conference by thanking the speakers and organizers, not forgetting the audience for the lively discussions during the 4th European Resources Forum.