World Resources Forum 2012

October 21 – 23, 2012 Beijing, China

Resources and Green Economy

Meeting Report

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The World Resources Forum (WRF) is the global science-based platform for sharing knowledge about the economic, political, social and environmental implications of global resource use. WRF promotes innovation for resource productivity by building bridges among researchers, policy-makers, business, SMEs, NGOs and the public. Flagship activity is the annual WRF Conference.

The WRF is an initiative of the Swiss Federal Laboratories for Materials Science and Technology (Empa). The founding members of the WRF Association are Empa, the Swiss Federal Office for the Environment (BAFU), the United Nations Environment Programme (UNEP), Hewlett-Packard (HP), and the city of St. Gallen. For associate partners and sponsors see the appendix in this report and updates on the networks page on the WRF website.

This report was drafted by Bas de Leeuw, based upon inputs from Hans Hänni, Student Reporters (editors: Claudio Ruch and Aishwarya Nair, reporters: Adam Wong, Akash Arasu, Andreas Slotte, Anna Leijonhufvud, Bing Yu, Fabian Aellig, Iliana Sepulveda, Nora Locskai, Robin Kleiner, Sina Blassnig), workshop reporters (Stefanos Foliou, Veronika Rékasi , Martin Lehmann, Lewis Akenji, Frans Verspeek, Christopher Manstein, Mathias Schluep, Tobias Welz, Liisa Tahvanainen, Pauliina Korhonen), speakers, oral presenters and participants. The report has not been reviewed by speakers. Thomas Ruddy reviewed the chairman's summary.

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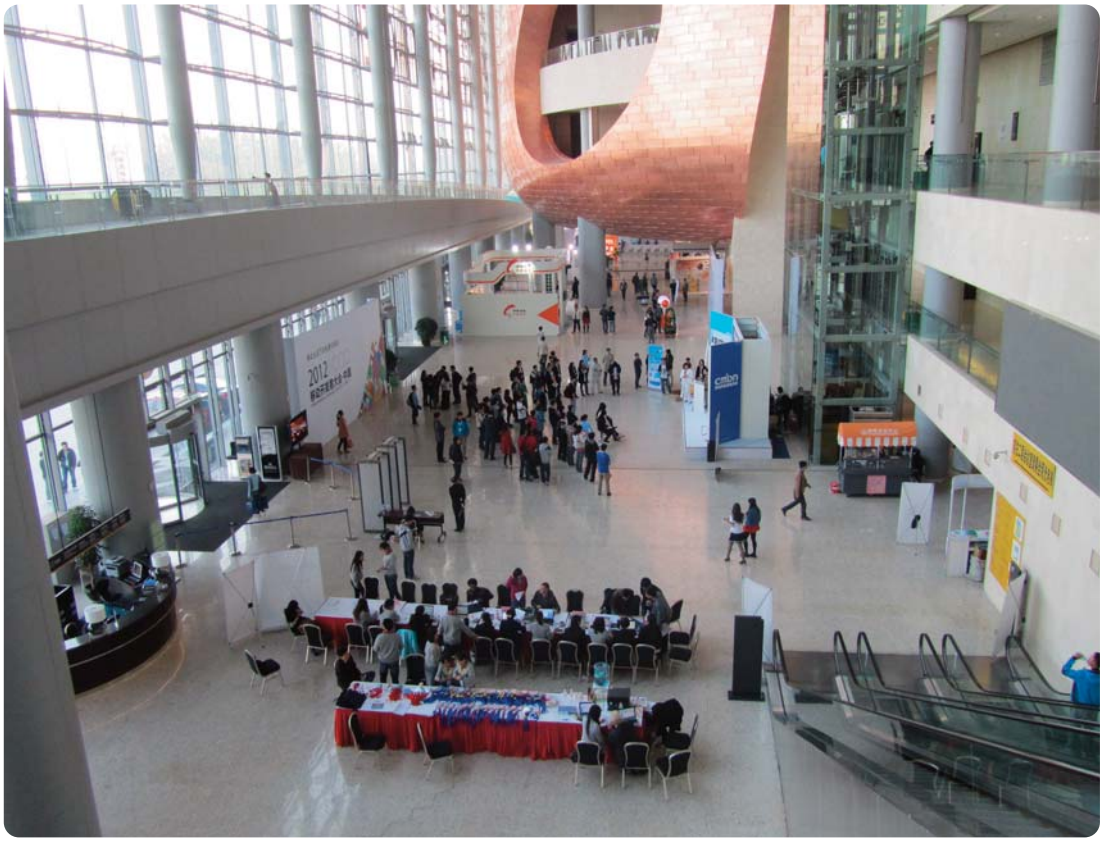
World Resources Forum



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Chairman's Summary

1. Over 700 participants from more than 50 countries convened in Beijing, China, October 21–23, 2012, to discuss the topic of "Resources and Green Economy" at the World Resources Forum 2012.

2. There was consensus that natural resources and the environment are subjects of common problems facing all countries in the world, with serious challenges for economic development, consumption and production patterns, and poverty eradication.

3. The Chinese approach of a harmonisation of the economy with ecology, or similar international initiatives by other countries, need to be implemented and followed by all.

4. A scarcity of resources, increasing prices, and unsustainable use of resources can hinder economic development, lead to poverty and social unrest; these factors pose risks for global stability.

Green Economy: how to make it happen?

5. Achieving a Green Economy should become a worldwide priority strategy for which the sense of urgency needs to be increased. Decoupling resource use and economic growth was considered to be possible and taking action was highly recommended. Some called upon countries to achieve an ecological footprint of one or less, by means of an industrial green revolution.

6. Policy answers have to include a shift of taxes from labour to resources, and improving data and indicators. Governments should create frameworks for resource-efficiency oriented innovation and explore underlying drivers for consumption, inspired and based on not only engineering but also behavioral oriented scientific research, involving youth.

7. Governments need to be alert to the growing spider web of bilateral resource agreements, in particular those involving developing and emerging countries.

8. Better international resource governance would be beneficial for all, since it would lead to stability, predictability and hence lower prices. Establishing a neutral international platform comparable to the International Energy Agency (IEA) should be considered for natural resources as well, involving developing countries from the start. This would lead to better transparency on the international commodity markets and to improved dialogue and cooperation.

9. Urban mining (recovering materials from waste) is getting more and more important, since primary production is becoming increasingly difficult and costly. Providing incentives for recycling and in particular improving collection systems are priority actions for governments at all levels and business.

10. Cities were seen as important agents of change for implementing decoupling strategies, as well as for preserving biodiversity and increasing the quality of life for their citizens at the same time.

11. The resources agenda has already been driving resource efficiency oriented product design. This trend is expected to continue, leading to a significant new wave of innovation spurring new economic growth. Bold business solutions need to include increased investments in more resource efficient products, services and systems, as well as in

designs based upon new (for instance, ultra-light) materials and renewable energy.

12. Phasing out or drastically diminishing dependencies on fossil fuels, in particular the world's addiction to oil and coal was considered to be technically and economically feasible for the next decades, with each country choosing its own path.

Green Economy: applications and perspectives

13. A large number of promising new sustainable business and city management solutions from all over the world were presented, including energy efficient life cycle building concepts, using renewable materials such as wood, chemical leasing, metal recovery and recycling, design for sustainability, urban mining, sustainable public procurement, ecosystem approaches for urban planning, and a wide variety of tools based on Information and Communication Technologies (ICT) such as E-vehicles. SME's have shown to be open to change; capacity building programs are very important to increase knowledge and improve skills of entrepreneurs on how to achieve more resource efficient and cleaner production. Scaling up successful capacity building programs such as SwitchAsia was seen as a challenge ahead.

14. Participants recommended further research to identify sustainable consumption and production drivers, setting up an international clearing house for SCP knowledge and actors, and finding strategies to achieve the potential for a bio-economy for increasing sustainable competitiveness. Increasing the sense of urgency, improving communication between policymakers and the scientific community, and further highlighting the business case for resource efficiency were considered among the priority topics for follow up events.

Closing and Next Steps

15. Participants expressed their appreciation for the World Resources Forum and its important role in establishing and improving dialogue and knowledge sharing between the various stakeholders, in particular business, scientific community, civil society and governments.

16. Chairpersons, speakers and participants thanked and congratulated the Chinese Academy of Sciences for its leadership role in organizing WRF 2012, and in particular admired the excellent organization of the event in the China National Convention Centre by the CAS Institute for Process-Engineering.

17. The next meeting of the World Resources Forum will be held in Davos, Switzerland, October 6 – 9, 2013.

Dr. Xaver Edelmann
President World Resources Forum

Prof. Jinghai Li
Vice President Chinese Academy of Sciences,
Chairman WRF 2012 Beijing

1. Plenary Session Stories

Jinghai Li

Xaver Edelmann

Jinghai Li (Chinese Academy of Sciences) welcomed the participants and speakers and announced that over 700 participants from over 50 countries were gathered in the China National Convention Centre to make sure that WRF 2012 would be a meaningful and successful event.

H.E. Ganjie Li

H.E. Ganjie Li (Vice Minister for Environmental Protection, People's Republic of China) stated that natural resources and the environment are subjects of common problems facing all countries in the world, with serious challenges for economic development, consumption and production patterns, and poverty eradication. The Chinese government aims at harmonising economy with ecology. Environmental protection is a very important, basic national strategy. The government is going to set up new policies to promote circular economy, including stringent monitoring and evaluation systems.

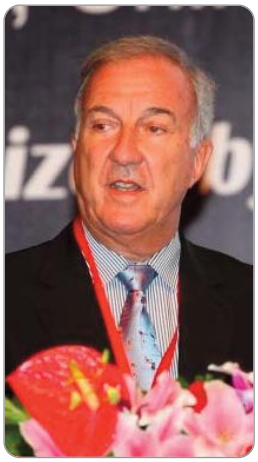
Xaver Edelmann (WRF) said that a decoupling of economic growth from resource use and environmental impact is needed. Resources are getting scarce, in a physical, economic, political, ecological or social sense. WRF 2011 had already recommended adequate policy instruments, such as taxes on resources, improving data and indicators, governments creating a framework for innovation, study consumer values and emotions, and working with young people. He welcomed the team of international Student Reporters, who would report about the event.

Bruno Oberle (Swiss Federal Office for the Environment) reminded the participants that one year ago – in Davos – we had discussed ways to decouple resource use from economic growth and that we talked about ecological footprints. In the Rio+20 conference – the UN Conference on Sustainable Development held in Rio de Janeiro, June 2012 – the international community has renewed its commitment of 1992. Oberle mentioned the adoption of a 10-year framework program on Sustainable Consumption and Production and said this will lead to concrete action. The concept of the Green Economy has emerged as a priority strategy. Greening the economy is a dynamic pro-

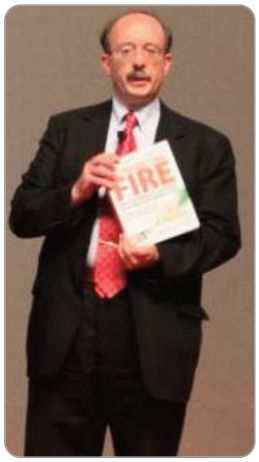
Bruno Oberle

cess. Resources and knowledge need to be combined differently. That is why the WRF is of great importance since it brings stakeholders together.

Arthur Ruf (Swiss Academy of Engineering Sciences) referred to a speech of Dennis Meadows at the WRF 2009 conference in Davos, where he introduced the key factors determining the amount of oil consumption, including population, economy and technology. Lifestyle and technological aspects were both important.



Arthur Ruf

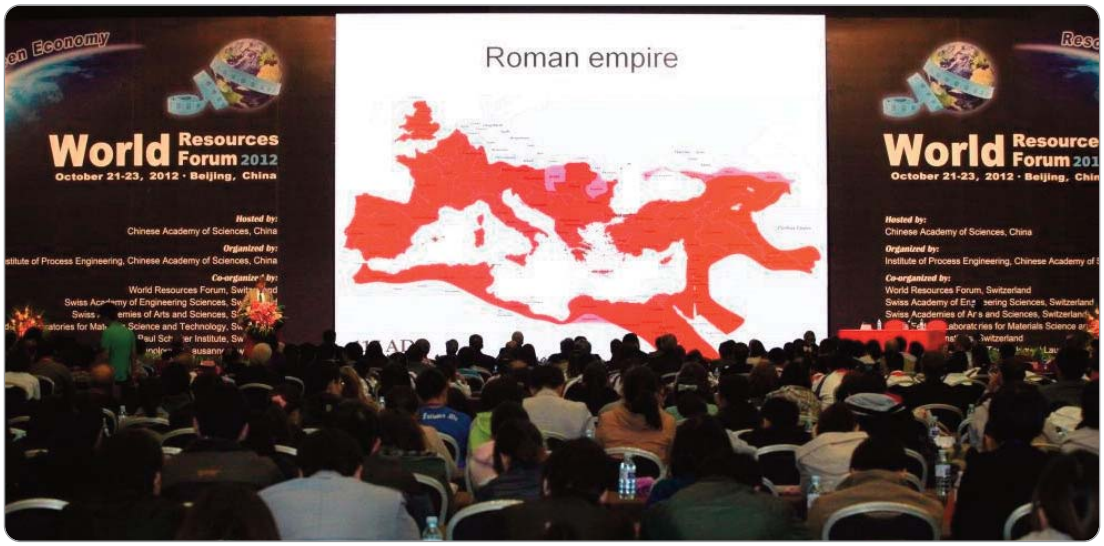


Amory B. Lovins

Green Economy: what are the challenges?

Amory B. Lovins (Rocky Mountain Institute) shared American solutions which could also be beneficial for other countries. His "Re-inventing Fire" book describes the way towards a profitable energy future, free from oil and coal. "We need new fire that makes us safe and endurable." Currently, 90% of America's energy comes from non-renewable energy. By 2050 energy systems can become efficient, connected and distributed. Business and civil society can do it. If a problem can't be solved, enlarge it (include more options), he quoted Eisenhower. As an example he mentioned the shift to electric cars, which is an equally dramatic shift as the one from typewriters to notebooks. This shift will double oil savings, made possible by new designs and using new ultra-light materials (carbon fiber cars etc.). Bold business solutions for the new energy era should make our "fire flow from above".

Gerben-Jan Gerbrandy (Member European Parliament) said that the resource hunger from the Roman Empire, about 2000 years ago, was enormous. Due to deforestation the Romans felt they needed to expand their empire to the North. The fall of the Roman Empire, Gerbrandy argued, was partly caused by resource scarcity. Today our world economy is addicted to cheap



Resource hunger 2000 years ago

resources. Increasing resource prices lead to social unrest in the world. He was convinced that an industrial green revolution is needed. Europe, as one of the most innovative regions of the world, is well placed to be the front runner. We should learn how to use fewer resources and use them in a much smarter way. The benefits, such as savings and job creation, far outweigh the costs. He referred to the road map for resource efficiency adopted in Europe. The analysis was received with great enthusiasm, but as soon as it became concrete member states backed down. For instance a collection system for electronic equipment in Europe was voted down. The sense of urgency needs to be increased. Use the economy (make secondary materials cheaper), innovate, focus on design, and implement measurable indicators and targets.

Gerben-Jan Gerbrandy

Something else, he added, is the threat that other countries will close their borders in order to keep scarce resources for themselves. They secure their supply by bilateral deals. Countries are creating a global spider web of resource dependencies: the USA with Brazil, China with Africa, Europe with Morocco. However, not everything can be dealt with in a bilateral way. Many countries are left out and this leads to instability and higher prices. The lack of transparency is a great concern. Stronger international governance for resources is needed. Doing things together will create stability, like the International Energy Agency (IEA) has stabilised oil markets in the past. A comparable new resources platform should not be an OECD club, but involve other countries from the start. China should be at the drawing table. This idea would need commitment from the Chinese Academy of Sciences and the World Resources Forum, which can lead to a joint effort of academics, business leaders, and politicians.

Mohan Munasinghe (Munasinghe Institute for Development) said he was addressing the "cream of the resources and business community" here in Beijing. He spoke of multiple threats and interrelated and synergistic crises, for which integrated and comprehensive solutions were needed. He observed a lack of political will by world leaders. Poor countries and poor groups are most vulnerable. Compared to global military spending of USD 1.75 trillion in 2011 and recent government bailouts in the financial sector, it takes "pocket money to achieve sustainability". Business as usual – enjoy the resource and pay later – poses unacceptable risks for the future. And he reminded the audience that the solutions are within the *Sustainomics* framework, which he already introduced to the Earth Summit in 1992, and which is a transdisciplinary, integrative, comprehensive, balanced, heuristic and practical framework for making development more sustainable.

Unsustainable development is driven by wrong values, such as greed, selfishness, corruption, inequity, and violence. He called the WRF very important for bringing business and civil society together for talking with government leaders. China has a key role, as second largest economy. It has the technology, the resources and skills, and the ancient culture which respects nature. He had a "mildly optimistic message for China and the world: WRF and China can play key roles in devising new sustainable development models for the 21st century.

Mohan Munasinghe

Munasinghe also referred to the Gross National Happiness (GNH) project, which is conducted with the government of Bhutan. He expected that this project will lead within ten years' time to a replacement of the current GDP (Gross Domestic Product) by an indicator which measures happiness by other data than material consumption.

Lothar Reh

Lothar Reh (Swiss Federal Institute of Technology; ETH) talked about the challenges in process engineering in the circular economy. He showed the long distance flows of used paper and other examples. Atmospheric CO_2 concentration will rise to uncertain levels. Increasing energy and material efficiency is a must. Innovative life cycle processing has to be achieved, he concluded, "so that we can stay cool!"

Max Lu (University of Queensland) spoke about the role of emerging technologies. Resource efficiency requires a shift of attention from processes to products. If we want to keep on turning our globe we should do it with care, face the challenges and adapt to change. Biopharmaceuticals, biopolymers, alternative fuels and functional materials are driving industrial innovation. We are on the threshold of a revolution

in the ways in which materials and products are created, resulting from nanotechnology.

Green Economy: how to make it happen?

Yi Kang (former Minister of Metallurgical Engineering, People's Republic of China) presented the achievements of exploitation of non-ferrous metal resources in China. Mineral output has been growing significantly. China has important shares in the global output and consumption for refined copper, virgin aluminum, lead and zinc. A comprehensive use of resources is the most effective way for building a resource efficient and environmentally friendly industry, as well as clean and smart mining practices. There are urban mining demonstration projects ongoing, such as a take-back system of secondary nonferrous metal, in particular in electronic goods. China has a huge economic potential, and is now at a strategic crossroad. It can become a strong non-ferrous metal country. The domestic market is expanding and is now a cornerstone for the industry. China is facing international challenges, he said, due to increased competition by developed countries who try to get hold of resources. These countries have more opportunities than developing countries. In the global top ten there is only one Chinese company. China faces huge environmental protection measures and will step up international cooperation.

Yi Kang

Thomas Graedel

Thomas Graedel (Yale University, USA) asked whether we are designing ourselves into potential difficulties, since modern societies cannot exist without metals. Challenges of metal supply can be seen on the periodic table of elements, which he called "a great playground for engineers and industrial designers". Nature does not provide these elements equally. Some of them are abundant, some of them are scarce. Ore grades are decreasing over time. So it takes more energy and rock to get the same amount of metal. This poses geopolitical challenges. As an example he showed an image of the international interdependences of the UK economy for resource supplies. The recycling challenges include that recycling may sound easy, but that we are not very good in it. We just don't get the materials where we can deal with it (collection problem). For instance, many obsolete electronic products still land up in trash, sometimes with backyard recycling done in India. He referred to the work of Empa in this field. Looking at the end of life recycling rates for 62 metals he concluded that for most of them these are (far) less than 50%. Limitations to the long-term supply of a full palette of materials are in sight.

James Bradfield Moody

James Bradfield Moody (Commonwealth Scientific and Industrial Research Organisation) presented new business models and opportunities for a resource-limited world. For him innovation is a process, starting with an idea, going to a point where somebody uses it, driven by needs and markets. He presented his book The Sixth Wave, which points at innovation based upon resource efficiency. The old mode of operation – harvesting resources that are plentiful and cheap – is being replaced by the new mode of operation: managing resources that are scarce and valuable.

Green Economy: what are the success stories?

Edward Clarence-Smith (United Nations Industrial Development Organisation; UNIDO) talked about green industrialisation, in particular about the strategy of selling services rather than goods (e.g. leasing). This has strong environmental advantages: the goods can be used more efficiently and for longer periods of time, less goods are sold, which means that less materials are consumed. They can be recycled better at the end of their useful life. He presented as an example a case of water purification and oil dehydration in Colombia, where chemical leasing led to economic, environmental and social benefits.

Edward Clarence-Smith

Joachim Klink

Joachim Klink (Hewlett-Packard) presented an "intelligent mobility business value framework". Congestion slows down the economic growth of cities. As an example he referred to the worst traffic jam ever: it was in China in 2010, and was 100 km long, lasting for 10 days. The economic costs of congestion in the US and Western Europe are 1–1.5 % of its Gross Domestic Product. Furthermore, pollution resulting from traffic jam is a major threat to individuals and society. Globally over 1 million of deaths per year are due to traffic caused air pollution. Intelligent mobility systems lead to increasing efficiency, providing more travel options, improving information, improving pricing and payment, and reducing or avoiding travel. HP has developed the so called connected E-Vehicle approach. Referring to a case study in the Chinese city of Hijang he showed that e-mobility could be made attractive with monetary and non-monetary incentives (no license limitations, extra parking space, longer parking time, priority bus/taxi lanes).

Stephan Wabnegger

Markus Reuter

Stephan Wabnegger (Creative Resource & Energy Efficiency, CREE) presented the Life Cycle Tower concept, which is, as he said, a method of construction for future cities. Minimal consumption of resources, using wood, economical and energy efficient, less expensive, adequate space on a small footprint, and short time for planning and designing. Life Cycle Tower One, located in Austria, was completed in September 2012; the second one is under construction.

Markus Reuter (Outotec) talked about recycling, and concluded that in the field of mineral processing there is a good understanding about the solutions and obstacles between all actors "from rock to metal". Breaking off "designer" minerals (for instance from cars, mobile phones etc.) is far more complex than geological minerals, in particular because of their complicated recovery. Still, metals recovery and recycling are not new topics, but rather have a long history.

Workshop highlights

Closing the loop requires a much deeper understanding between all actors than is the case presently. If this is achieved, resource efficiency will improve significantly.

Bas de Leeuw

Bas de Leeuw (World Resources Forum) presented the draft chairman's summary and led the plenary feedback panel session of the most important findings of the workshops.

Christian Ludwig (Paul Scherrer Institute, PSI; scientific co-chair of the WRF) said that we do not need a DaVinci Code to solve the resource crisis. He thanked the other scientific co-chair, Suojiang Zhang, and all oral session and poster presenters for their contributions. His personal scientific highlights included presentations from Sam Pickard, Komal Habib, Shemaiah Weekes, Zhong Lin Wang, Chang-Jun Liu and Helmut Langer.

Christian Ludwig

Stefanos Fotiou (UNEP) reported that in the special briefing on UNEP's Sustainable Consumption and Production (SCP) and resource efficiency activities a SWOT analysis was made for sustainable development. It was concluded that economic "mal-growth", unethical social values and environmental debt lead to inequality. Economic development, social empowerment and environmental resilience lead to better wellbeing. For Asia and China SCP is an important concept.

Stefanos Fotiou

He mentioned sustainable public procurement as one of the key strategies. For metals recycling more efficient collection is needed, better dismantling, cutting, sorting, and smelting, linking primary metal producers and recyclers, transparent movement of discards across national boundaries and financial incentives to make recycled metal more interesting. He invited participants to come to Bangkok to attend the "SCP Engine" Conference (12–13 November 2012).

Rui Zhang (World Resources Forum) reported about the Urban Eco-Efficiency Lab on cities, biodiversity and ecosystems. Ecological solutions for sustainable cities exist and need to be multiplied. She mentioned as examples of such

Rui Zhang

Lewis Akenji

ecosystem approach forested wetland for water purifying, green roofs, urban parks, "urban compact cells" for less automobile dependent life, ecosystem supported local economy, and food security through urban agriculture. In particular Information and Communication Technologies (ICT) have great potential for a more efficient urban life. Furthermore it was concluded that buildings can be built much faster, easier and with renewable materials.

Student Reporter Adam Wong presented the outcomes of the workshop on Circular Economy, where it was suggested to consider regional development strategies for China, in order to improve resources and waste management. The concept of "Township Building" could lead to intensive cooperation of villages.

Lewis Akenji (Institute for Global Environmental Strategies) presented a summary of the workshop on Balancing Poverty Eradication and Sustainable Consumption and Production in Asia. They had observed a large scale transition in many Asian countries away from an agricultural base towards an industrial economy. Although technological development improves material efficiency, overall resource use increases. The problem is not mainly population growth but growth of consumption. Traditional practices of consumption and productions should be examined to find solutions for a more sustainable future. Sustainable livelihoods should be built by targeting SMEs (for instance through the SWITCH-Asia program), engaging communities and being in line with local environmental conditions. The workshop participants recommended to develop a framework for Sustainable Consumption and Production (SCP) research, analyse current state of SCP literature, map the movement of practitioners, and to create an online database of SCP knowledge and practice.

Frans Verspeek (UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production) shared achievements and lessons learnt in the SWITCH-Asia Programme. The project promotes sustainable con-

Frans Verspeek

Christopher Manstein

Mathias Schluep

sumption and production patterns in Asia, notably by mobilizing the private sector, i.e. SMEs, retailers, intermediary producer and consumer organisations, financial sector along with relevant public sector authorities. For resource efficiency to be effective, reaching out to a large number of target audiences is necessary.

Christopher Manstein (German Federal Environment Agency) said that the workshop on resource-efficiency was very interesting because of the different perspectives between European and Asian policies. Europe and its member states have a good policy framework for resource efficiency, but policy need to be turned into action. Making the business case for resource-efficiency and showcasing best practice examples should be a focus topic of the next World Resources Forum.

Mathias Schluep (Empa) presented a joint statement from the participants of the workshop Urban Mining, Challenges and Opportunities, which discussed synergies between e-waste recycling and mining of mineral resources. They are aware that Asia needs large quantities of mineral resources to support its growing economy, and that Asia is endowed with large deposits of mineral resources ("primary mines"). They recognise that Asia is increasingly accumulating mineral resources in end-of-life products, such as waste of electrical and electronic equipment (e-waste) and that "urban mines" offer opportunities to create jobs and to lower environmental impacts by partially substituting primary mineral resources. The participants are concerned that mineral resources from urban mines are recovered only partially at low material recovery rates and often at high social and environmental costs. They recommend to make use of the knowledge from primary mineral resource extraction and refining in urban mining; develop know-how and physical infrastructure (collection and treatment) for urban mining; promote the trade of pre-processed secondary mineral resources on a global scale where investments for further resource extraction and refining cannot be justified from the perspective of sustainable development; make use of the experience from current responsibility standards in the primary mining sector to complement existing standards in urban mining, and develop resource policies considering the systemic, global and multi-stakeholder character of urban mining.

Heinz Gutscher (Swiss Academy of Arts and Sciences) presented some results of the workshop that had explored the question why the sense of urgency that scientists feel about resource efficiency has not reached mainstream politicians, business and individual households.

Heinz Gutscher

"When will they start listening to us?" he asked, "What do you mean? We can't see. We can't hear. We can't feel. We don't understand! Why do you ask?" He identified three variables - perceiving, assessing and acting - as the main modules to achieve change in behaviour. He argued that the issue of urgency has first to be recognized with our sensory system and then understood, in order to cause sufficient action in result.

Liisa Tahvanainen

Liisa Tahvanainen (Koli Forum) presented the results from an interactive panel discussion on Sustainable Management of Forest Resources and Wood Constructions. Bioeconomy should become a driver for European sustainable competitiveness by promoting biomass based new products and energy, setting global criteria for the sustainable bioeconomy sector, initiating international commitments on global key targets and measures, accelerate the use of best available technologies, knowledge and practices, and having a minimum of 20% of public building and construction wood based. A quantitative survey among the participants revealed that these factors were applicable for China as well. The forest resources of China would be best used for sustainable development if they were used for commercial purposes, for wood construction, as carbon sink and for recreation and nature parks.

Aishwarya Singh Nair

Aishwarya Singh Nair, one of the coordinators of the Student Reporters, showed a hilarious video with the students' impressions of the conference, including practical information about how to eat with chop sticks.

Audience discussion

Closing

Arthur Ruf (SATW), Xaver Edelmann (WRF), Suojiang Zhang and Jinghai Li (both CAS) presented awards, closing speeches, and words of thanks to all speakers, participants and staff.

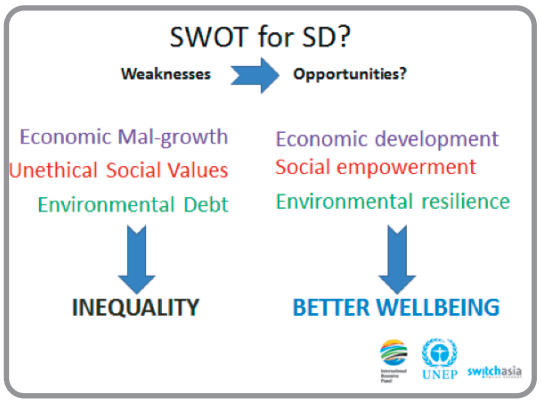
The next World Resources Forum will be held in Davos, Switzerland, October 6–9, 2013.

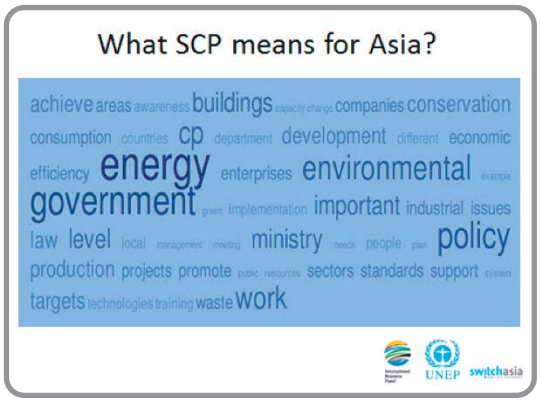
Impressions Conference Banquet

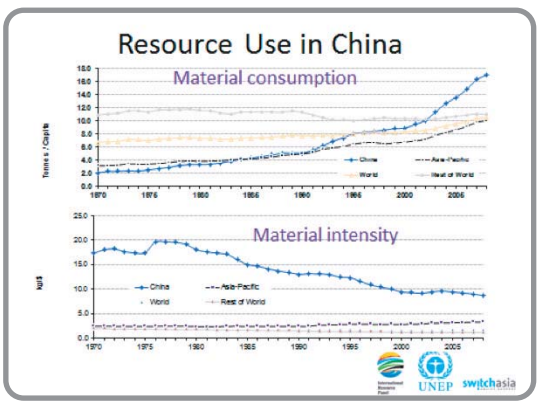
2. Selected Workshop Highlights

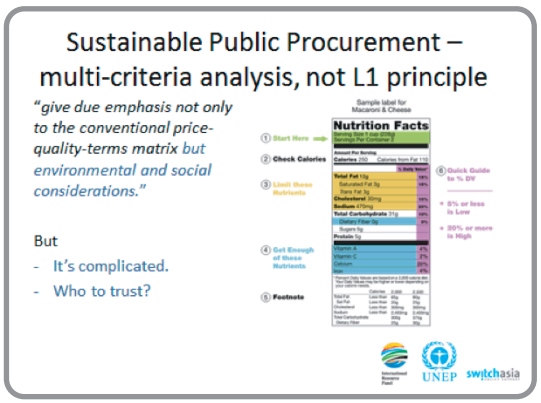
Special Briefing on UNEP's latest findings in Resource Efficiency

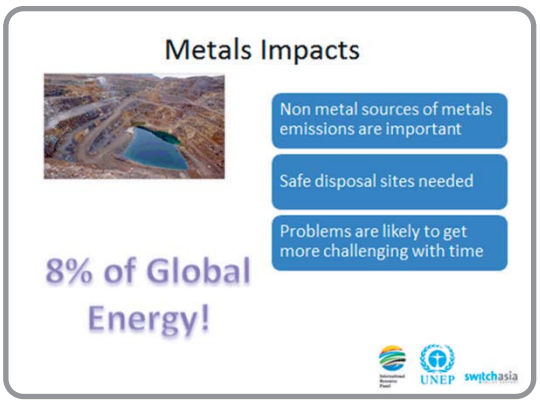
Organised by UNEP
Slides: Stefanos Fotiou

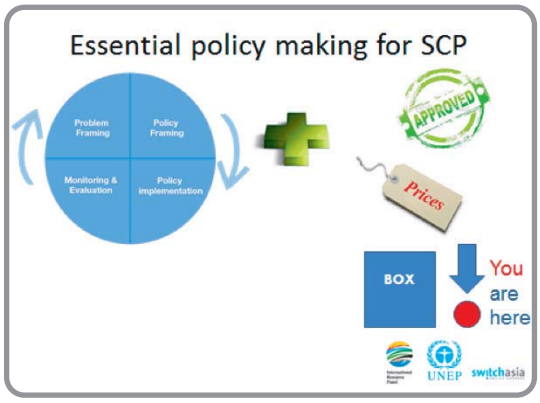












Urban Eco-Efficiency Lab - Cities, Biodiversity and Ecosystems

Organised by World Resources Forum Secretariat
Report: Veronika Rékasi, based upon inputs of speakers and participants

The Urban Eco-Efficiency Lab was one of the workshops of the conference organised by the Secretariat of the WRF. The Lab was focusing on ecological and technological solutions for sustainable cities, which are featured by greater efficient urban life, environmental-friendly urban infrastructures, and increased capacity for accommodating the rapid urban growth within the ecological boundaries. The presented solutions include ICT strategy and tools for smart urban transportation and efficient urban life, planning with ecological approaches, and "replicating" buildings that can be built much faster, easier and with renewable materials.

The moderator of the workshop, **Dr Xaver Edelmann** opened the event at 8:30 am with a short retrospection of the week before. The World Resources Forum was also present at the conference COP11 in Hyderabad, India, with a side-event organized on the same topic. The Urban Eco-Efficiency Lab in India was a great success, with a lot of participants and very promising ideas and initiatives. That was the first step of a joint-project directed by WRF and the Secretariat of Convention on Biological Diversity in the field of sustainable and bio-diverse cities. Dr. Edelmann delivered the apologies of Mr. Oliver Hillel, Program Officer of the Secretariat of CBD, who unfortunately could not join the workshop this time. After this short preface, he welcomed the participants, highlighting the Student Reporters presence and introduced the speakers:

- **Rui Zhang,** Program Associate, World Resources Forum – Presenting the WRF Background Paper
- **Luis Neves,** Climate Change and Sustainability Officer, Deutsche Telekom AG, – ICT

Xaver Edelmann

Luis Neves

Enabling Energy efficient and Sustainable Cities

- **Stephan Wabnegger,** CEO of Cree GmbH, Austria – The Natural Change in Urban Architecture
- **Sibylle Rock,** WW Stakeholder Engagement Manager, Hewlett-Packard, USA – Simple City: The Impact of ICT.

Xaver Edelmann anticipated that we need practical solutions and actions, not just theoretical papers. We need concrete and standardized indexes in order to make sustainability measureable, and we have to strengthen the cooperation between initiatives. He recommended reading the booklet on Cities and Biodiversity Outlook to get a clear picture about the situation of the urbanized areas.

Rui Zhang presented the WRF Background paper, highlighting the advantages of the intelligent use of ecosystems. At city level, eco-efficiency can be particularly useful for integrated planning, because a city is a multi-sectorial, multi-stakeholder system and its ecosystem is a common asset to all. Cities need ecosystems services and biodiversity to dispose of waste, purify freshwater, clean up pollution, reduce energy needs through temperature regulation in heat islands, and maintain its citizen's health. A network of parks increases surrounding property values by up to 20% and creates local jobs; green parkways generate businesses as urbanites look for cleaner air. Using just the technology we already have (public transportation, bicycles, electric cars, natural cleaners) we can reduce our footprint and the loss of biodiversity.

Luis Neves started with the vision of GeSI (Global e-Sustainability Initiative): “Responsible ICT creates a sustainable world”. This should become real as soon as possible. At the moment, if all the inhabitants of the Earth would live like an average-European, we would use the resources of

Rui Zhang

Stephan Wabnegger

3 Earths. If they lived like an average American, we would use the resources of 5 Earths. If we look back at the history of humanity, we can see many civilisations that collapsed after a few centuries of prosperity. We are going in the same direction: building a huge population without considering the impacts on nature. ICT is very important in reducing our footprint, although the discussion on its positive impact is very rare in organizations. But ICT is the future, it has transformed the world. Videoconferences and laptops were just dreams 20–30 years ago and now they are real. If we consider for example a China-Germany flight, it creates pollution; instead we could use videoconferences to do the same. It would be much more sustainable. We would save a notable amount of resources. By 2020 CO_2 emissions of the ICT sector will represent an estimated 3% of total global emissions; in the same time ICT has the potential to cut global CO_2 emissions by as much as 15% and save up to 600 billion euro. Teleworking could reduce the CO_2 emissions by millions of tons. Smart motors, smart logistics and smart buildings are all assets to reduce our environmental impact and to live a better organized, simpler and greener life. Countries should learn from each other. Smart buildings have the highest efficiency in the USA, transportation is best organized and most effective in Europe, while energy production and use is best managed in India. In his closing Mr Neves asked the audience to look at all the potentials provided by ICT, because humanity has already everything to live a better and more sustainable life. We just have to use them.

Xaver Edelmann noted that in 2009, parallel to the World Resources Forum in Davos a similar event was held in Nagoya, Japan. The two congress sites were connected via teleconferencing technology, so the WRF Davos and the WRF Nagoya had common plenary sessions and technology enabled the remote participation.

Stephan Wabnegger explained the architectural side of urban efficiency. His key question is "How will we live tomorrow?" We will face 3 billion new members of middle class society. Actually this is good news, because it means reduced poverty, but on the other hand these people need more resources. How do we face this? Mr Wabnegger showed us one way to solve this problem: growing to the sky. Growing to the sky, but accounting for the resources we use. To produce a very light object, we use multiple times more resources from the Earth than when producing a heavier object For example, to produce a 0.3 kg mobile phone we use 500 kg of our resources. The production of a 5 kg computer consumes 1500 kg of materials. Bearing this in mind, how should we build our cities? They should meet the following requirements: Minimal consumption of resources, energy efficient, economical, fast, adequate space on a small footprint. CREE GmbH decided to use wood for their buildings, because wood is renewable and it is CO_2 neutral. In the production of 1 m^3 of cement building material 1.700 kg CO_2 is emitted. If we are talking about steel, then this rate is around 6.800 kg CO_2. In case of wood, the CO_2 emission is - 960 kg. This means not just CO_2 neutral, but CO_2 consuming. In addition each building item is designed for being recycled at the end of its life. This hybrid-timber prefabricated construction system developed by CREE allows building up to 30-story houses. This all sounds spectacular, but what about fire proofing? Interestingly this hybrid-timber is more resistant to fire than steel. This great practice works fine in Austria, but it has difficulties in other countries. Unfortunately the local law cannot be standardized, and all the standardized building blocks have to be changed from country to country. The participants were interested in where the market of wood buildings could be extended. They agreed that in China this method could be implemented with great success, as a lot of raw-materials can be found and the building sector is emerging. Japan arose as well as a possible market, because in Japan wooden houses are very popular. Another question from the audience referred to whether the CREE is targeting developing or developed countries for

its market. Particularly, when cities with growing wealth are looking for individualism and identity, to what extent they would embrace "standard" buildings? Mr Wabnegger said that these buildings are generally as expensive as normal ones in developed countries. Clearly the idea would be to transport the technology to developing countries. He also said that it is "the decision that we have to make between luxury individual consumption and our responsibility for the common interest through resource efficiency".

Sibylle Rock

Sibylle Rock presented the efforts of Hewlett-Packard to build a more sustainable future. HP's strong commitment to environmental sustainability can be recognized from all the green rankings and awards it has earned. ICT companies have a big responsibility in solving environmental challenges. HP is taking huge efforts to follow up its products life-cycle. Partnering with its suppliers, nongovernmental organizations (NGOs), and other industry leaders, HP can promote sustainability at every stage of the IT supply chain. HP provides Asset Recovery services, where customers can return their products at the end-of-life. A question arose from one of the participants whether this recovery service covers just HP products or products from other brands as well. In China, it is a huge problem dealing with all the smart phone copies circulating on the market, and being thrown away after some months of use. ICT companies are taking efforts in order to get back more products after use. Recycling and recovering a certain percentages of the sold products is regulated by law in the European Union. Mr Neves mentioned the importance of the co-operation between organizations in order to achieve better results in recycling e-waste. Ms Rock described the main idea of two impressive HP inventions: The HP Pod 240a - nicknamed the HP Eco POD – a modular datacentre, deployed in Georgia, Texas. Each HP Eco POD offers the equivalent of nearly 9,000 square feet of traditional data centre IT in a 900-square-foot package and in the same time uses 95% less facilities energy when compared with traditional data centres. The other invention is called Energy Sustainability Systems (ESM) software, which analyses, monitors and optimizes energy consumption and CO_2 emissions. It provides solutions on integrated management and reporting of financial and sustainability key performance indicators. Using this software we could save up to 10% of the city's costs. Ms Rock claims: "ICT is a key enabler to improve the quality of urban life while reducing the CO_2 emissions in times of global urbanization."

At the end of Ms Rock's presentation, she announced the brand new project of HP in Intelligent Mobility. The connected E-vehicle solution will be implemented in China, and with a short video we could learn about the structure of the project. The intelligent electric cars are connected to a smart traffic system which makes them able to find always the nearest charging station and to avoid the traffic jams. Taxis are running on electric batteries as well, and with a well-organized dispatching centre passengers are assured to always travel by cabs with sufficient battery. The project was presented one day later in the plenary speech by Joachim Klink, Director of the Global Automotive & Aerospace Industry Architect, Hewlett-Packard.

The workshop ended with an active discussion on the presented ideas. As China is one of the fastest growing countries, huge efforts are taken to build cities in an eco-efficient way. Chinese city managers are trying to get all the knowledge from

developed countries. But it remains the question whether all these visions will be implemented. Rui Zhang commented that while the eco-city concept is becoming popular and feasible, emerging cities and new urbanized areas are having more opportunities nowadays to become “eco”. However, it seems that more thoughts should also be given to the transformation of old cities into smart and green cities. Sibylle Rock explained that in China it is easier to implement a new mobility system than in Europe. Especially because in Europe people are used to just a few big vehicle producers. Chinese consumers could be more open for new mobility technologies.

The workshop ended with an active discussion on the presented ideas.

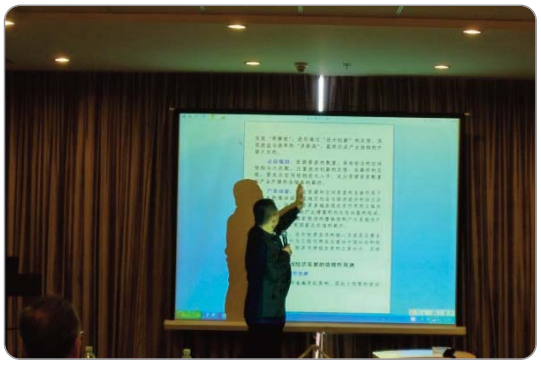
Circular Economy and Green Process Engineering

Organised by Chinese Academy of Sciences/Institute for Process Engineering
Report: Adam Wong and Martin Lehmann, based upon presentation in the workshop panel by Adam Wong

The Circular Economy workshop was attended by roughly 30 participants from various countries.

Jiankun Song talked about the "Resources Capacity of China". In China, there has been a huge transformation of production going on during the last 10–15 years, from labor and commodity centered to technology centered production. Although China is a very big country, this development has obvious impacts on the space with its natural resources and landscape.

The space factor is therefore a very important issue to look at. Dr. Song suggested considering more regional development strategies for China, in order to take up more collective resources and waste management. This way, resources and waste recycling can be managed more efficiently. He claims that "Township Building" is the keyword in this process, which would lead to an intensive cooperation of villages. Farmers should work closely together, using their products and waste in a circular way. For example farmer A producing vegetables could offer his waste material as fertilizer to farmer B who is producing rice. Win-win situations have to be created, and everybody should join in.



Jiankun Song

As a result, resources will be allocated in a better manner, and their focused management will lead to different innovations. Technology is not bad per se, but it has to be applied for beneficial purposes, meaning that it has to lead to useful innovations to manage space, resources and waste. For a better future?!

In China, there are however challenges that have to be tackled. There seems to be different interests between the central government and the local governments. Farmers may be under pressure because local governments need to achieve different indicators set by the central government.
A possible solution could be to set up specific guidelines targeting different regions in China.

Balancing Poverty Eradication and Sustainable Consumption and Production in Asia and the Pacific – Challenges for Policy, Research and Practice

Organised by the Global Research Forum on Sustainable Consumption and Production
Report: Lewis Akenji

At the recently held Rio + 20 UN Conference on Sustainable Development, governments reiterated the central role of sustainable consumption and production (SCP), declaring once again that "fundamental changes in the way societies consume and produce are indispensable for achieving global sustainable development." This workshop, organised by the recently launched Global Research Forum on Sustainable Production and Consumption (GRF-SPC), explored the relevance of SCP in Asia, in particular the challenges for policy, research and practice in relation

to balancing poverty eradication and Sustainable Consumption and Production.

Lewis Akenji (Institute for Global Environmental Strategies, Japan) introduced the objectives of the workshop, linking it to the GRF's aim to create a research framework for SCP that answers to the needs of different constituencies. He explained the global mandate for SCP, relating it to the 1992 Rio UN conference where SCP was declared an overarching objective of sustainable development as well as the Rio + 20 UN Conference where the 10-Year Framework of Programmes (10YFP) was affirmed with a view to supporting SCP action at the regional, national, sub-national and local levels. Both conferences recognised that there are imbalances in consumption between North and South, and asked for a multipronged approach to address the needs of these different groups.

Mohan Munasinghe (Munasinghe Institute for Development, Sri Lanka and Sustainable Consumption Institute, UK) gave an overview about the global challenges associated with a movement towards more sustainable production and consumption. In particular, he pointed at the global financial crisis, resource scarcity, poverty, climate change and misgovernances.

Heinz Schandl (Social and Economic Sciences Program, Australia) then focussed on the challenges faced within the Asian-Pacific region. He demonstrated that there have been large scale transitions in Asia from agricultural base societies towards industrial base economies. Although there have been improvements in material efficiency, at the same time there has been a rise in material intensity and overall resource use as a result of these transitions. In addition, he highlighted an increasing global transfer of production of goods from high-efficiency economies to low-efficiency ones. All three speakers agreed on the urgent need to reduce material consumption by the economically wealthy while increasing the material consumption of the economically poor and called for a shift away from a distinction between rich and poor countries towards rich and poor consumers.

The workshop then turned towards possible solution pathways. On a global scale, the millennium consumption goals and the need for new matrixes to measure well-being were discussed. On a more local scale, Ying Feng (Institute of Scientific and Technical Information, Ministry of Science and Technology, China) described how traditional consumption and production practices in China could give inspiration for a more sustainable production and consumption future.

Frans Verspeek (SWITCH Asia, Germany) promoted the support of Small and Medium Enterprises in order to create sustainable livelihoods that engage communities and stay within the boundaries of local environmental conditions. He also highlighted the importance of capacity building and bringing Small and Medium Enterprises into the global value chain, for example through the instrument of product labelling.

Leonie Dendler (Sustainable Consumption Institute, UK and Tyndall Fudan, China) explained how the effectiveness of such product labelling schemes in facilitating more sustainable consumption and production is driven by a dynamic construction of legitimacy between a variety of actors, including not only consumers and producers but also retailers, civil society, media, governmental and non-governmental organisations.

Patrick Schroeder (China Association for NGO Cooperation, China) expanded on the power dynamics between such actors groups in a Chinese context. In particular, he focussed on the role of civil society and governmental organisations and the related effectiveness of bottom up versus top down policy approaches. All presentations stressed the importance of taking into account and enhancing our understanding of how social and physical infrastructures and their interactions direct consumption and production, including their differences across geographical scales.

Upscaling mechanisms for Sustainable Consumption and Production – achievements and lessons learnt in the SWITCH-Asia Programme

Organised by UNEP/Wuppertal Institute Collaborating Centre for Sustainable Consumption and Production, Germany
Contributions to slides/report: Frans Verspeek, Akash Arasu

The workshop highlighted the importance of linking and interconnecting projects in different regions because they can learn from each other and share results when appropriate. There has been a strive to upscale projects to bring them to a larger macro level and Switch Asia helicopters and monitors such projects and communicates the messages learnt and results contrived to the outside world and general public.

Ultimately there are five leverage points

- Service providers
- Engaging policy makers
- Supply chain engagement
- Access to finance
- Engaging with consumers

The first two projects presented dealt with mainly increasing control in the transformer industry for small businesses and the effective marketing and growth of the bamboo industry in Asia.

The third project deals with the bringing together of small businesses and larger governmental entities. Erik ter Avest representing a Dutch national agency addresses the importance of greening small businesses and linking them to the public sector. There must be voluntary public and private partnerships (PPPs).

In marriage, who asks the hand of whom? Does the boy ask the girl, or vice versa? – "Neither. In China, they both ask each other at the same time" (Erik ter Avest)
How to encourage efficiency? – "Use a carrot, and a very hard stick" (Erik ter Avest)

The fourth project brings the idea of sustainable consumption in civil society. It focuses on large cities, namely Beijing and Tianjin. These heavily populated cities have large numbers of people with strong purchasing power. With proper education on all levels, the spread of green consumption is feasible.

Resource efficiency strategies in Europe – The EU Roadmap and examples for national implementation

Organised by German Federal Environment Agency
Report: Christopher Manstein

The consumption of natural resources already far exceeds the earth's capacity for regeneration. Careful handling and efficient use of natural resources will become a key competence of sustainable societies. Increasing resource efficiency can reduce pollution and waste, strengthen competitiveness, create new jobs and ensure sustainable employment.

Against the background of the "Roadmap to a Resource Efficient Europe" published by the European Commission and the "German Resource Efficiency Programme" (ProgRess), the German Federal Environment Agency presented at this workshop resource efficiency strategies in Europe and examples for national implementation.

In his introduction, moderator **Christopher Manstein** (German Federal Environment Agency) gave an overview of recent EU resource policy developments in general and of the so-called "EU Roadmap to a Resource Efficient Europe" which was published by the European Commission in September 2011. He also presented a report of the European Environment Agency titled "Resource efficiency in Europe", which describes policies and approaches in 31 EEA member and cooperating countries.

"Bottom-up action for resource efficiency in the Netherlands" was the title of the following speech by **Arnold Tukker**, Business Line Manager Societal Innovation & Economy from TNO (the Netherlands). Mr Tukker pointed out that both approaches, bottom-up and top-down, are needed for a successful resource efficiency policy.

Christopher Manstein subsequently presented the "Germany Resource Efficiency Programme (ProgRess)". ProgRess is - together with the "Austrian Resource Efficiency Action Plan" – the first national implementation of the EU Roadmap. ProgRess was adopted by the German Federal Cabinet in February 2012. One of the starting points of ProgRess was the fact that in Germany materials account for 45% of the cost in manufacturing and that Germany depends very much on imports. Resource efficiency can lower production costs and decrease dependency from imports. The goal of ProgRess is to decouple economic growth from resource use, to reduce environmental impacts of resource use and to improve the sustainability and competitiveness of German industry. With this, German resource productivity should be doubled by 2020 in comparison to the year 1994.

Gerhard Weihs, director of Centric Austria International, then presented "ECOPROFIT – A global case study from Austria" as a best practice example. ECOPROFIT is a strategy to achieve resource efficiency in SMEs. It was adopted on four continents and in dozens of countries. ECOPROFIT is a win-win solution for entrepreneurs and the environment. It requires local governments, local policies, industries, businesses to work together.

Finally, **Yi Heng Cheng** (Managing Director of HAMC) presented the topic "From Country Strategy to Pan Asian". He recommended the development of a Pan Asian Resource Plan. Mr. Yi Heng Cheng: "We shouldn't look at what belongs to which country, we should better try to find modern technologies and share them".

The workshop concluded with a panel discussion "Successful strategies and approaches for Europe and Asia – What can we learn from each other?"

Results of the workshop and the discussions (feedback of participants):

- "Interesting workshop" because of different perspectives/levels of resource efficiency (European/national policies, bottom-up action, company level, Asian relevance)
- Europe and member states have a "good policy framework" for resource efficiency
- But: "Turn policy into action!"
- Resource efficiency: "academic approach" or solution for companies?
- There is strong interest in business cases and implementation of resource efficiency (good-practice examples of resource efficiency). This should be a focus topic at World Resources Forum 2013.
- Resource efficiency should be "voluntary for business"
- "Stakeholder dialogue" is helpful
- Resource efficiency is not only a technical issue but is also an interesting and new instrument for management

Urban Mining, Challenges and Opportunities – synergies between e-waste recycling and mining of mineral resources

Organised by Empa, Switzerland
Report: Mathias Schluep

The participants of the workshop "Urban Mining: Challenges and Opportunities" focusing on metals from e-waste

- are aware that Asia needs large quantities of mineral resources to support its growing economy (infrastructure, production of consumer goods);
- are also aware that Asia is endowed with large deposits of mineral resources (in so called "primary mines");
- recognise that Asia is increasingly accumulating mineral resources in end-of-life products, such as waste electrical and electronic equipment (e-waste) (in so called "urban mines");
- also recognise that urban mines offer opportunities to create jobs and to lower environmental impacts by partially substituting primary mineral resources;
- are concerned that mineral resources from urban mines are recovered only partially at low material recovery rates and often at high social and environmental costs.

Considering this, the participants of the workshop recommend to

- (i) make use of the knowledge from primary mineral resource extraction and refining in urban mining;
  (ii) develop further knowhow and physical infrastructure (collection and treatment) for urban mining where appropriate;
  (iii) promote the trade of pre-processed secondary mineral resources on a global scale where investments for further resource extraction and refining cannot be justified from the perspective of sustainable development;
- make use of the experience from current responsibility standards in the primary mining

sector to complement existing standards in urban mining;
- develop resource policies adequately considering the systemic, global and multi-stakeholder character of urban mining.

Annukka Dickens

When will they start listening to us?

Organised by Swiss Academies of Arts and Sciences and World Resources Forum Secretariat
Report: Tobias Welz (WRF)

For decades, major technological and economic scientific analyses have been pointing to the limits of growth and the need for more resource efficiency in society at large. Even though policy reports have been identifying the tools for achieving this goal ever since, progress is breathtakingly slow. The sense of urgency in society for achieving drastic progress towards increasing resource productivity is not comparable to the attention for given to other societal challenges and crises, such as financial and economic issues.

Workshop, moderated by Bas de Leeuw

This workshop, moderated by **Bas de Leeuw** (WRF) explored the question why this sense of urgency has not reached mainstream politicians, business and individual households. Thereby, not only obstacles were identified, but special focus was put on what could be done better.

There was a common understanding that more and deeper interaction between engineering, economic and social scientists might be the key for achieving significant progress. Furthermore, concrete ways of improving the cooperation between science producers and science users (politicians, policy makers) also need to be explored.

Heinz Gutscher (chair) – social science perspective
In his talk, Heinz Gutscher pointed on the behavioural key variables that are needed to be addressed to create more sustainable decisions. He referred to percepting, assessing, and acting as the main modules to achieve potential change in behaviour. He argued that the issue of urgency has first to be recognized with our sensory system and then understood, in order to cause a (sufficient) action in result.

In case of perception, so far, overuse, misuse, and wasting of resources are perceived still inadequately and readiness to act is still low. To achieve a certain progress towards sustainability he pleaded for decoupling resource use from well-being, using the approaches of efficiency (using less materials) and sufficiency (doing things differently). Further it has to be realised that perception is limited by evolutionary constraints, and so to be dealt with adequately for each case. As an example many daily tasks go without us paying attention.

While assessing information, humans tend to distorted assessments, as they tend towards unrealistic optimism or overestimate the degree of control between factors. Assessments are mainly driven by experience-related processes as well as analytical processes. If we want people to listen to us, we have to be aware of that.

Finally, human actions are extremely habitualised, as this makes everyday life easier. That promotes a preference for the status quo (as long as it is successful). So disrupting the status quo is the aim. This means that tension between actual state and target state; sufficient efficacy; sufficient cost/benefit ratio of the necessary change, are keys to help to create change opportunities.

Thomas Graedel – industrial ecology perspective

"Industry and education are not well connected" – This was the introductive statement by Thomas Graedel in his talk. Further he referred to the example of physics and design of separation in recycling. He argued for the interlinking of material-centric academic community with the product-centric industrial community. The aim is to overcome the insufficient appreciation of each other's position regarding easy recycling versus complex products. Overcoming this gap of interests, and bringing together such stakeholders, said Thomas Graedel, is one of the main challenges of the World Resources Forum.

As it was shown in the case of UK supply chain cardiology (interdependencies of resources), resource issues are linked together worldwide. However, specialists are often not aware of those connections and do not understand the general system. In fact, in today's world, we need everybody to understand and act accordingly.

How to make things happen? Thomas Graedel's answer is to build up a stakeholder dialogue between governments, industry, representatives in education, in particular also Academies of Science. The World Resources Forum should take action to identify and connect key players. Identification in this manner means to know how to address stakeholders with the right form of communication. So a dialogue has to be established focusing on the resources issues, with a scope longer then the life span of a product. More likely this dialogue should define a time span back to when mankind started intensive resource use, in the Industrial Revolution, 250 years ago.

Arnold Tukker – transition management perspective

Analysing the workshop title in the beginning, Arnold Tukker asked himself, are we so efficient? Are we so consequent? Us, the scientists? Maybe that is not so true. As we see in the results of our conferences: Meetings without impact or action that is considered (too?) difficult or inconvenient. We need to have achievable goals. For example, Rio promised poverty eradication and sustainability producing a 200 Trillion $ wish list for 2050. Realising that our worldwide economy output is 50 Trillion $ annually, we see that it is unrealistic. Policy-makers support the current Ponzi scheme on which our wealth and stability is based. This means only economic-environmental win-win situations are supported. Is there a way out of this dilemma? Certainly there is, if we head towards a stable economy without craze of growth, with emission targets, and a policy that abolishes subsidies that prevent innovation and keep us in the 20th century.

Thomas Graedel

Arnold Tukker

Janet Salem – policy-governance perspective

Janet Salem spoke from the point of view of UNEP, focusing on the work of the International Resource Panel and the Switch Asia project. Within both initiatives, UNEP is connecting scientists with policy-makers, in order to understand each other. For this purpose working together with mass media is obvious, but is the message getting across? Society needs a constructive dialogue between scientist and decision-makers, but is this provided for so far?

Janet Salem

Of course, science is acting neutral and specialized, but is often not conducted for normative purposes. On the other hand, policy-makers are used to deal quickly, in a multidisciplinary environment, and apply cross cutting knowledge to tackle new challenges. As a result, scientists and policy-maker do not communicate efficiently with each other, yet. To overcome this gap, new experts, institutes, and fora are needed to be involved in the next step discussions. People like communication experts, social scientists, and taste makers are all invited to become our resources ambassadors.

Zhouying Jin – social science perspective

Zhouying Jin brought insights from her latest book "Global Technological Change – From Hard Technology to Soft Technology" to the audience. This updated second edition is a powerful reconceptualization of technological options and innovation management, which can help steer societies in assessing technologies for the 21st century.

With human-centered "soft technology" driving machine-based "hard technology" in ever more complex ways, Zhouying Jin provides an understanding of the human dimension of technological advancement.

Through a theoretical framework that incorporates elements of both Eastern and Western philosophy, she offers insight into the dynamic dimension between the two as it relates to a variety of technological innovation.

Rainer Kündig – geoscience perspective

We shall require a substantially new manner of thinking if mankind is to survive (Albert Einstein). That's how Rainer Kündig started his presentation while switching to the next slide that visualized a roller-coaster, representing all interdependencies related to raw materials in Switzerland. He raised the question how to deal with all these issues in a proper way, e.g. on the topic of renewable energies versus the demand of rare-earth metals? Everyone should have the chance to demand these materials, but who will be successful in the end? Which applications are most important for society, as they are key factors in the future? Rainer Kündig reminded us that we have to educate our students and convince the politicians but also to encourage curiosity. We need to talk… and to be honest. As an example, he mentioned the demand of Neodymium needed to assure wind parks in the UK to make the energy turnaround for sustainability happen. We need to discuss these issues at all levels in society, not only with authorities, but also with the public and workers.

Otto Smrekar & Wolfgang Stark – social science perspective (written contribution)

Otto Smrekar and Wolfgang Stark addressed key questions on how to achieve next steps towards sustainability in society.

Changing towards sustainable decision making and lifestyle means for both the need for a big transformation process, which affects many of

our political and individual habits and reward systems. But so far, even if we realize the need, non-sustainable decisions are still rewarded. There is obviously a need to re-structure our reward systems in society and encourage a new long-term mentality. The current individualized society prefers individualized solutions that, in fact, led to more individualized freedom and less social control. Further, this means also a fade away of responsibility for the community and the commons in our society. By now, the discourse on the big transformation towards a sustainable society though pretends that it is all about technical feasibility and rational, political and individual decisions. So far, all our knowledge of the psychological dynamics of change seems to be ignored. This may be one of the unknown causes why change towards sustainability is failing.

The situation gets even worse when we realize the existing communication gaps, regarding the two dominant concepts at stake, the industrial concept of simplicity, speed, rational planning and big numbers, and the sustainability concept of complex systems, long-term thinking, and emergent structure and 'slow quality'. Strangely enough, the beauty of complexity in sustainable thinking has been spoiled by the industrial environment it lives in and causes another gap: sustainable thinkers tend to develop and exert hundred-percent plans of sustainability – quite often "small wins" don't count. In addition, there are only few powerful role models for sustainability: people of power may talk sustainability and ask others to live a sustainable life; however in their own lives and decision-making, sustainability is only the "icing on a cake of growth and competition". In a world of quick wins, the idea of sustainability seems to be more exhausting and less rewarding than the concept of power. This is frustrating to the well informed and creates no draw for the less informed.

Today we have enough knowledge to opt for alternative decision models towards sustainability, and standards of technology can be highly supportive for sustainable solutions. But when we have to realize that change and transformation processes cannot be restricted to rational choice and planning, there is a need for non-linear, even fuzzy solutions. To overcome the pitfalls of rational (industrial) planning we need to focus on small patterns which are flexible to use for continuously re-designing innovative solutions. From improvisation methodology (in jazz, theater and dance) we can learn that the arts are an important source for non-linear thinking.

Sustainable Management of Forest Resources and Wood Constructions

Organised by Koli Forum
Report: Liisa Tahvanainen & Pauliina Korhonen

The interactive workshop with its invited experts as panelists but also the audience was encouraged to actively take part. All participants voted for options for specific questions raised during the panel by the chairperson and the results were seen immediately on the screen. This was done by using a wireless response voting system.
The topic of this session "The sustainable forest management and wood constructions" was discussed through the presentations and panel discussion which covered "the future perspectives of wooden houses in China from the point of view of forest management, public perceptions and education; possibilities to utilize bamboo as a solution for problems from environmental and raw material point of view; forest carbon sequestration in China, and preconditions and

Liisa Tahvanainen

possibilities of bioeconomy. Furthermore, the topic was discussed using a wireless Response voting system and active discussions during the session.

The KOLI Forum aims to formulate its results in the form of feasible solutions. The results of this session are based on the voting responses of the participants. However, it should be noted that the results are personal opinions of a very limited group of seminar participants and cannot be considered as recommendations for action, but provide an interesting insight in the discussions in this session.

About half of the participants were men (47%) and half female (53%), most were less than 40 years old (77%) and from Asia (72%).

The respondents thought that the best way to raise bioeconomy as a driver for China's sustainable competitiveness would be 1) fasten the utilization of best available technologies (BAT), knowledge and practices (47%) and 2) promoting biomass based products and energy (27%). The options were taken from the KOLI Forum 2011 Theses. The biggest difference to the actions suggested in the KOLI Forum 2011 for Europe were that in China the global criteria and commitments were not seen as important tools as in Europe.

The respondents saw that the main obstacle on wood constructions is the governmental policy (38%), shortage of raw material (19%) and technical challenges (knowhow) (19%). According to the opinions of the respondents the forest resources of China would best benefit the sustainable growth of economy by managing the forests in a sustainable way to be used for commercial purposes to boost bioeconomy (33%), the secondly important options were to use forests as carbon sinks, for recreation and nature parks, and for wood constructions to preserve CO_2.

Conclusions

A lot of work has been done concerning bioeconomy, its importance and challenges. Climate change, resource efficiency and green economy are all closely interlinked to bioeconomy and are topics of global debate. How fast we need to act forward and change our way of living, what are the new innovations needed and how the societies can remain competitive in global economy? We need new sophisticated ways to commit people to combat the major global challenges. It is no longer sufficient that policymakers are directing the future. They need the discussions, advice and views of business, research and NGO's as well as approval from the whole society. The ownership of natural resources varies around the globe, needs and values are different. Society needs to find different solutions of its own to take the responsibility and commit people to sustainable management of natural resources. Finally we share the same globe and global challenges are common. Responsibility of the global commons is our task and the Koli Forum is joining to do its best to provide tools for decision makers especially concerning the huge forest resources.

The biennial Koli Forum searches out new information and long-term policies to support a future that takes into consideration both the potential and the limitations of natural resources. Outcome of the forum, the Koli theses are defined by European opinion-leaders from the spheres of business, politics, science and culture. Koli theses are to help decision-makers to take responsibility for our renewable forest resources, sustainable economic competitiveness as well as social and ecological welfare. More information about the Koli Forum, materials, the Koli theses and videos can be found from www.koliforum.fi. The next Koli Forum will take place in the Koli national park, Finland 17–19 September 2013.

3. Scientific Sessions and Posters

Interview with Prof. Christian Ludwig, scientific co-chair World Resources Forum 2012

WRF: What is your relationship to WRF?

Prof. Ludwig: WRF grew out of the R-conferences series which was established by Empa back in 1995. In 1999 I joined the scientific committee and later I was involved in the organization of the follow-up conferences in different functions. In 2011 I was then elected as the scientific chairman of the WRF conference and this year I have supported the WRF conference in Beijing as scientific co-chairman, supported by Martin Lehmann (WRF).

WRF: What are the duties of the scientific chairman?

Prof. Ludwig: A major issue of a conference is its scientific quality. Traditionally, we have scientific contributions from the conference attendees. The scientific chairman is responsible for the evaluation of the submitted abstracts. He decides about necessary improvements, suitability for poster and oral presentation, or their rejection.

WRF: There are hundreds of abstracts to be evaluated, are you reading and evaluating all the abstracts yourself?

Prof. Ludwig: Indeed I am reading all abstracts to come up with my own opinion. However, it is important to have several independent opinions from different reviewers who are evaluating the abstracts. Normally, every abstract has been evaluated by three independent experts.

Christian Ludwig

Born:	March 30th, 1963 in Berne, Switzerland
Education:	Chemist, PhD
Expertise:	Resource Management, Waste and Bioenergy Technologies
Position:	Head of research group at Paul Scherrer Institute (PSI) and professor at École Polytechnique Fédéral de Lausanne (EPFL)
Hobbies:	Hiking, skiing, sailing, mobile home and family

WRF: How are you selecting the reviewers?

Prof. Ludwig: The scientific chairman is president of the scientific expert committee and most of the reviewers are chosen from this committee. The selection of reviewers is difficult. The expert committee brings experts together with different professional background. Therefore, the appreciation of the abstracts is sometimes influenced by the professional background of the reviewers.

WRF: In this context it may be likely that reviewers have sometimes different opinions. How are you dealing with this particular problem?

Prof. Ludwig: Indeed the format of this conference increases the chance to obtain different reviewer opinions. Therefore, it is most valuable that our reviewers have been selected over several years and that they have been trained in preparatory meetings which took place at Empa in St. Gallen. However, contradictory evaluations cannot be avoided. In such cases it is most im-

portant to give the authors a feedback which will help them to find an adequate way to present their findings for this very interdisciplinary audience.

WRF: The WRF gives a lot of space to plenary lectures and in the past years extraordinary personalities contributed to the success of the plenaries. What do you think about high profile candidates?

Prof. Ludwig: Indeed the plenary lectures with CEO's from large companies, high level authorities and ministries or researchers with outstanding reputation increased the quality and contributed to the strong profile of the WRF conference. These key presentations are on invitation only. In the selection process the scientific chairman pays only an advising role. The organizing committee who has also the financial risk is making the final decision.

WRF: Which is the most challenging duty of the scientific chairman?

Prof. Ludwig: Certainly it is the compilation and finalization of the program. Time and space for regular sessions, plenaries, and workshops need to be allocated in a reasonable manor considering the content of all these activities. Often last minute changes are made, for example a workshop will not take place or more time for it is requested. Registrations are canceled if attendees fail to get the funding for travelling or for other reasons. Such open slots should be avoided whenever possible.

WRF: Looking back with your own an experience of more than 13 years R-conference and WRF history how was the event in Beijing this year?

Prof. Ludwig: WRF 2012 was of course an outstanding event. With more than 700 participants coming from all over the world it obtained high international recognition.

WRF: WRF is trying to develop a clear profile for its events including politicians, authorities, economy, practitioners, engineers and scientists. Has WRF 2012 fulfilled your expectations?

Prof. Ludwig: Yes, absolutely. We have to consider that the profiles of the different events are depending on different factors. The bi-annual flagship events in Davos (2009, 2011, 2013 etc.) are directly organized by WRF whereas the events between are hosted by other organizations. Exchange between Switzerland and organizations in Asia is challenging and common goals and values need to be developed together. This takes a lot of time. Friendships evolve over years and many exchange visits are necessary. I am very happy that WRF 2012 opened doors to key governmental persons and organizations. We certainly profited from the relationships that were established during the R'2005 conference which took also place in Beijing. We will further collaborate with our Chinese friends in the future and work towards the goals set by the WRF Association.

WRF: How do you judge the quality of WRF 2012 in comparison to R'2005?

Prof. Ludwig: It became evident that many of the problems we cannot solve at the end-of-the-pipe and that we need a new and a more integrated approach. The new branding to "WRF" has clearly influenced the content of the conference. The focus shifted from recycling towards resources management and the political aspects gained in importance. Besides the new and different focus of the conference, the quality of the scientific contributions was considerably improved since 2005. This was especially the case for the many Chinese contributions.

WRF: What's your explanation for this quality improvement?

Prof. Ludwig: There are different important factors. The Chinese boom and prosperity has also left its traces in research. Modern institutes were

built in the last years which have adopted western standards. China makes fast and big steps ahead. The quality of research has improved and the exchange in English, especially with the younger generation, is easier than just a few years ago. WRF has further supported the local organization committee with their long term experience. It was one of the reasons, why I have accepted to serve as scientific co-chairman. It was important to do some knowledge transfer to adopt WRF scientific quality standards. It was a great experience for me when I have been invited last summer to Beijing where we worked on the program together with the Chinese team around Prof. Suojiang Zhang.

WRF: You mentioned that the focus changed from end-of-the pipe to an integrated perspective. How has this been implemented at WRF 2012?

Prof. Ludwig: If we talk about resources today, politicians think immediately of energy. And when it gets to environmental concerns in the energy sector greenhouse gases are in the focus. This perspective is a most dangerous one, as it neglects important relationships and many other factors. We have to avoid that by solving one problem we create new and perhaps even more severe ones. However, not acting is definitively also wrong. In this difficult context WRF should be the ideal platform for this discussion. At WRF 2012 we were very open in discussing a large variety of issues in the workshops and in the plenary presentations. Further, 12 session topics have been chosen for the regular presentations.

WRF: As scientific co-chairman you were invited to present your personal selection of highlights in the final plenary of the conference. How have you made your selection?

Prof. Ludwig: I tried to attend as many different sessions as possible and selected 7 personal highlights which I have shortly presented in the final plenary lecture. You can find my presentation with my choices on the WRF website. The examples indicate that the energy related issues were very dominant in the discussions. There is a strong wish of our society to obtain cheap and infinite energy services provided with low emission technologies. Hope is expected from new renewable energies, such as wind power or efficient use of bioenergy (Sam Pickard). However, it seems that both pathways suffer from missing resources. Wind turbines need rare elements which seem to limit the theoretical potential of wind energy (Komal Habib). However, clever models allow better predicting wind situations (Shemaiah Weekes). Improved nanotechnologies may allow the development of future power generators for small mobile equipment (Zhong Lin Wang) or new materials may be relevant to increase the efficiency of energy technologies (Chang-Jun Liu).

WRF: You have also selected a presentation by Helmut Langer as a highlight, why?

Prof. Ludwig: Mr. Langer presented in the session on "Alternative Business Models and Socio-Economic Issues". His presentation may also have fitted in the "Policy and Education" session. He is a professional designer who is able to address the scientific messages in strong and simple pictures which can be understood by everyone. He shared some of them with us. For me this was also a cultural enrichment of the conference.

WRF: One session was about "Food and Biomass", however, the contributions that were dealing with food were not many. Should we omit such sessions in the future?

Prof. Ludwig: Indeed this topic was not well represented. The energy recovery from residues was discussed in other session, however, in my opinion WRF has to think about how to better address this topic. Food production can strongly interfere with extensive agriculture to produce biofuels. Further, agriculture itself is a resource intensive industry. WRF could be the ideal platform for this debate in the future.

WRF: What are your next plans?

Prof. Ludwig: I am looking forward to celebrating Christmas and to have some relaxing days with my family. This was a very intensive year and my wife is sometimes not so sure if I have ever heard something about sustainable resource management. Anyway, I am already looking forward to the next WRF conference which will be held in Davos October 6–9, 2013.

WRF: We are counting on the support of Professor Ludwig in 2013 and thank him for the interview and his ongoing support for WRF.

WRF 2012: The Best Poster Award Winners are…

Author: Martin Lehmann

Best Poster Award Winners

Apart from the plenary speeches, the workshops and the scientific oral sessions, more than 90 posters by scientists from all over the world were presented at the World Resources Forum 2012 conference in Beijing.

Topics displayed on the various posters ranged from Green Economy applications in certain regions of the world, catalyst solutions, electrochemical processes, ionic liquids, biofuels, to metal recycling options and improvements, solid waste management in developing countries, law of environmental protection, or fuel cells and batteries, just to name a few.

We are proud to present the five winners of the WRF 2012 Poster Award (in alphabetical order):

- **Denice Byarushengo**, University of Dar es Salaam, Tanzania, with the Poster on "Lemongrass Essential Oil as a Natural Preservative for Pineapple Juice"

- **Sho Shindo**, Akita Research Institute of Food and Brewing, Japan, with the Poster "Bioethanol Production and Cadmium Removal from Phytoremediation Plant"

- **Minqian Sun**, Institute of Process Engineering, Chinese Academy of Sciences, China, with the Poster "Effect of Propane Sultone

as Additive for Ionic Liquid Based Electrolyte"

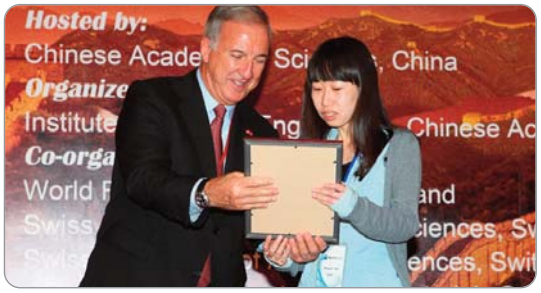
- **Wei Wang**, General Research Institute for Non-Ferrous Metals, China, with the Poster "Recycling Copper and Zinc from Scrap Copper Smelting Slag"

- **Jiayu Xin**, Institute of Process Engineering, Chinese Academy of Sciences, China, with the Poster "Integrated Catalytic Process for Hydrocarbons Produced from Lignocellulosic Materials".

Some WRF 2012 participants might have had challenges in understanding in detail what some of the more specific posters described. These informed in a nutshell about very complex projects, each of them being a small piece of a puzzle to improve processes and efficiency. Sooner or later they will help us to achieve overall resource-efficiency targets for our planet Earth.

That is what the World Resources Forum initiative – together with its plenary sessions and workshops – promotes: improving basic and applied research in the resource field at universities and laboratories, while at the same time generating intensive discussions among the different stakeholders from governments, industries and academies, on resource use questions to be dealt with in a globalised world.

Xingmei Lu discussing with Arthur Ruf



Arthur Ruf congratulating one of the award winners

Appendices

Appendix 1: WRF 2012 Program

Sunday, October 21, 2012

Registration, High-level Opening Session, Plenary Sessions, Poster Session and Welcome Cocktail

14h00 Opening (chaired by Jinghai Li, Vice President, Chinese Academy of Sciences (CAS), China, and Xaver Edelmann, President, World Resources Forum, Board of Directors Empa, Switzerland)

- Welcome address by Chinese Academy of Sciences (CAS), China
- H.E. Li Ganjie, Vice-Minister of Environmental Protection, China
- Xaver Edelmann, President, World Resources Forum, Board of Directors Empa, Switzerland
- Bruno Oberle, State Secretary Environment, Director, Federal Office for the Environment (FOEN), Switzerland
- Arthur Ruf, Vice President, Swiss Academy of Engineering Sciences, Switzerland

15h00 Plenary I "Green Economy: what are the challenges?"

- Amory B. Lovins, Chairman and Chief Scientist Rocky Mountain Institute, USA
- Gerben-Jan Gerbrandy, Vice Chair Environment Committee, European Parliament, Netherlands
- Mohan Munasinghe, Vice Chair, UN Intergovernmental Panel on Climate Change (IPCC), Sri Lanka
- Lothar Reh, Swiss Federal Institute of Technology, Switzerland
- G. Q. Max Lu, University of Queensland, Australia

17h20 Plenary II "Green Economy: how to make it happen?"

- Yi Kang, former Minister of Metallurgical Engineering, China
- Thomas Graedel, Yale University, USA
- James Bradfield Moody, Executive Director Development, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia

18h40 Poster Session and Exhibition

19h30 Welcome Cocktail

Monday, October 22, 2012

Workshops, Scientific Sessions, Exhibition, Posters, Congress Banquet

08h30 – 18h00 Workshops

- 08h30 – 18h15 Special Briefing on UNEP's latest findings in Resource Efficiency (UNEP, Bangkok/Paris. Presentations by: Mohan Munasinghe, Heinz Schandl, Sonja Heyenga and Karin Hosking, Rajan Gandhi, Chen Shaofeng, Thomas E. Graedel, Markus Reuter, Yuichi Moriguchi
- 08h30 – 10h15 Urban Eco-Efficiency Lab – Cities, Biodiversity and Ecosystems (WRF/ Secretariat Convention on Biological Diversity, Montreal, Canada. Presentations by: Xaver Edelmann, Sibylle Rock, Stephan Wabnegger, Rui Zhang, Luis Neves
- 10h45 – 12h30 Circular economy (CAS, China). Presentation by: Jiankun Song
- 14h00 – 18h15 Balancing Poverty Eradication and Sustainable Consumption and Production in Asia and the Pacific – Challenges for Policy, Research and Practice (Global Research Forum on Sustainable Production and Consumption, USA). Presentations by: Lewis Akenji, Ying Feng, Patrick Schroeder, Heinz Schandl, Leonie Dendler
- 14h00 – 16h00 Upscaling mechanisms for Sustainable Consumption and Production – achievements and lessons learnt in the SWITCH-Asia Programme (UNEP/Wuppertal Institute Collaborating Centre for Sustainable Consumption and Production, Germany)
- 16h30 – 18h15 Resource Efficiency Strategies in Europe – EU Roadmap and National Implementation (German Federal Environment Agency). Presentations by: Christopher Manstein, Arnold Tukker, Gerhard Weihs, Yi Heng Cheng

08h30 – 18h00 Scientific sessions

- Green and Circular Economy (Session1)
- National and Regional Approaches (Session 2)
- Petroleum and Natural Gas Upgrading (Session 4)
- Renewable Energy (Session 6)
- Green Process Engineering and Technologies (Session 8)
- Waste/Material Recovery and Recycling (Session 9)
- Alternative Business Models and Socio-Economic Issues (Session 10)
- Policy and Education (Session 11)
- Nano Green Energy (Session 12)

18h00 Congress Banquet

Tuesday, October 23, 2012

Plenary Sessions, Scientific Sessions, Workshops, Exhibition, Posters, Summary, Awards, Closing Session

08h30 – 12h30 Workshops

- 08h30 – 12h30 Urban Mining, Challenges and Opportunities (Empa, Switzerland) Presentation by: Jinhui Li, Luis Neves, Rainer Kündig, Annukka Dickens
- 08h30 – 10h15 When will they start listening to us? (Swiss Academies of Arts and Sciences/WRF, Switzerland). Presentation by: Thomas Graedel, Heinz Gutscher, Janet Salem, Arnold Tukker, Rainer Kündig
- 08h30 – 12h30 Sustainable Industry – Sustainable Management of Forest Resources and Wood Constructions (Koli Forum, Finland). Presentations by: Liisa Tahvanainen, Li Zhang, Qu Mei, Wu Junqi, Pekka Hallberg

08h30 – 12h30 Scientific sessions

- Metal and Mineral Resources (Session 3)
- Clean Coal Technologies (Session 5)
- Waste/Material Recovery and Recycling (Session 9)
- Food and Biomass (Session 7)
- Nano Green Energy (Session 12)
- Petroleum and Natural Gas Upgrading (Session 4)

14h00 Plenary III "Green Economy: what are the success stories?"

- Edward Clarence-Smith, UNIDO representative and Head Regional Office, China
- Joachim Klink, Director, Global Automotive & Aerospace Industry Architect, Hewlett-Packard, Germany
- Stephan Wabnegger, CEO, CREE, Austria
- Markus Reuter, Outotec, Finland

16h00 Plenary Highlights Panel (chaired by Bas de Leeuw, Managing Director WRF)

- Christian Ludwig, Paul Scherrer Institute, Switzerland
- Panel discussion with workshop rapporteurs

17h00 Closing Session and Awards

- Arthur Ruf, Vice President, Swiss Academy of Engineering Sciences, Switzerland
- Xaver Edelmann, President, World Resources Forum, Board of Directors Empa, Switzerland
- Jinghai Li, Vice President, Chinese Academy of Sciences (CAS), China

Appendix 2: Participants Survey

High satisfaction with WRF 2012, results of participants survey show

An overwhelming majority of participants of WRF 2012, which took place in Beijing, October 21–23, 2012, is (very) satisfied with the event. This can be concluded from the results of the participants survey.
A very encouraging 94 % of all respondents were either "very satisfied" or "somewhat satisfied" with the WRF 2012 event as a whole. Find below an overview of the main questions and answers. All answers will further be analysed by the team and considered in the preparations of our next events.

The venue of WRF 2012, the China National Convention Centre, was rated by again 94 % as "excellent" or "above average". There were a couple of critical voices who found that the venue did not communicate the message of a sustainable use of resources. The WRF team also wanted to know how the participants perceived the logistical organisation of the event like registration, hotel reservation etc. Again, a high percentage of participants concluded that the organisation was "excellent" or "above average".
People thought the conference staff was very friendly and helpful. A number of vegetarians wished some more meat-free dishes.

1. Overall, how satisfied are you with the WRF 2012 event?

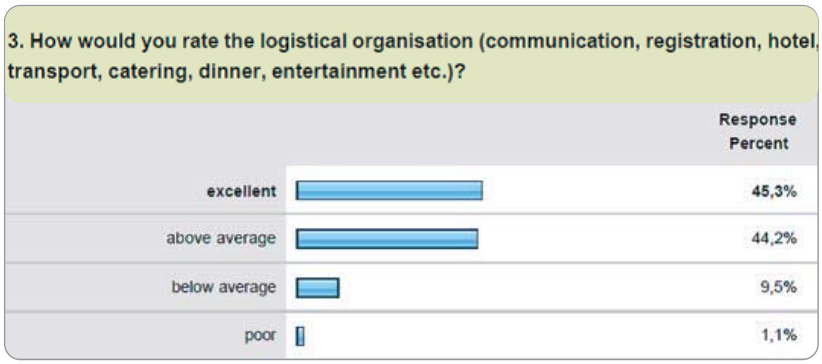
	Response Percent
very satisfied	52,6%
somewhat satisfied	41,1%
somewhat dissatisfied	4,2%
very dissatisfied	2,1%

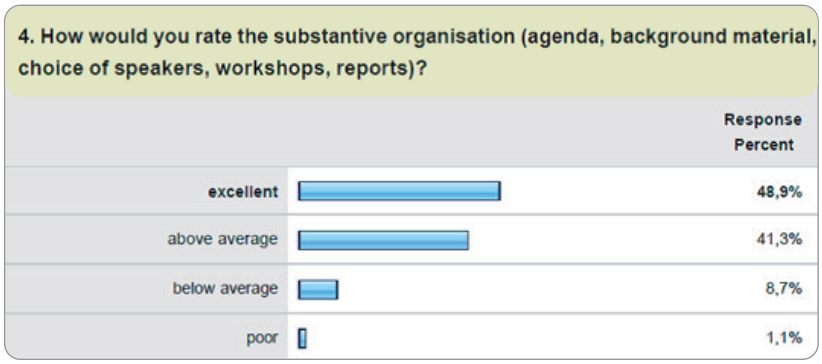
2. How would you rate the venue (China National Convention Centre)?

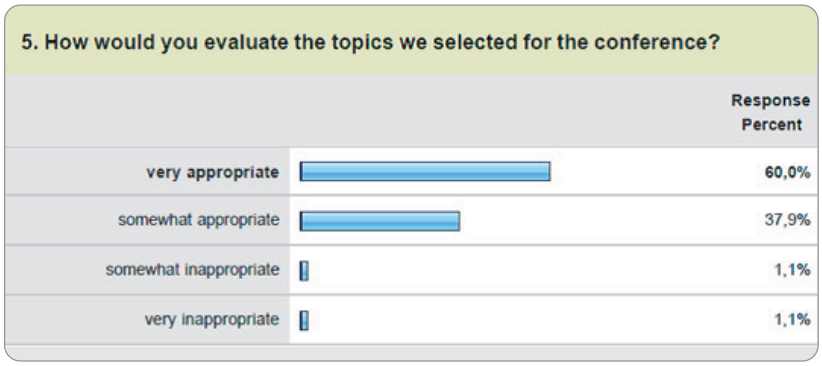
	Response Percent
excellent	63,2%
above average	30,5%
below average	4,2%
poor	2,1%

Around 90% of the responses considered the substantive organisation (agenda, choice of speakers, workshops etc.) as "excellent" or "above average". The open comments on that question will be considered by the organising committee to further improve the WRF events in the future. The next question aimed at the choice of topics and how appropriate they were for the conference. 60% of the responding participants found the chosen topics to be "very appropriate", and 38% as "somewhat appropriate". This means for the organisers to keep on sticking to most of the hot topics, but at the same time to modify the focus where needed. This was already achieved during WRF 2012, where as a result of the 2011 survey for instance the A+ workshop was dealing with the social aspects of the resource discussion, asking the decisive question "When will they start listening to us?"

With regard to the quality of the plenary speeches, the feedback is also very favourable, as 95% of the responding participants liked these presentations. A couple of attendees pointed out that the plenary speeches were very different; however, this can also be seen in a positive light. The quality of the workshops and parallel session was also judged as "excellent" or "above average". The feedback though is a bit more diverse. It was for instance mentioned that there were too many parallel workshops and sessions at the same time. This is a challenge for the organising committee. Providing the opportunity to discuss specific topics and research questions in the workshops/sessions means at the same time that the amount of parallel events increases. Reducing the amount of parallel sessions and workshops would mean to extend the



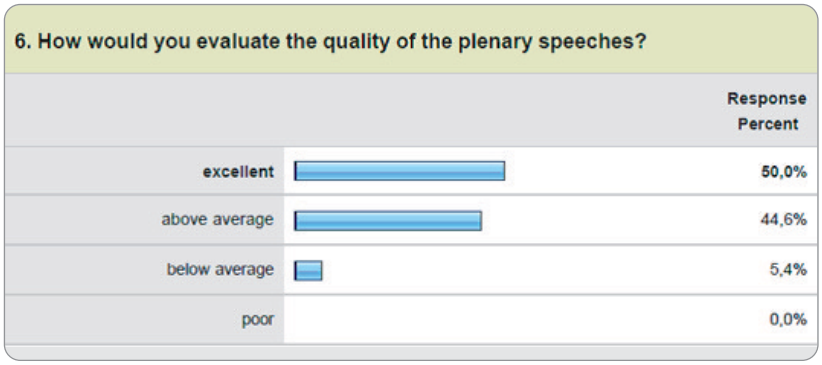


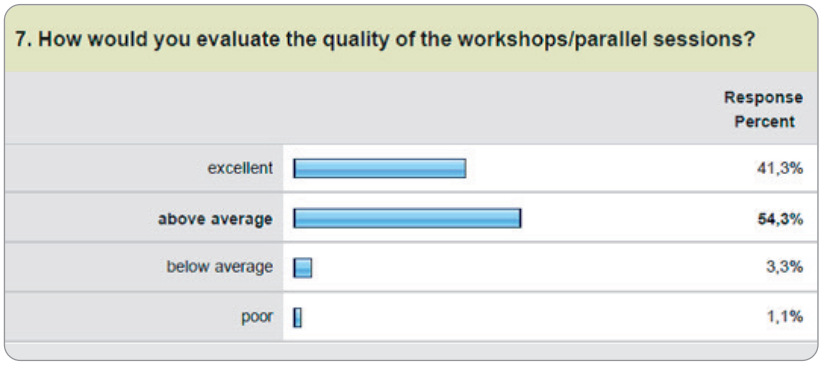


WRF conference to more than 3 days. So the choice has to be balanced, which means between 5–8 simultaneous sessions/workshops. The following question supports this concept.

Question number 8 was referring to the general setup of the WRF conference, and whether the participants would prefer to see more plenary sessions, or more workshops, or keep it as it is. As expected, this is very much a matter of taste, but the majority (47%) of the answers indicates that the setup should be kept as it is.

The next question was tackling the issue of what stakeholder group the WRF participants would like to see more often in future events. As a respondent to this question, one can either be interested to see "more people of my group" or say "I would like to meet more people from other sectors, professions, organisations, parties etc." In that sense, this question is a bit difficult to interpret, but basically the WRF participants appreciate to meet experts with a diverse background. This feedback supports WRF in its strategy to be the global science-based platform for sharing knowledge about the economic, political, social and environmental implications of global resource use, by building bridges among researchers, policymakers, business, SMEs, NGOs and the public.



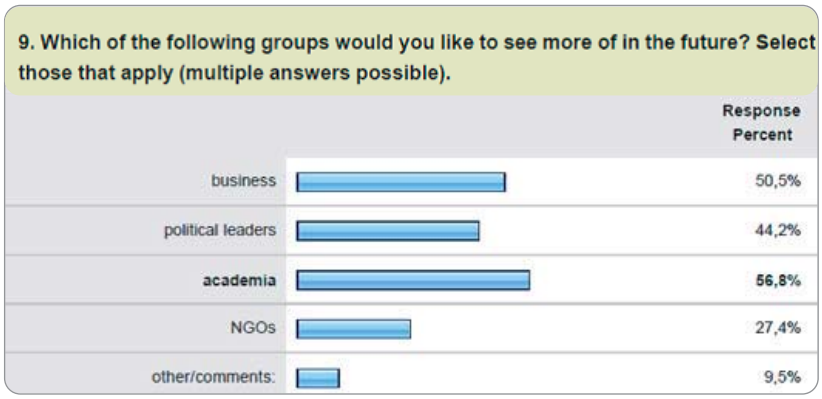


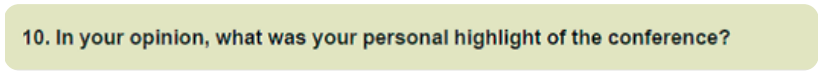
It is always a pleasure to read through all the personal highlights that WRF participants experience during the conference. For some, it is the venue, or the delicious dinner, for others it is a more content-related highlight like a workshop or a plenary speech, for a third group it might be a conference topic, or a new insight like "do not sell goods, sell services instead". Many participants were delighted to see so many young people attending. The answers to this open question are not reported here, since it would fill

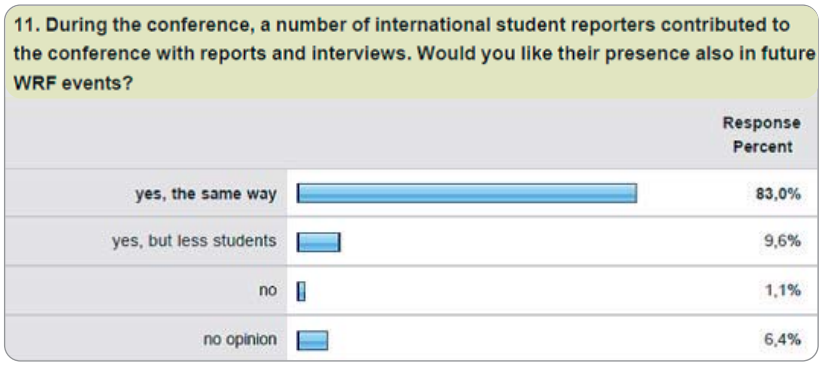
many pages, but these will certainly play a big role in our considerations for WRF 2013.

The last question was about the international student reporters who were present at the conference, contributing with reports and interviews. Participants were asked whether they would like their presence also in future events, and if yes, how big the group of student reporters should be. As it can be seen from the chart, 83% of the attendees would like to see as many student reporters as in Beijing, and with the same or similar functions.

All in all, the participants survey showed that the WRF conferences are in demand and that the setup reflects the needs of the participants. We will always be happy to get your feedback at any point in time. Please check our WRF website or send an email to our conference manager, Martin Lehmann, at info@worldresourcesforum.org







Appendix 3: Sponsors and Partners 2012

	Chinese Academy of Sciences		National Natural Science Foundation of China
Institute of Process Engineering, Chinese Academy of Sciences		Platform for Sustainable SMEs, Switzerland	öbu works for sustainability.
EMPA Materials Science & Technology	Swiss Laboratories for Materials Science & Technology	Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra Swiss Confederation Federal Office for the Environment FOEN	Swiss Federal Office for the Environment
Hewlett Packard		Swiss Academies of Arts and Sciences	Akademien der Wissenschaften Schweiz Académies suisses des sciences Accademie svizzere delle scienze Academias svizras da las scienzas Swiss Academies of Arts and Sciences
KOLI forum	Koli Forum, Finland	Convention on Biological Diversity	Secretariat Convention on Biological Diversity
UNEP International Resource Panel		Mercator Foundation, Switzerland	Stiftung Mercator Schweiz
UNIDO	United Nations Industrial Development Organization	SATW Schweizerische Akademie der Technischen Wissenschaften Académie suisse des sciences techniques Accademia svizzera delle scienze tecniche Swiss Academy of Engineering Sciences	Swiss Academy of Engineering Sciences
Federal Environment Agency Germany	Umwelt Bundes Amt For our Environment	City Council of St. Gallen, Switzerland	Energiestadt GOLD St. Gallen european energy award
Global Research Forum on Sustainable Production and Consumption		cscp UNEP/WUPPERTAL INSTITUTE COLLABORATING CENTRE ON SUSTAINABLE CONSUMPTION AND PRODUCTION	Wuppertal CSCP Centre, Germany
Rhomberg Group, Austria		Sustainable Consumption and Production in Asia	switchasia NETWORK FACILITY
MISTRA THE FOUNDATION FOR STRATEGIC ENVIRONMENTAL RESEARCH	The Foundation for Strategic Environmental Research, Sweden	SQS	Swiss Association for Quality Management Systems
Dutch Ministry of Infrastructure and the Environment	Ministry of Infrastructure and the Environment	Global e-Sustainability Initiative	GeSI GLOBAL e-SUSTAINABILITY INITIATIVE
HALDOR TOPSOE 托普索	Haldor Topsoe	鹏翔 Golden Eagle	Tianjin Golden Eagle Technology Co.,Ltd

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