Decarbonisation Conference 2016

“Decarbonisation and Resource Efficiency – 100% Renewable Energy and more”

Documentation of the conference discussions

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Conference background

The scientific underpinning leaves no doubt Greenhouse gas (GHG) emissions need to be drastically reduced across all economic sectors to keep global warming below 2°C. Studies across EU Member States have shown that moving towards an energy system that uses 100% renewa-ble sources is technically and economically feasible. Since the energy sector accounts for more than 80% of GHG emissions in the EU, this is an important message for policy makers. Howev-er, effective decarbonisation strategies need to tackle all sectors and find integrated solutions, also taking into account interactions and synergies between sectors, but also with other policy areas.

A transition to greenhouse gas neutral economies requires deep restructuring of infrastructures and technologies. While promising significant savings of fossil fuels, such a transition also requires huge investments in renewable energy production units, battery or power to gas/liquids-systems. Such technologies and infrastructures require certain mineral raw materials, which like Lithium or Rare Earth Elements could become economically and/or geopolitically scarce in the future.

The “Decarbonisation and Resource Efficiency Conference” will tackle the climate-energy-resource nexus. It aims at highlighting synergies and ways for minimising trade-offs between decarbonisation and dematerialisation policies.

Conference agenda

9:00 Registration and welcome coffee

9:30 Welcome

Maria Krautzberger, President, German Environment Agency (UBA)

Setting the agenda

Dr. Harry Lehmann, Head of Division I, German Environment Agency (UBA)

10:00 Resource footprint of a renewable energy system

Klaus Wiesen, Project Coordinator Sustainable Production and Consumption, Wuppertal Institute
Prof. Andrea Ramirez, Faculty of Technology, Policy and Management, Delft University of Technology

Prof. Harald Sverdrup, Iceland University

Darina Blagoeva, Directorate C - Energy, Transport and Climate, JRC

Moderation: Prof. Uwe Leprich, Director of Department I 2 Climate Protection and Energy UBA

12:00 Lunch

13:00 Resource footprint of a greenhouse gas neutral mobility system

Marine Gorner, Transport analyst, International Energy Agency

Dr. Matthias Buchert, Head of Division Resources & Transport, Öko-Institute

Dr. Andrea Del Duce, Analyst, Quantis Ökobilanzen

Moderation: Martin Schmied, Director of Department I 3 Transport, Noise and Spatial Development, UBA

14:45 Coffee break

15:15 Policy strategies to address the nexus of resource efficiency policy and renewable energy transition

Jock Martin, Head of Integrated Environmental Assessments, EEA

Prof. Paul Ekins, Director Institute for Sustainable Resources, UCL & member of UNEP IRP

Dr. Kora Kristof, Director of Department I 1 Sustainability Strategies, Sustainable Resource Use, Instruments, UBA

Leida Rijnhout, Programme coordinator for Resource Justice and Sustainability, Friends of the Earth Europe

Prof. Kristín Vala Ragnarsdóttir, Vice President, The Balaton Group & member of Club of Rome; University of Iceland

Dr. Inge Paulini, Secretary-General, German Advisory Council on Global Change, WBGU

Moderator: Matthias Duwe, Head of Climate, Ecologic Institute

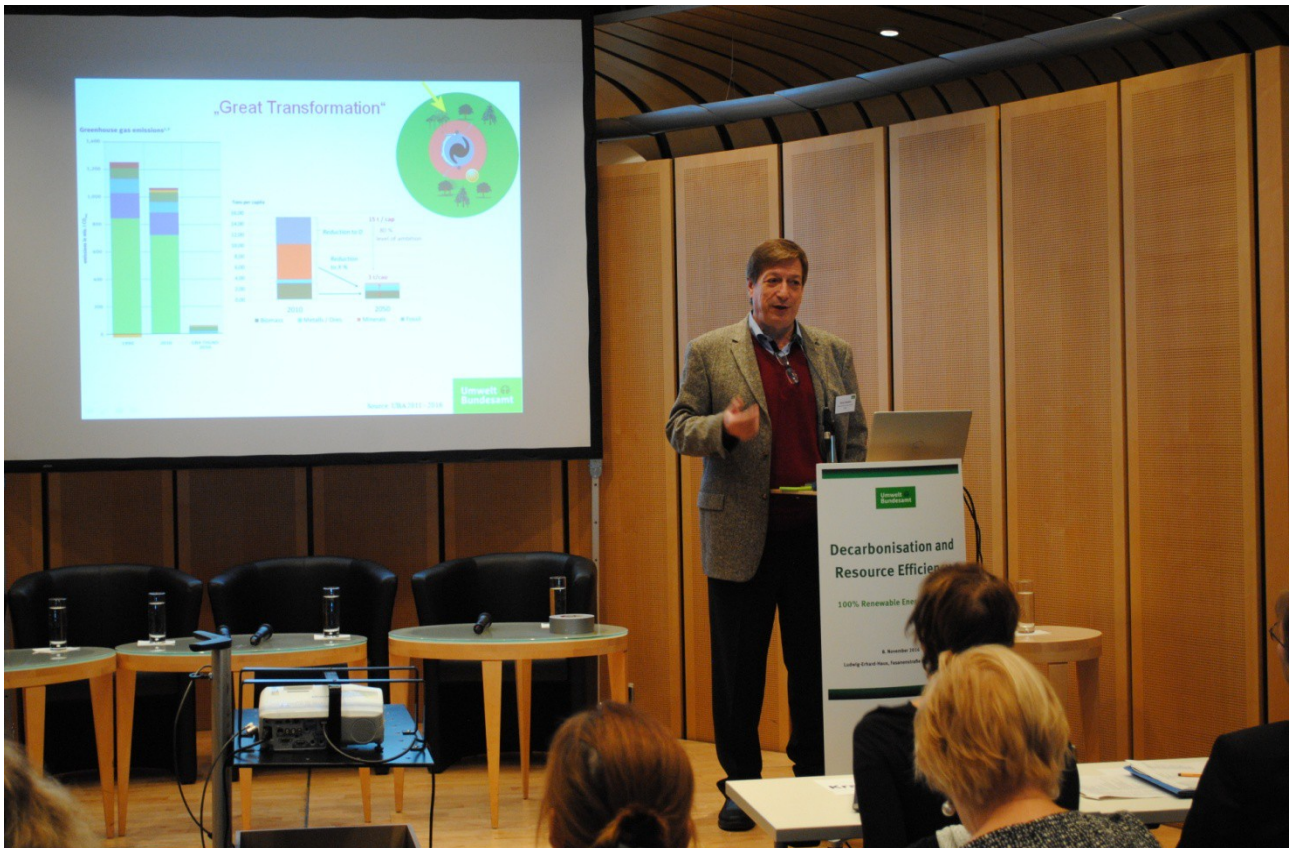
16:45 Summary and Outlook

Dr. Harry Lehmann, Head of Division I, UBA

Session "Resource footprint of a renewable energy system"

The Welcome speech by Maria Krautzberger, President, German Environment Agency (UBA) and the introductory presentation on "Setting the agenda" by Dr. Harry Lehmann, Head of Division I, German Environment Agency (UBA) are available at:

https://www.umweltbundesamt.de/en/conference-decarbonisation-ressource-efficiency-0



Session background

Obviously, the use of resources and the generation of greenhouse gas (GHG) emissions are closely coupled. Low-carbon renewable energy technologies were found to have much higher material needs for certain metals per unit of power produced, e.g., PV systems require up to 40 times more copper, and wind power plants up to 14 times more iron than fossil-based power (UNEP 2015) .

Certain materials and metals, such as steel, cobalt, copper, and lithium, which are needed for renewable energy and also for storage technologies, will become increasingly scarce in the coming decades. Hard, in particular monetary, scarcity will be an issue from 2060 to 2100 onwards, which is beyond most time horizons reflected in policy strategies. Improving resource efficiency of renewable energy technologies as well as fostering recycling to strengthen secondary raw material markets for these materials will be key policy levers and reduce the need for virgin materials. However, as recycling will only be able to shift material availability peaks further into the future, but not avoid them, policy should also support efforts to further reduce the need for critical raw materials, e.g., through funding research and development into substitution of these materials.

Documentation of the main discussions

Four input presentations were given and discussed:

1. "The Energiewende in Germany – Does Decarbonisation lead to Dematerialisation?" (Klaus Wiesen, Wuppertal Institute)
2. "Material requirements for low carbon technology- implications for supply needs and resource policy" (Prof. Andrea Ramirez, TU Delft)
3. "On the integrated climate impact of resources and energy extraction and use in society" (Prof. Harald Sverdrup, Iceland University/Stockholm University)
4. "Bottleneck materials for the deployment of low-carbon technologies in the EU" (Darina Blagoeva, JRC)

In the discussion of the four inputs, the need for careful and appropriate communication of research findings, in particular as regards communication of modelling results, to the public, citizens, policy makers was highlighted in order to minimise the risk that the research messages can be misused.

For a transparent communication of scientific findings scientists need to put all information on uncertainties on the table and provide, as much as possible, an own interpretation of the findings to show the range of statements that the results can support. As scientists we cannot avoid the risk of misinterpretations, so we need to give all relevant context and background information. This might benefit from engaging communication experts, but this also rests as an important task with scientists. Furthermore, discussing potential pathways towards decarbonisation and dematerialization with respective implications on critical resources and environmental impacts may facilitate the communication of results.

As the presentations focused in particular on the supply side of the energy system, it was discussed whether a focus on the demand side change conclusions. There will be a UNEP report on the demand side published in the coming months (this report is currently under revision). What gets clear from this is that we need to add a level of complexity to think about what we demand from products in terms of functions and hence whether we can get the same functions from a more decarbonised product. We focus very much on products designed for high function performances (e.g. heat re-sistance), hence if we want to substitute, we need to consider function needs in design and con-sumption. It was assumed that eventually the utility of things counts for a population; therefore, when it comes to a car, the longevity of the car and the end number of person-kilometers driven will become more important in the future than product ownership and hence resource productivity of the product itself.

Furthermore, the issue of scarcity was discussed in the light of market potential to successfully address scarcity issues. It was raised that markets can do part of the job, but as markets have no forward planning and no memory, there is a need for governance and policy in addition to markets.

The need for communicating scientific findings sensitively also applies to the issue of scarcity, where we need to learn on what happened with fossil fuel scarcities. Here, the fossil fuel projections on peak oil from the last decades did not match with reality. Furthermore, most commodity prices have gone down as well, so it was doubted whether we are on the path to scarcities. However, potential future material scarcities also depend on the trajectories of socio-technical development pathways in the future. For instance, if all cars were to become electrified (1.5 billion on the world), then we have problems on Lithium and Cobalt availabilities. So we need to differ between two challenges that are closely coupled in a nexus way: the way to establish a renewable energy system and the implications that this has in terms of material needs.

We are confronted in general with developments that need more and more different resources, which means that achieving a Circular Economy gets harder and harder. If one looks at the development of electronics we are using more and more metals in more and more refined form, which might become a huge challenge for recovery and recycling in the future for closing the loops. As we distribute many metals through the devices we create around the world in minimal quantities, we need energy for recuperating all these metals and also for dissipating them; we need to bring them back for recuperation. The EU depends heavily on many materials and therefore we need to take the right policy approaches to prevent very volatile prices. Recycling of end-of-life renewable energy systems would be among such approaches, for instance as regards the significant volume of Photovoltaics waste for recycling in Germany in the next years. Here, having a recycling standard for renewable energies will help tremendously. Such standards should be adopted for other materials as well, e.g. for Lithium, because here companies are lacking market certainty that this material will be part of the standard battery in the future.

The more you go into detail for different renewable energy technologies, the more you get a spread of different material rucksacks. Robust knowledge on such rucksacks depends on good data and the need for more data is a crucial, but also very difficult to solve issue. For instance, for LCA-analyses we often do not have up-to-date data and putting together more actual data is a huge task in terms of costs and effort; there is a strong need for excellent data, but we also face resistance to getting this data together.

Science has been building up capabilities to analyse the nexus between renewable energy systems and material needs. Based on such findings, we need to focus on policies that are technologically and economically possible, but also socially. In this context it appears sensible to proceed with fostering energy generation from wind and PV, whereas in biofuels we need to improve and learn from past mistakes, in particular not using crops for renewable energy production because we do not have unlimited land area on earth. One no-regret policy option to foster decarbonisation of our energy system would be a clear and stable policy framework as this will provide security and stability for investments; whatever industry it is, having a clear perspective of where we are going is helpful. Decarbonising is a possible option and we should not cut momentum or limit ourselves to certain renewable energy technologies therein. However, from an LCA assessment point of view, some developments of renewable energy technologies should be carefully looked at from a systemic understanding in terms of knowing all sides and impacts so as to ensure that policy and our development of systemic knowledge are in lock-step. Finally, looking at the demand side we must not just think that we can simply replace technologies as used today by alternative technologies – we also need to focus on sufficiency, e.g. influencing on the production and consumption side that products last and are used longer and more so that we products which leverage consumers to consume them in a sustainable way.

Session "Resource Footprint of greenhouse gas neutral mobility system"

Session background

Similar to establishing an energy system based on renewable sources, also changing mobility to become greenhouse gas neutral will need decarbonisation technologies (such as emobility, Power-to-Liquid, or Power-to-Gas) as well as associated infrastructure that in turn depends on the use of certain materials (e.g. lithium for storage technologies; copper, gravel and steel for road and railroad infrastructure).

Certain materials and metals, such as steel, cobalt, copper, and lithium, which are needed for renewable energy and also for storage technologies, will become increasingly scarce in the coming decades. Hard, in particular monetary, scarcity will be an issue from 2060 to 2100 onwards, which is beyond most time horizons reflected in policy strategies. Improving resource efficiency of renewable energy technologies as well as fostering recycling to strengthen secondary raw material markets for these materials will be key policy levers and reduce the need for virgin materials. However, as recycling will only be able to shift material availability peaks further into the future, but not avoid them, policy should also support efforts to further reduce the need for critical raw materials, e.g., through funding research and development into substitution of these materials.

Documentation of the main discussions

Three input presentations were given and discussed:

1. "Deployment of electric vehicles and support policies – Findings from the Global EV Outlook 2016" (Marine Gorner, IEA)
5. "Material needs for greenhouse gas neutral mobility systems" (Matthias Buchert, Öko-Institute)
6. "Life cycle assessment of different mobility technologies with a look at future trends" (Andrea Del Duce, Quantis)

In the discussion of the three inputs it was stressed that we need to decarbonise all personal transport that we have left, even in a rather conservative scenario of mobility shift approach where we already assume 2 billion cars overall globally compared to 1 billion cars today. While this number of cars indicates a need to constrain personal transport and/or shift to public modes of personal transport, we also need also to think about electrifying the 2 billion cars assumed for 2050 in order to decarbonise transport. The respective charging infrastructure currently is built using mainly public money. There are also many interesting public-private partnerships (PPPs), e.g. where shopping centres to be build in a city will need to offer a certain number of electric charging posts in their parkings in order to get building permission. Another example is Autolib' business in Paris, which the city allowed based on the provision that Autolib' equips each of the charging stations with one charging spot freely available publicly for charging electric vehicles (EVs) – this helped scaling up the use and charging of EVs.

Towards 2030 some scenarios see 140 million EVs globally. The turning point of when we see EVs becoming the standard car, which now is internal combustion engine car, may be cost parity – once use costs would be lower than for internal combustion engine cars EVs would become a mass mar-ket thing. This could then make EVs attractive even for environmentally unaware people. In this con-text government procurement is very important, because equipping public fleets with EVs helps developing the charging infrastructure and helps making EVs familiar to people and educates them on increased use of EVs.

Urbanisation patterns and trends are linked with deployment of EVs, especially in developing coun-tries. In particular the Chinese government is betting on electric mobility for its growth of urban areas because of pollution reduction from internal combustion engine cars. The transport sector is one of the sectors where behaviour plays a central role: people are buying cars for many other reasons than passenger kilometers. Mobility models used in the project "Greenhouse gas neutral and resource light Germany" by German Environment Agency UBA include behaviour as far as increasing preferences for smaller cars – and even this shows that we only achieve 50-60%

reductions in Greenhouse gas (GHG) emissions from mobility. Hence, it is the finding that we need EVs rather than asking how many we do need – we need to decarbonise mobility and be more resource efficient.

Looking back to the last 20-30 years, we had many predictions failing on technology development and deployment, including on the need for nuclear power plant or on the growth rates of energy demand in Germany. Therefore, scenario assumptions of further developing technologies seem valid so that there will be many more new and more efficient technologies in the next decades. This may also hold to increasing use of car-sharing where some people replace own cars with car-sharing because the schemes become more convenient and comparably cost-efficient – and this change is fostered by the change of technology in ICT. EVs can be very appealing to customers nowadays, not only to environmentally aware people, but also to a wider group of people needing not only transportation, but also other functions.

The material needs of certain electric mobility technologies will likely be significant as regards battery electric vehicles. While company experts and geologist may not see continuous supply of Lithium as a problem even for EVs as a mass market, one key issue will be whether the extraction and sourcing of Lithium can be (more) sustainably done, i.e. without destroying pristine nature and world heritage sites in producing countries (such as Bolivia). Therefore, regardless of supply issues, we should push society to the recycling and use of secondary materials because we do not and we cannot yet know how technology for battery production will develop over the next 30-40 years (because in the past we could not foresee current battery technology).

Session "Policy strategies to address the nexus of resource efficiency policy and renewable energy transition"

Session background

The session aims at discussing potential policy support options to better address the resource-climate nexus. While existing or new policy instruments will certainly be able to support nexus thinking, this might be even more the case when bundled with a longer time perspective in policy mixes. However, it is not clear whether such an approach will be sufficient to address the need for systemic policy intervention and for transformative change. This may encompass required changes in policy institutions to better reflect nexus thinking in policy making.

Documentation of the panel discussion

Chaired by moderator Matthias Duwe from Ecologic Institute, the following six panelists discussed strategies to address the nexus of resource efficiency policy and renewable energy transition:

1. Jock Martin, Head of Integrated Environmental Assessments, EEA
2. Prof. Paul Ekins, Director Institute for Sustainable Resources, UCL & member of UNEP IRP
3. Dr. Kora Kristof, Director of Department I 1 Sustainability Strategies, Sustainable Resource Use, Instruments, UBA
4. Leida Rijnhout, Programme coordinator for Resource Justice and Sustainability, Friends of the Earth Europe
5. Prof. Kristín Vala Ragnarsdóttir, Vice President, The Balaton Group & member of Club of Rome; University of Iceland
6. Dr. Inge Paulini, Secretary-General, German Advisory Council on Global Change, WBGU

In a first round of statements the meaning of the climate-resource nexus was discussed to be a very popular term calling for a wider perspective integrating consumption and production. The

consump-tion perspective is lagging behind the production side in terms of policy, which calls for a strong(er) integration of the precautionary principle in policy making. The nexus is a technical term that can facilitate thinking about systemic interlinkages and challenges us to get out of our own silo thinking. Hence, robust policy making in the context of the climate-resource nexus requires more holistic thinking among different actors as well as in our education system. Only such holistic and long-term perspectives can bring about a great transformation needed to achieving the SDGs. Such a transfor-mation should also address the fair share and equal share of the use of resources as well as the need to dematerialize economic growth and our idea of well-being – improving efficiency will not be enough made, we need to move towards sufficiency and an absolute reduction of material use in Europe (towards our "fair share"). In this context, the concept of double decoupling offers promising potential to allow continuing economic growth in particular for the Global South while reducing resource use and associated environmental impacts on a physically finite planet. We need to get stark policy message across – we need to foster internalization of external costs (e.g. as regards carbon) and we need to close the gap between resource efficiency and economic efficiency; economic efficiency always wins in daily decisions so we need to have them match.

When designing policies addressing such a complex field, we need to break the problems down because complexity can lead to paralysis. We need a high-wage resource efficient economy for humans and planetary boundaries; this is a difficult combination because humans (labour) become more expensive than products, which fuels the throw-away society. This needs to change without compromising the international competitiveness of the European Economy, so this requires coordi-nate action across Europe. There are many examples showing that such a change can be done through policy support – the UK landfill taxation is a very good example for effective policy. Standing at around 84 £/ton has made resource efficiency less expensive than resource wastage. Furthermore, this tax has made for a nice earner for the treasury, which it uses for all sorts of other purposes, and it did not receive opposition from industry as other resource taxes had received.

Policy mixing appears a promising concept to foster such changes, as policy mixing can enable shift-ing innovation and behaviour changes from the niche to a wider level. We may have a totally different way of consumption and production in the future, so we have to think about completely new policy options to support this. As there are many different policy levers, several target groups, several targets we do need a mix of policies. Currently, policy mixing in the energy and resource sectors mainly yields a mix of different actors and ideas, while we are lacking an integrative assessment for first best solutions of a policy mix to feed into policy making. As you are not likely to get a first best policy mix at the end of political discussions, we need to look at success factors for getting policy mixes implemented in policy making including foresight processes in order to best to prepare for the future to come.

Hence, there is a clear need to identify systemic intervention points able to support or bring about the transformation required. In this context we need to improve the systemic understanding of how our economy, lifestyles, etc. are integrated. Furthermore, we need to foster material literacy and awareness – for instance, if you buy a new gadget than often the old one, e.g. mobile phone, ends up in the drawer because people do not know that this is full of valuable materials. Also, we need to stop thinking about stuff – we need to think about well-being and indicators reflecting better on well-being and economic equality than GDP does. Here, we need to educate at all levels, including educating civil servants who are executing what our policy makers decide, as well as policy makers so that they can design and make good policies. This includes providing scientifically based recommendations to policy makers, for instance as the German Advisory Council on Global Change (WBGU) does.

Identifying systemic intervention points necessitates a twin-track strategy: (1) Thinking about the problems at stake and about how best to solve it? (2) Despite the time pressure taking the time to

think and to go to the future and to learn from through backcasting, because we need to interlink the system we have today with the system we need to co-create for the future; this is a matter of discussion for society as a whole. Therefore we also need to create more room for a vision of future-proof policy making. This is essential because in any transformation there will be losers and winners, causing resistance. So we have to find and experiment with solutions, which is a learning process that needs time and space for some sort of rethinking ourselves – if we act, think and behave and look for solutions the same old way, we will probably not get to the needed solution. This also applies to how we deal with mistakes. Do we put money in scientific endeavours only if we are sure that they are successful or do we also fund studies learning from the past and informing about failures to enable learning? Looking to Reallabore (living labs) in the German State of Baden-Württemberg, a little group of such labs is on the way to iteratively make the first steps to jointly decide on how to go further; this process includes scientists, policy makers, society. This is the sort of time and space we need to have to enable learning together and dealing with our mistakes, which in a complex and dynamic world we inevitably make.

The EEA as an institution aggregating and communicating science to the public produces information and knowledge around such systemic challenges. Environmental policies of the last 30-40 years were by and large problem-focused and we now need to flip this around and investigate what is happening solution wise among the 39 EEA institutional members as environmental policies are part of the solution, and (should) not (be) part of the problem. In this context, the interactions and coherence between different environmental policies need to be investigated to find potential synergies based on information that we have. This will also include trying to understand relationships between fiscal policies (public instruments) and finance policies (rather private instrument) in terms of how they can support us along other challenges, e.g. demographics. Such an integrated view is needed to improve integration of nexus issues on European level with regard to implementing and achieving the SDGs. Here, the European Commission seems to face challenges in understanding what the SDGs are about because there are no linkages made between the different SDGs and the work done by the European Commission on SDGs in Europe. This is problematic because a key element in the discussion on the SDGs is social innovation and the leverage that this can have on changing our lifestyles and behaviour; we really have to invest much more in social innovation and to upscale innovation through policy, e.g. supporting cities and regions to do that. People will be ready to change if the change gives them a better life and also if the fit between current policies and the needed future vision can be enhanced. The current political situation is working against such fit as policy making is very much silo-based. Furthermore, we need narratives and pictures to understand and communicate the problem and enable people to change, sometimes also through creating a push in the political system.

Such a push necessitates political will – here, the economic opportunities arising from policy ap-proaches are absolutely critical and we need to get this message across so that we do not lose mo-mentum for resource efficiency, decoupling and the 2°C target. We need the language of economic opportunities and to improve our understanding of the dynamics of such (macro)economic opportunities. However, while this may convince European resource policy regarding competitiveness of Europe when going for more resource efficiency and decarbonisation, we also need to acknowledge that only thinking in economic opportunity terms carries risk to deplete our ecologic capital as we cannot and should not just monetize any opportunity arising from nexus policy.

In the end, this will come back to the importance of dealing with uncertainties in our communication of research and of future visions. “Apocalyptic talking” from green parties will not strengthen democracy in policy, science, society – in fact, we have to learn from past mistakes in terms of experimental science and seek for mixed alliances in the near future, also alliances between good

science, good policy and good media coverage. Through forging new and lasting alliances we can increase the likelihood to successfully change existing structures, such as markets and economic power that may exert significant lock-in power to unsustainable trajectories.

Looking at changes that will facilitate such shifts, we should start building on initiatives that are already in place, e.g. the carbon pricing coalition and increase carbon price towards 100 EUR / ton by 2050. Then renewable energy can become the competitive choice everywhere. Furthermore, we should take the extension of the Extended Producer Responsibility (EPR) principle to its logical con-clusion, designing policies so that producers cannot sell materials, but only a life-time service and producers have to take their products back at end-of-life; that would do much to the design for reparability, longevity, etc. Adding to this, we should think about a materials added tax instead of value added (labour, e.g.); some of the tax revenues could be used to create sustainable commodity agreements outside Europe for sustainable production. We also need to have an accounting system that tells us what is important; so combining an economic accounting system with a resource ac-counting system because this helps increasing the share of European economic development resulting from green or bio-type of economy. Furthermore, we need a well functioning democracy based on the subsidiarity principle (i.e. deciding on national, regional and local level and provide guidance from European level); we should not approach people as consumers only, but as conscious citizens who in a well functioning democratic system are also taking on responsibility. Fostering good democracy and conscious citizens will reduce the dominance of multinational corporations and increase decision making for local societal and environmental benefits.

Session “Summary and outlook”

In his concluding remarks, Dr. Harry Lehmann from UBA highlighted that 35 years ago no one would have thought that it is possible to achieve renewable energy. Using the comparison of a mosquito being able to impact on how well a large being such as humans sleep at night, he pointed out that we underestimate the power of small changes through some and increasingly many of us.

In order to best guide such changes towards a larger and common goal, it is important to find the right direction for system change. Economists have not foreseen the economic crises, politicians have not foreseen the breakthrough in reunifying Germany. With all that Mr Lehmann said to be optimistic that we can achieve relevant changes in the next 35 years.

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Section I 1.1 Fundamental Aspects, Sustainability Strategies and Scenarios, Sustainable Resource Use

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