



BOOSTING RESOURCE PRODUCTIVITY BY ADOPTING THE CIRCULAR ECONOMY

Davos | Switzerland

MEETING REPORT WRF 2015

WRF is an independent non-profit international organization that serves as a platform connecting and fostering knowledge exchange on resources management amongst business leaders, policy-makers, NGOs, scientists and the public.

This report was drafted by Xaver Edelmann, Bas de Leeuw, Mathias Schluep, Sonia Valdivia, Cecilia Matasci, María Lucía Híjar and Angel Versetti based upon inputs from workshop reporters, speakers and participants. The report has not been reviewed by the speakers.

Photos Robert Stürmer. Contact: www.stuermerfoto.ch

Technical assistance and design María Lucía Híjar (WRF)

St. Gallen, Switzerland, March 2016

ISBN 978-3-906177-11-3

Contact information Lerchenfeldstrasse 5, CH-9014 St. Gallen, Switzerland
WRF Secretariat Phone + 41 71 554 09 00
info@wrforum.org
www.wrforum.org
Visit us on Facebook, Twitter and LinkedIn



TABLE OF CONTENTS

Chairman's Summary.....	5
1 Photo Gallery.....	10
2 Plenary Highlights.....	13
3 Selected Workshops Highlights.....	19
4 Selected Master Classes Highlights.....	66
5 Overview Scientific Sessions and Awards.....	70
6 Overview Side Events.....	72
7 WRF Cinema.....	76
8 Exhibition and UN Lounge.....	78
9 Participants Survey.....	79

Appendices

Appendix A: Programme.....	80
Appendix B: Scientific Sessions Programme.....	85
Appendix C: Scientific Poster Exhibition.....	91
Appendix D: Committees.....	92
Appendix E: Sponsors and Partners.....	97



World Resources Forum 2015
has compensated for:

689 tonnes of CO₂e

World Resources Forum 2015 has offset the emissions by investing in

Kariba Avoided Deforestation in Zimbabwe (990)

For more information about our services and more than 400 climate
protection projects, please visit: thesouthpolegroup.com/projects



Renat Heuberger
CEO, South Pole Group

This certificate is issued by South Pole Group. The CO₂ emissions indicated on the
certificate are compensated through investments in the above mentioned carbon offset
projects based on international standards. Certificate (w) no. spg 55225160127084624

CHAIRMAN'S SUMMARY



Xaver Edelmann, President WRF

1. Over 600 participants from 108 countries from every continent gathered and actively participated in the World Resources Forum 2015 in Davos, Switzerland, on 11-14 October, 2015.
2. Attendees coming from government, business, scientific and civil sectors, representatives of international organisations as well as engaged students and young change-makers, debated and exchanged their views on how to increase resource efficiency, invest in innovation for sustainable production, respond to climate change, decrease the socio-environmental footprint of current consumption and production patterns, achieve sustainable lifestyles and ensure high quality of life for all groups of society.
3. Increased global recognition of resource efficiency in international declarations was highlighted by participants. The G7 Summit Declaration explicitly identified resource efficiency as a vital element of sustainable development. His Holiness Pope Francis Encyclical Letter on "Care for our common home" noted that the problems of environment cannot be separated from the human issues and that the world's interdependence requires us to reach a global consensus and create a common plan to prevent further decay and degeneration of our planet's environment and land.
4. Decoupling of economic growth from resources use and circular economy were the key areas of discussions at plenary sessions and workshops. Stakeholders representing countries at different stages of economic development and capacity discussed the need for suitable cross-border governance frameworks as well as noted the urgency in boosting investment in businesses that can serve as building blocks for circular economy. This could be achieved through development of stronger links between the financial and techno-industrial sectors. In particular, there is a significant potential in exposing financial actors to new business models and opportunities in circular economy.

5. There is a strong need for reliable and comprehensive indicators and benchmarks that could produce meaningful data to set targets and goals for policymakers in the field of resource management.
6. Participants engaged in roundtables and working groups at workshops and scientific sessions, funnelling their collective creativity and expertise to formulate policy recommendations on resource governance at all levels from global through to regional to local, suggesting follow-up activities and topics for further research and investigation.
7. UNEP's International Resource Panel, UNIDO's Global Network on Resource Efficient and Cleaner Production, the Factor X-Club and the ISO Workshop on Guidance Principles for Addressing Sustainability Criteria in Secondary Resource Management were major events held back to back with the World Resources Forum 2015.

Sustainable Lifestyles and Education

8. Lifestyles occur within a larger context that is not always within individual control - people don't consume with the intention of harming the environment. Hence planning for sustainable lifestyles must account for the dynamism of society and the people's aspirations rather than static understanding of society's classification.
9. Education is the fundamental element to change consumer behaviour and to usher in sustainable lifestyles. There are different kinds of consumers and enablers for this change: traditionalists and ecologists.
10. Research needs to provide learnings on principles and values that motivate actions, on how daily choices affect our lives, others and the planet, and on systems and processes upon which modern society depends.
11. Art can also play a crucial role for sustainable lifestyles. In particular, its humanistic and therapeutic nature enable the society to connect to underlying issues of sustainability. Art can also be successfully employed in business and politics to encourage change.
12. The power of communication and imagery is also essential to change behaviour: the Great Pacific Garbage Patch is a powerful wake-up call for the public.



Mathias Schluep, WRF

Circular Economy: The Business Case

13. Businesses are becoming increasingly aware that as resources run out and commodity prices increase, it becomes ever more important to decouple economic growth and human well-being from resource extraction.
14. Circular Economy has to make a business case by going away from the historical „take, make, break“ approach of linear economy. It can act as a framework for various schools of thought on making sustainable and increasingly restorative business and living conditions a reality.
15. Entry level barriers for Circular Economy might be lower in developing countries due to higher pressure on natural resources systems, less strict regulation and increasing consumer demand.
16. The Circular Economy model can be promoted to all types of business model and size from multi-national corporations right down to a micro-enterprise level. Established businesses that are entrenched in a traditional business model and fail to adapt will eventually loose in competitiveness.
17. Practical business experiences gained on circular economy can be developed as a blueprint to share widely through knowledge networks in order to enable the newcomers to „leapfrog“ and build on the experience of Circular Economy pioneers.
18. We need to adopt a culture to communicate the real and true values and costs of doing business and to stop externalising costs to the environment.
19. Life cycle based information is needed in product design. Improved awareness of consumers about the actual cost of production to the environment will empower them.

Investing in Resource Efficiency and Circular Economy

20. Investing in resource efficiency and circular economy not only delivers higher profits but can enable more people to benefit from employment. Though new business models and circular economy businesses must be able to perform financially and to deliver their value even after core financing has been withdrawn.
21. There needs to be more taxation of natural resources consumption. At the same time renewable and sustainable energy sources should be tax-free to create incentives for businesses to invest. Currently only 0.3% of all taxes collected pertain to natural resources use, while taxes collected from human resources amount to nearly half of the global total.
22. The recovery of secondary resources in emerging economies is mainly an informal business posing threats and opportunities. A positive market response to invest in sustainable recycling industries hence demands for investment security through clear rules and standards set by governments, the availability of local capacity and expertise supported through international cooperation, and addressing sustainability criteria in secondary resources management through multi-stakeholder standards setting.

23. Direct investment platforms should be developed online and offline to showcase investment opportunities from resource-efficient businesses and connect them with investors and financiers. Strengthening capacity of resource-efficient businesses to obtain and manage their finance for business growth is essential. This is particularly important for the emerging and transition economies where there is a big mismatch between demand for sustainable goods and services and available supply.
24. 75% of infrastructure that will be in place in 2050 does not yet exist today. This is a huge opportunity and risk for resources governance. Investing in sustainable procurement could help improving the feasibility of sustainable infrastructure growth.

Resource Efficiency and Circular Economy

25. Although we live in an unequal (resource consumption) world, the resource economics acts as a universally applicable imperative. Therefore, to address resource inequality we need global, multi-stakeholder partnerships to monitor the monetary and financial systems and to give a higher voice to values and ethics in the resource distribution debate.
26. For a resource-efficient economy we have to work with the informal sector and to include it in consultative and governance processes. Materials is all about people and their need to survive. For many developing countries many activities of the resource-sectors – from mining through to recycling will remain informal for a long time. Policies and strategies to address environmental concerns and safety standards for workers should not ignore the needs of the informal sector.
27. To shift towards circularity we need to be able to measure material flows, to foster industrial innovation, to develop new designs and business models, and to usher in a shift in resource governance. For that we need to develop advanced knowledge about materials and their compatibility with the circular economy. A recyclability index could help achieve that.

Political Solutions for Global Resource Efficiency

28. For political decisions on resource governance, the decisive factors are the vote value, scientific evidence and national constitution and legislation. Very few of the existing governance approaches address socio-economic issues of resource use. Business-focused initiatives of governments have potential, but they often lack of ambition and accountability, and have major problems with public trust.
29. There could be \$3.5 trillion of annual gain in improving resource efficiency globally. The main barriers to obtaining this gain is lack of quality standards, poor cooperation down the value chain and insufficient data on material flows.
30. Designing a circular economy for metals is as urgent as securing continued primary production. Preparations for circular economy for metals must start today and should include changes in product design, improved recycling technologies and infrastructure and development of urban mining plans. Innovation will underpin the emergence of working solutions.
31. Efficiency of food chains is an important issue in the context of global hunger and poverty. Agricultural resources are often used unsustainably and inefficiently. Looking at resource efficiency through the lens of food systems is essential to identify opportunities in agricultural sector and to prevent food waste and soil degradation.

32. There is some integration of demand reduction into the discussion of global resource management, but little consideration of the implications for resource-dependent countries.

Closing Remarks

33. Sustainable use of natural resources lies at the heart of discussion about the future we want and of the climate debate. High quality of life and adequate economic growth will require technological, financial and societal innovations in order to preserve our planet's natural wealth for the future generations.
34. The World Resources Forum Latin America and the Caribbean will be jointly organized with the Green Building Council Costa Rica (GBC-CR) and the United Nations Environment Programme (UNEP) and will take place back-to-back with the International Sustainable Building Congress on May 17 – 20, 2016 in San José, Costa Rica.



Ana Quiros, Green Building Council Costa Rica (left) and Isabel Montero de la Cámara, Costa Rican Ambassador in Switzerland (right)

Xaver Edelmann and Bruno Oberle,
Co-chairs World Resources Forum 2015

1 PHOTO GALLERY



Bruno Oberle, Swiss Federal Office for the Environment (FOEN)



Bas de Leeuw, WRF





2 PLENARY HIGHLIGHTS

SUSTAINABLE LIFESTYLES AND EDUCATION

Session Chairs Harry Lehmann, German Federal Environment Agency (UBA)
Sonia Valdivia, WRF

The focus of the session laid mainly on the role of education and the values enabling circular economy concepts. State-of-the-art insights in communication tools and approaches for sustainable lifestyles were presented. Furthermore, speakers discussed the importance of the global food regime and the need for change to meet the Sustainable Development Goals (SDGs). Activities fostered by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP) Sustainable Lifestyles and Education Program were also part of the agenda.



Lewis Akenji, Institute for Global Environmental Strategies (IGES)



Victoria Thoresen, UNESCO



Captain Chales Moore, ALGALITA Marine Research and Education



Marilyn Mehlmann, Global Action Plan (GAP) International



Mila Popovich, World Academy of Art and Science

CIRCULAR ECONOMY – THE BUSINESS CASE

Session Chair Anders Wijkman, UNEP's International Resource Panel (IRP)

Speakers were asked to showcase business models grounded on circular economy. In this respect, sustainable business models considering the entire life cycle of products, product design, consumer engagement, resource supply and optimal recycling, amongst others, were introduced.

Additionally, the challenges of mainstreaming sustainable business models were covered, such as the lack of know-how in companies, effective waste management and the length of service/product life.



*Dianne Dillon-Ridgley,
Interface, Inc*



*Gunter Pauli, The Blue
Economy*



*Stephan Sicars, United Nations
Industrial Development
Organization (UNIDO)*



*Peter White, World Business
Council for Sustainable
Development (WBCSD)*



Seta Thakur, ÖBU



*Jocelyn Blériot, Ellen
MacArthur Foundation*



*Sanna Due-Sjöström,
Nordic Waste Group*

INVESTING IN CIRCULAR ECONOMY

Session Chairs Barbara Dubach, engageability
Cornis van der Lugt, Stellenbosch University Business School

This session tackled aspects related to the role of financial instruments and tax system for the transition to a circular economy. The importance of boosting business investments in circular economy was addressed and examples in the infrastructure and recycling sector were presented. Moreover, investments in sustainable lifestyles were highlighted. Finally, panellists pointed out that there is a need for improvement of the integration of sustainability in the finance sector.



Ernst Lutz, European Institute for Innovation & Technology (EIT)



Mathias Schluep, WRF



Femke Groothuis, Ex'tax



Hans-Peter Egler, Global Infrastructure Basel (GIB)



Mari Pantsar, Finnish Innovation Fund SITRA



Angel Versetti, WRF



Walter Stahel, Product-Life Institute

RESOURCE EFFICIENCY AND CIRCULAR ECONOMY – UNDERSTANDING THE CONCEPTS

Session Chairs Giulia Carbone, International Union for Conservation of Nature (IUCN)
Heinz Leuenberger, UNIDO

The discussion centered on the road towards Circular Economy. It analysed particularly the objectives, conditions, enablers, monitoring mechanisms, as well as the challenges and recommendations for the implementation of the circular economy. Furthermore, speakers exchanged insights on how to connect circular economy science to policy-makers and the wider public.



Mathis Wackernagel, Global Footprint Network



Claude Fussler, CO2 Forum



Maria Amelia Enríquez, Bureau of Industry & Mining of State of Pará, Brazil



Arnold Tukker, Institute of Environmental Sciences (CML), Leiden University



Edmund Nickless, Geological Society of London



Laila Rashed Iskandar, former Minister of Urban Renewal and Informal Settlements, former Minister of the Environment, Egypt



Markus Reuter, Outotec

POLITICAL SOLUTIONS FOR GLOBAL RESOURCE EFFICIENCY

Opening by FOEN, UNEP, UNIDO and the Peruvian Ministry of Environment



Bruno Oberle, Director of the Federal Office for the Environment (FOEN), Switzerland



Ligia Noronha, Director, UNEP Division of Technology, Industry and Economics (DTIE)



Philippe Scholtès, UNIDO Programme Development and Technical Cooperation Division



Mariano Castro, Vice-Minister of Environmental Management, Ministry of Environment Peru

Circular Economy and Resource Efficiency Session Chair Janez Potocnik, Co-Chair of the IRP

The dialogue reviewed key concepts of the circular economy, and the linkages between circular economy and resource efficiency, including the broader context of sustainable development. Linkages with the newly adopted Sustainable Development Goals (SDGs) were discussed to identify where circular economy and resource efficiency fit within the SDGs and how it can support achievement of the SDGs targets.



Alice Kaudia, State Department of Environment and Natural Resources, Kenya



Astrid Schomaker, Strategy Directorate, DG Environment, European Commission



Ester van der Voet, Member of the IRP; CML, Leiden University



Maarten Hajer, Member of the IRP; Utrecht University



Shardul Agrawala, Organisation for Economic Co-operation and Development (OECD)



Nabil Nasr, Member of the IRP; Golisano Institute for Sustainability Rochester Institute of Technology, United States

Resource Governance

Session chair Ashok Khosla, Co-Chair of the IRP

The dialogue addressed the key role played by natural resources and their sound governance in sustainable development, ensuring a safe and healthy environment, human well-being and economic growth. The session analyzed existing initiatives in this field and involved stakeholders, major challenges and emerging issues, and the linkages with the Sustainable Development Goals (SDGs), in particular future potential actions to address equitable governance of natural resources.



Antonio M.A. Pedro, Member of the IRP; Sub-regional Office for Eastern Africa, United Nations Economic Commission for Africa (ECA)



Mark James Mwandosya, Parliament Member, Tanzania



Paul Ekins, Member of the IRP; UCL Institute for Sustainable Resources and Research at the School of Sustainable Resources and Energy, University College London



Dirk-Jan Koch, Netherlands Ministry of Foreign Affairs



Helge Wendenburg, Water Management and Resource Conservation, Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany

For an overview of speaker's presentations visit www.wrforum.org/events/wrf-2015/

3 SELECTED WORKSHOPS HIGHLIGHTS

UPDATE ON CITIES WITH ZERO WASTE GOALS

Organised by Zero Waste International Alliance

Workshop chair(s) Richard Anthony, Zero Waste International Alliance

This Workshop presented Zero Waste Cities, their issues and solutions. In four hours we covered unintentional pollution and marine debris, packaging and how cities are dealing with these discards in the new paradigm.

Main conclusions

- There is no off ramp on the closed circle economy
- It is three dimensional (air, water, land) and these are the essential pillars of sustainability
- 500 miles from the nearest shore there is plastic in the ocean
- All products and materials must be designed for recycling and/or composting – there is no middle ground for planet polluting products
- The world needs to unite to save the albatross, the largest sea bird and whose survival is based on cleaning up the ocean



Speakers

- Captain Charles Moore on the impact of plastic marine debris in our ocean on our fish and wildlife – Plastic Chaos
- Paul Connett on the steps to Zero Waste with examples from around the world
- Bill Worrell on new rules that have been enacted in California to address responsibility for managing toxic discards
- Rossano Ercolini on the Italian Zero Waste miracle
- Tom Wright on guidelines for the packaging industry
- Richard Anthony on the Zero Waste Approach and best cases internationally of Zero Waste cities
- Ruth Abbe on Zero Waste cities in the United States
- Steve Sherman on the San Francisco Bay Area and leading local Zero Waste programs and policies
- Kamila Guimarães de Moraes on Zero Waste cities in Brazil

A CIRCULAR FOOD REGIME

Organised by Global Action Plan (GAP) International and Eaternity

Workshop chair(s) Marilyn Mehlmann, GAP International
Judith Ellens, Eaternity

Opening questions

Which hurdles do you encounter in your food-related work? What are your favourite success stories? What would you like to see happen in future? Which policies or governance do we need to get there?

Summary

We know what to do, but are hampered by:

- Powerful and “hidden” lobby groups
- Laws, regulations, counter-productive taxes and subsidy structures
- Lack of awareness and education

1. Farming

- Soil is key: enrich it with nutrients and carbon
- Local crop diversity as an adaptation strategy to climate change
- Food production is a human need and a cultural tradition
- Land rights regulations should favour young active farmers

2. Lobby counterbalance

- More transparency: understand the ‘battlefield’
- Municipal engagement programs that identify and prioritize local needs
- Invest in education of decision-makers as well as the general population

3. Other regulations and incentives

- No subsidies on foods that harm health and climate
- Sustainable Development Goals (SDGs): proper definitions and targets to measure

Discussion

1. Hurdles and knowledge gaps for progress towards a sustainable food regime

Strong lobby groups

- Strong lobby of food corporates
- Not easy to get appropriate funding for projects that critically analyse food production
- Proper engagement opportunities in communities and schools are lacking
- Consumers are not empowered – there is a lack of awareness

Wrong market incentives

- Transportation is too cheap
- Emissions from food and reduction efforts are not rewarded or captured by any policy instrument as opposed to measures in mobility and energy

- People inside corporates are mostly held account for profitability only, setting the wrong incentives
- Policies set the wrong incentives for farmers and markets
- Trade agreements are dysfunctional, they are not creating a better environment for being a farmer, as incentives and subsidies are not always allowed

Farming is currently unsustainable (socially and environmentally)

- Farmers are underpaid, it is not attractive to farm – who is going to farm?
- Farmers are not adapting yet to climate change
- Maintaining soils in a sustainable manner, loss of productive areas
- Cities occupy productive areas
- No answer yet how to feed 10 billion people sustainably

Other

- Definitions of words we talk about are not necessarily clear: what is meant with scaling-up? what is exactly meant by the SDGs?
- It seems all the ideas are there, why are they not working or taking off?
- How to scale-up or replicate solutions that do work?

2. Takeaways

Strong lobby groups

- There should be transparency on the strength and influence of lobby groups. Better understand the battle fields.
- We should increase consumer power and the power of municipalities through engagement programs to counterbalance.
- Strong conventional farmers' organizations and the food industry lobby. Good example: transition towns.
- We need upskilling of consumers and politicians.

Reorient market incentives

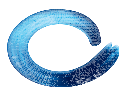
- We should increase and stimulate European economic growth of the climate sector (more companies doing good for the climate).
- We should stop subsidizing foods that are harmful to us, e.g. sugar.
- We should pay the real price for food to increase farmers' income and status, and reduce waste.
- We can learn from the example in Japan that got around trade-law by working together with the ministry of culture. Rice production can get extra money as it preserves local culture. Multi-cultural-landscape diversity is important.

Farming is currently unsustainable (socially and environmentally)

- Soil is key, we should make it richer instead of poorer. Nutrient recycling should get more attention. Furthermore, we should stimulate techniques that build up soil carbon. We have the metrics. We should just implement them.
- To adapt to climate change move away from mass production of one crop towards more diversity. Use sustainable farming options like permaculture. Bring back food production to your region.
- Laws that regulate building on fertile land might make sense. Either forbid it or demand compensation by having a productive roof.
- Alternative farming solutions: farming part-time, restaurants that work on the farm, community farming.
- People that want to farm should get land to farm. Laws that keep ownership of land within the family although no one is farming should be abandoned.

Other

- Replicating ideas may be more important than upscaling only. We need both upscaling and replication.
- Scientists should take action and properly define what is meant by the SDGs (definitions, targets, etc.). Zero net land degradation sounds great, but we need indicators. How to measure and control it? What is meant with land degradation?
- We should have more knowledge on the informal food economy (black market). This is tremendously positive for food security in developing countries. It has some dangers (health issues), but if working properly we need to know more on the mechanisms, so that we can make it a replicable example.
- Give people their social context (for example like Eaternity does for cooks and restaurants, and GAP does for households and communities). In addition to facts and figures we need to deliver the social context to groups and people to motivate change.



GLOBAL ACTION PLAN
INTERNATIONAL



Vivid participation by workshop attendants

E-WASTE COUNTRY PROJECTS AND HAZARDOUS ADDITIVES IN E-WASTE PLASTIC

Organised by Sustainable Recycling Industries (SRI) Programme

Workshop chair(s) Mathias Schluep, WRF
Michael Gasser, Empa

Overview

Waste from Electronic and Electrical Equipment (WEEE) is globally the fastest growing waste stream. WEEE contains both highly hazardous and valuable components, making material recycling both potentially dangerous and lucrative. Especially countries of the global south struggle with setting up appropriate collection systems and sustainable recycling operations, which require appropriate legislation and technical regulation. In the same countries, plastic from WEEE are often indiscriminately recycled or burned in the open. Brominated flame retardants (BFRs) contained in the plastic are thus released into the environment or redistributed into new products. Some BFRs fall under the Stockholm Convention and thus have to be treated as hazardous waste and appropriately disposed. BFRs are only one of many examples of plastic additives which have recently come under scrutiny due to health and environmental considerations. Although phased out, certain legacy additives can still be found in waste and practical rules have to be found to sufficiently remove them from increasingly circular material flows.

Funded by the Swiss State Secretariat for Economic Affairs (SECO), the Sustainable Recycling Industries (SRI) Programme supports several countries in improving the local WEEE recycling conditions. During the workshop, the current status of WEEE and scope of the individual country projects were presented by Luis Briceño (IPES, Peru), Carlos Hernández (CNPML, Colombia), Ghada Moghny (CEDARE, Egypt), Sampson Atiemo (Atomic Energy Commission, Ghana) and Sabyasachi Sengupta (CII Green Business Centre, India) and discussed. Michael Gasser (Empa, Switzerland) summarised the current state of how WEEE plastic is treated in the countries and provided background information on BFRs. Jürg de Pietro (Swiss Plastic Training and Education Centre, Switzerland) gave a short overview over the plastic additive world and a few examples of how other legacy additives have been dealt with.

SRI country projects on WEEE

Peru and Colombia are two most advanced countries, having ratified specific legislation on WEEE which is based on the Extended Producer Responsibility (EPR) principle. Through the SRI country project, further progress is supported through capacity building, engaging actors in the chain and strengthening the governing institutions. Colombia has developed technical regulation on WEEE recycling and SRI will support the auditing/conformity assessment of formal recycling units according to these regulations. In Peru, technical regulations are currently developed with support of the SRI project. Egypt and Ghana are in the process of introducing WEEE legislation. SRI is supporting the introduction or further application of standards and certification schemes with a focus on creating green jobs and reducing the environmental impact of recycling activities. In Egypt, this is realised through a youth incubator programme and in Ghana through developing business models for green recyclers while also contributing to the development of legislation. An overview of current status the SRI countries is given in the following table.

	PERU	COLOMBIA	EGYPT	GHANA	INDIA
Is there a national e-waste legislation?	Yes	Yes	ongoing	ongoing	Yes
Who bears the main responsibility?	producer	producer	producer, state	producer, state	producer, consumers
There are technical guidelines	ongoing	Yes	Yes	No	Yes
The country has provisions on restricting the use of hazardous substances in new products (RoHS)	No	No	ongoing	No	Yes

Hazardous additives in WEEE plastic

In India, a WEEE legislation has been introduced and is currently under revision. Technical guidelines are also available. While the guidelines refer to BFRs as hazardous substances, they do not require any removal. Thus, in practice, even in formal recycling units, WEEE plastic is recycled indiscriminately. SRI in India thus supports the development of standards, separation and disposal methods and setting-up of take-back scheme for plastic containing hazardous BFRs.

Based on the Swiss experience, technical regulation needs to contain certain requirements to ensure a proper treatment of WEEE plastics. As indicated in the table below, not only India but also other SRI countries do not fulfil these criteria, leading to similar situations observed as in India.

THE TECHNICAL GUIDELINES	PERU	COLOMBIA	EGYPT	GHANA	INDIA
... consider WEEE plastic a problematic material?	Yes	No	Yes	n/a	Yes
... give concentration limits above which material needs to be disposed?	No	No	No	n/a	No
... forbid the mixing of materials to reach limits?	No	No	Yes	n/a	No
... contain mechanisms for conformity assessment (documentation, etc.)?	No	No	No	n/a	No

Additives and the circular economy

Additives are chemicals added to plastic in order to change their properties. Virtually all plastics contain some sort of additives, of which most are currently not considered problematic. However, the list of banned or regulated additives is growing steadily. The regulations of additives often do not address the realities on the ground, especially if working with recycled material. (1) Old material still containing regulated additives may have to be disposed although there still may be safe applications. (2) Concentrations limits specified in regulations may be too low to be reliably measured or technologies for sufficiently accurate separation are not available. (3) Even if a gradual phase out is permitted, replacements substances are sometimes chemically incompatible with old substances.



Ghada Moghny (CEDARE) presenting on the e-waste situation in Egypt



Jürg de Pietro (KATZ) presenting on plastic additives

Conclusions

The Sustainable Recycling Industries Programme supports five countries in the global south in improving the handling of their e-waste specifically targeting each country's needs. For WEEE plastic, considerable legal and practical gaps still exist in all SRI countries. Technical guidelines from more advanced countries, e.g. Switzerland, may be useful in implementing the parts of the Stockholm convention relating to WEEE. Ongoing processes in developing country legislations and technical standards need to be used to further regulate the treatment of WEEE plastics. Experiences currently being made within the SRI project in India, especially in the field of appropriate segregation and disposal technologies are of high interest for other countries. Hazardous plastic additives present a challenge for increasingly circular material streams of the circular economy. Experiences from well-established cases such as BFRs may be useful in defining more comprehensive rules and legislation for legacy substances in a circular economy.

BUILT ENVIRONMENT AND THE NEXUS OF HUMAN DEVELOPMENT, RESOURCE EFFICIENCY, AND CLIMATE CHANGE MITIGATION

Organised by WRF, the Swiss Federal Laboratories for Materials Science & Technology (Empa), the Norwegian University of Science & Technology (NTNU) and the Swiss Academy of Engineering Sciences (SATW)

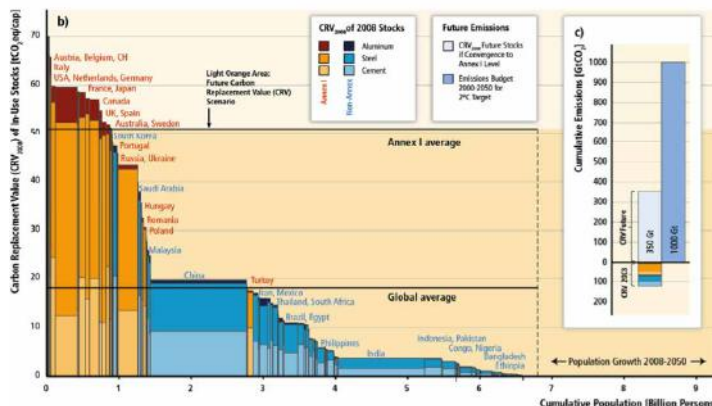
Workshop chair(s) Heinz Böni, Empa

Infrastructure development is essential for human development, but it is also responsible for most of society's resources consumption, greenhouse gas emissions and waste generation. Resource efficiency and climate mitigation strategies involve a transformation of built environment stocks and may result in synergies or trade-offs which are still poorly understood due to fragmented analytical approaches, partly reinforced by fragmented policies. The aim of this workshop was to highlight this nexus from a systems perspective on various scales, to inform a discussion about the state of knowledge, gaps, and potential policies to address this nexus most effectively.

Prof. Daniel Müller (NTNU Trondheim, Norway) first presented a general overview of the topic and the difficult issue of balancing the qualities of built and natural environments. Humanity is both facing a growth in population and a migration from rural areas to cities, where they get access to infrastructures for water, energy, transportation, education, health care, etc. Urbanisation becomes therefore one of the key drivers for human development, but at the same time also for resource use and related greenhouse gas (GHGs) emissions. The current use of western cities as role models for global infrastructure development therefore results in a conflict between the goals of poverty alleviation and climate change mitigation. In Prof. Müller's opinion, if we want to reach both goals, we need to understand human needs and how they can be met with alternative resources and production systems. He also stressed that industrialized and developing countries have very different boundary conditions for increasing resource efficiency and climate change mitigation:

- Industrialized countries have a lower resource demand (stocks are built up) and have a greater opportunities for reuse and recycling.
- Developing countries have a higher resource demand (urbanization: build up stocks) and have lower opportunities for reuse and recycling. However, powerful opportunities for leapfrogging still need to be identified.

As a result of urbanization, the carbon footprint of the existing infrastructure mainly lies in industrialized countries. An extension of westerns infrastructure stocks to a global level could pose a significant challenge for the 2°C target. Powerful opportunities for leapfrogging for developing countries still need to be identified, as there is a poor understanding of resources use on city level, which means for buildings and infrastructure.



Carbon Replacement Value (CRV2008) per capita of existing stocks by country (red/yellow and blue) and as yet unbuilt stocks if developing countries converge on the current average Annex I level (light orange area); (c) comparison with emission budget for the period 2000–2050 to reach the 2 °C target with a 75% probability. Of this emission budget (1000 Gt CO₂), approximately 420 Gt CO₂ was already emitted during the period from 2000 to 2011. Source: (Müller et al., 2013).

Alessio Miatto (Nagoya University, Japan) provided an overview on how the resource use at the city level could be better understood. He did so by presenting his analysis on the weight of cities and their material stocks and flows based on spatial database over time. He presented the examples of the cities of Manchester (UK), Wakayama and Nagoya (both in Japan). Results show that sub-surface stocks are in the same order of magnitude as stocks above surface, and that these stocks are often more difficult to recover economically, which can lead to significant challenges to use the recycling potential for increasing material efficiency in the long-term. Miatto also stressed that 4d-GIS (spatial and temporal dimensions) models have a great potential for supporting an integrated planning of urban development and resources management. It is by understanding these values and their drivers that one can set targets and reach sustainable goals.

Ing. Hubert Rhomberg, the managing director of Rhomberg Bau, presented a hybrid-timber construction system developed by the company. The first prototype – called the LifeCycle Tower - is a high-rise 30 stories tall building based on the renewable resource wood. The building has a 90 % improved CO₂ balance and a reduced input of resources. The building changes with intelligent module rules, with conversion and dismantling measures which allow being always close to the specific requirements of the building. This provides the construction with a virtually very long lifespan. In order to sensibilise architects and planners for resource and climate impacts of buildings, he proposed that public authorities add two requirements for building permits: (i) a documentation of all materials used, and (ii) a concept for deconstruction once the building has reached end-of-life. Rhomberg argued that, even if the deconstruction concepts are not at the highest level, this requirement would imply that architects start reflecting about materials in a new way, which will in turn create a new demand for research and stimulate an improvement over time.

Finally, **Prof. Julia Steinberger (University of Leeds, United Kingdom)** looked at the built-environment considering well-being and discussed possible pathways of low-carbon, resource-efficient human development. She concluded that decoupling of well-being from unsustainable resource use in the building sector is in principle possible, but often locks in excessive consumption.

Some key questions arose from the four presentations, related to both developing and industrialised countries:

- How to address urban expansion in developing countries and are there powerful opportunities for leapfrogging?
- How to address the renewal of the building infrastructure? Do we need new scrutiny of built-environment decision-making from a well-being perspective? And what kind of planning process exist that can be modified to integrate well-being proprieties?

In the discussion it was stressed that there is not a silver bullet to solve the construction material issue and that in each case the climate and the environmental impact-related education of the population need to be addressed. Trends and wishes (e.g. towards concrete buildings) can be important barriers to action that need to be tackled. A solution would be to make building permits dependent on (i) a demonstration of materials to be used and (ii) a reuse/recycling plan. The wellbeing approach (alternative forms of living) has a large potential, but limited experience.

At both levels, effective strategies for human development, climate change mitigation, and resource efficiency need to be informed by analytical studies that link the three on multiple scales (from individual structure to global).



Julia Steinberger, Daniel Müller, Alessio Miatto

THE E-WASTE TRAGEDY, OR HOW ILLEGAL E-WASTE TRAFFICKING AFFECTS OUR INDUSTRIES

Organised by Cosima Dannoritzer as part of the WRF Cinema

Workshop chair(s) Cosima Dannoritzer, writer/director of *The E-Waste Tragedy*
Mathias Schluep, WRF

The workshop started with the screening of the documentary *THE E-WASTE TRAGEDY* (full 86 min version, produced in 2014 by Media 3.14 in Barcelona, Spain and Yuzu Productions in Paris, France).

Synopsis of the film

Every year, up to 50 million tons of electronic waste - computers, television sets, mobile phones, household appliances - are discarded in the developed world. 75% of this waste disappears from the legal recycling circuits, with much of it being shipped illegally to India, China or Africa. Illegal recycling and waste dumping is a multi-million dollar business, polluting the environment and destroying the lives and health of those forced to live with it.

This film takes the viewer on a breathtaking journey of investigation to Europe, China, Africa and the US. It reveals how the European recycling system, ruined by lack of controls, greed and corruption, leaks like a sieve to shady international exporters; how harbour officials in Europe and Asia are fighting a losing battle against the immense volume of e-waste crossing the oceans; why the US are the biggest exporter in the world; and how whole cities in China are drowning in our discarded appliances, where they are recycled with a total disregard for the environment or the future.

The consequences are worrying and manifold: Valuable resources are lost, in large quantities, to industries all over the globe. The potential damage to the environment and the health of whole populations is immeasurable. An important security risk: Recycled and damaged computer chips are creeping into the production of electronics that control key aspects of our lives, such as public transport. Can the toxic tide be stemmed, or are too many people willingly turning a blind eye?

The debate

The screening of the documentary was followed by a lively debate, with participants from all over the globe, including Europe, Asia, Africa and the US.

The following key points were voiced:

E-Waste disposal is a big (and growing!) problem. The film shows how up to 75% disappear from the official recycling circuits in Europe (with sizeable percentages also disappearing in the US and in the developed nations in Asia), taking with it the valuable resources contained inside the waste.

The reasons for the disappearance are numerous and often country-specific. These include:

- small-scale theft
- informal networks siphoning off waste at national level, thus preventing it from reaching official and professional recycling facilities
- the illegal shipping of e-waste to developing countries for the purpose of dumping and/or substandard recycling, hereby allowing valuable resources to 'escape'

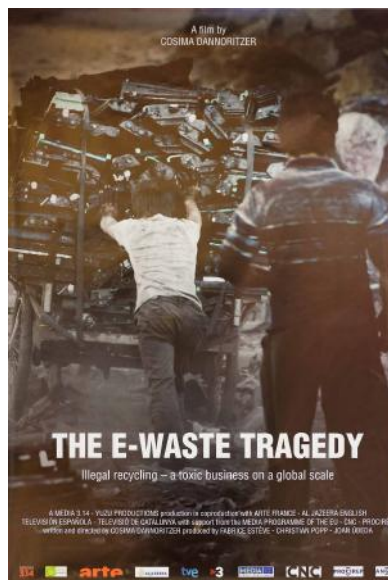
- corruption within the official recycling system
- lack of controls (local, regional, national and international)
- the challenge of controlling such huge quantities (currently, between 20 and 50 million tons of e-waste are produced by the developed nations every single year)
- large-scale international trafficking, with in some cases organised crime getting involved
- lax application of existing laws and regulations
- lack of real deterrents in many countries (small fines, etc.)
- the consequences of the economic crisis (more e-waste theft, shrinking resources to keep tabs on the problem and control it)

Several contributions from participants dealt with the complexities of the problem in different countries involved (for instance, Europe as an exporting country versus Ghana at the receiving end).

A number of solutions and possible starting points towards dealing with the issue were shared and discussed, including:

- the role of cultural habits and traditions
- the intricacies and weak points of the recycling system in different countries
- a better application of laws and regulations

To contact the film team with further questions or about further screenings: www.facebook.com/ewastetragedy



DEVELOPING A BUSINESS PLAN FOR MANUAL E-WASTE RECYCLING

Organised by SRI and the United Nations Industrial Development Organization (UNIDO)

Workshop chair(s) Mathias Schluep, WRF
 Smail Alhilali, UNIDO
 Markus Spitzbart, Wiener Volkshochschulen

UNIDO's involvement in e-waste management

Ms. Elisabeth Herbeck introduced UNIDO's e-waste management approach, highlighting that UNIDO helps build and consolidate local capacities to promote sustainable e-waste recycling industries, throughout the whole life cycle of electric and electronic devices, to recover efficiently valuable resources, while generating quality jobs and safeguarding the environment and human health.

Summary

1. UNIDO has ongoing project in Africa, Latin America and Asia in order to support the countries to establish sustainable e-waste management strategies.
2. UNIDO provides technical assistance and capacity building activities to establish sustainable recycling industries in developing countries. Business models and financial sustainability of the established dismantling facilities are essential for UNIDO.
3. UNIDO tackles the whole life cycle of Electrical and Electronic Equipment (EEE) and cooperates with international experts, organizations and platforms in order to establish sustainable solutions on a global scale.

Sustainable Recycling Industries (SRI)

Mr. Mathias Schluep presented the WRF led programme "Sustainable Recycling Industries". The programmes development objective is the sustainable integration and participation of small and medium enterprises from developing and transition countries in the global recycling of secondary non-renewable resources. The SRI applies an integrated approach engaging in three main areas (1) global SRI Roundtables (2) Recycling Initiatives and (3) Life Cycle Inventories.

Summary

1. The State Secretariat of Economic Affairs (SECO), together with Empa and WRF has supported developing countries with the implementation of sustainable solutions for e-waste management since more than 10 years.
2. Beneficiaries included micro, small and medium sized enterprises as well as the informal sector. Objectives associated with this includes building up technology and business skills and providing related tools for recycling activities.
3. The workshop also demonstrated the close collaboration between SECO and UNIDO projects, which are pursued since many years and lead to further improvement of concepts and methodology for sustainable recycling industries in developing countries.

Southern African E-Waste Alliance (SAEWA)

The Southern African E-Waste Alliance (SAEWA), introduced by **Ms. Susanne Karcher**, is a non-profit organisation which helps to coordinate responsible collection, management and treatment of the entire electronic waste (e-waste) stream in a one-stop shop format in South Africa and beyond. The SAEWA strongly encourages the active introduction of environmentally sustainable and intelligent design on manufacturing level (maximizing the life-span of equipment), improved (and new technology based) downstream recycling activities and diversion of components from landfill e.g. for unique entrepreneurial waste to art community job creation projects. The “recovery of function” is thereby preferred over the “recovery of materials” and to this end Alliance Members work together to provide a value-cascading solution. Since 2014 the SAEWA offers individuals who are not (yet) legally compliant to improve on current informal activities by signing up as an Affiliate with all the benefits of networking and skills building. The SAEWA is currently positioning itself to become the official voice representing environmentally responsible and ethically operating collectors, dismantlers, recyclers and refurbishers in South(ern) Africa to communicate (through this NPO) industry specific needs (both service and financial support oriented) related to fulfilling future “producer” based EPR obligations.

Summary

1. The SAEWA is committed to build an e-waste industry-sector specific unified voice to communicate Member/Affiliate opinions, viewpoints and needs to the public (Government) and private sector:
 - market the collective activities of its Members and Affiliates as well as the SAEWA brand
 - educate through the media the public at large about all aspects of responsible e-waste
 - provide training and learning materials and legal updates for Affiliates/Members
 - connect different e-waste management service providers to work together as an “Alliance” and follow the Integrated Waste Management Hierarchy as in NEM:WA (No. 59 of 2008)
 - create a level playing field for e-waste service providers of all sizes
 - support Members to fulfil recovery and treatment obligations from future IndVWMP driven take-back systems
2. The SAEWA is currently only surviving on the raised fees from Members and Affiliates which amount to less than R 3500 (Euro 230) per month – all other work is done in a voluntary capacity since the last five years by the SAEWA coordinator and this cannot continue. Hence funding support is urgently required – otherwise SAEWA activities might have to be curtailed or even concluded.



Susanne Karcher, SAEWA



Trashdesign exhibition

Group Work

The group work, led by **Markus Spitzbart**, was the core of the workshop and focused on supporting the participants to familiarize themselves with an excel-based tool to calculate business plans for a manual e-waste dismantling facility. The three cases of Kampala, Uganda, Rio de Janeiro, Brazil and Phom Penh, Cambodia were calculated and analysed. The calculations were based on a predefined input mix to the facilities and an assumed total throughput at the facility of 500t. The results showed that for Kampala and Phom Penh it is advisable to perform an in-depth manual dismantling whereas for Rio a more superficial dismantling is more cost effective. The main factors leading to this result are labour costs and recycling options in the countries as well as the neighbouring countries.

Conclusions

City	Level A	Level B	Level C
Kampala	USD -74 326/y	USD -23 147/y	USD 22 714/y
Phom Phen	USD -13 283/y	USD 41 408/y	USD 117 673/y
Rio de Janeiro	USD -20 933/y	USD 43 789/y	USD 31 408/y

Participants showed great interest in the tool and the opportunity to organized in-depth trainings to apply the tool. An open source version of the tool will be soon available. Interested participants will be informed about the location of publication.



Smail Alhilali, UNIDO



Vivid participation by workshop attendants

SYSTEM DYNAMICS AND ECONOMETRIC APPROACHES: POTENTIAL AND LIMITS OF MODELLING RESOURCE EFFICIENCY

Organised by Ecologic Institute

Workshop chair(s) Prof. Harald Sverdrup, University of Lund

40 years after limits to growth. The World3 system dynamics model and its impacts by Prof. Harald Sverdrup

The discussions on limits to growth date back a long time, linked to a small group (Malthus; Paul Ehrlich "the population bomb", Ehrlich equation: $I = P \cdot A \cdot (1-R) \cdot (1-E)$; (xy); Hubbard curve ; Pachet – "Club of Rome"). From these roots grew the first "limits to growth team" at Massachusetts Institute of Technology (MIT). They developed the World3 model, which in its logic looked at causalities, producing simple modules and "causal loop diagrams". Their main results were: the world would run low on resources and the resources would become too expensive for anyone to pay; the exponential growth of the population would lead consumption to overpower all counteractions like improved efficiency and circularity. However, the established system reacted with denial to limits to growth; growth was kept up with debt and quantitative easing since 1976 in the US and many other nations.

Critic on the World3 model included its oversimplification (no distinction was made between materials etc.) but ironically also its complexity. However, it had to be simplified to be executable on the MIT computers at the time. While the lumping together of resources created a credibility problem, the model runs remain roughly valid.

Q&A

- Assumptions are often highly political
- The original world model did not underestimate the technological effect (as is often claimed) – these were political campaigns

Conclusion

Modelling is a highly political business – not only are the assumptions going into models political, but also are discussions revolving around model results often strongly politically motivated.

Methodological Background and scope of GINFORS

Mark Meyer presented the (econometric) model GINFORS applied by the Institute of Economic Structures Research (GWS). GINFORS is a dynamic Multi-Region Input-Output (MRIO) Model. The first base for robust modelling is data quality – the data needs to be objective, reliable and valid. GINFORS' empirical database integrates monetary flows from the System of National Accounts (SNA), which are considered high quality, as they are classified and harmonised by the United Nations. Based on this historical information, aggregated accounts for domestic private households, the public sector, corporations and non-resident economic transactions are projected until the year 2050.

Furthermore, global supply chains are mapped by dynamic projections of internationally harmonised Input-Output tables. These tables contain detailed mappings of industry specific supply chains, their interrelationships with final demand categories and sectoral income generation.

The data analysis in GINFORS is based on economic theory and has furthermore been influenced by INFORUM (INterindustry Forecasting at the University of Maryland) in its modelling methodology. Hence, all applied parametrisation techniques rely heavily on historical (panel-) time series analyses. Overall, the resulting modelling framework might be classified as a Neo- Keynesian dynamic economic simulation model with environmental extensions. Compared to other simulation models, GINFORS features a detailed sectoral disaggregation and includes a treatment of emissions as well as material demands land and water use. Based on more than 1.8 million time series, it produces results for 38 countries (+rest of world), 59 goods, 35 industries and 12 material categories. Due to its global coverage, GINFORS is able to map national material demands in raw material equivalents.

Q&A

Q: Is biodiversity included?

A: No, as there is currently no data available for these calculations. However, GINFORS is able to follow the supply chain of products and calculate resource extraction, land and water use as well as air emissions. From this knowledge some qualitative insights can be transferred to biodiversity loss.

Q: Are wastes and illegal markets included?

A: No, shadow economies are not included.

Conclusion

Dynamic MRIO modelling will become more important in the future, as the lasting globalisation trends and interconnectedness as well as the accelerating global material use and their linked environmental impacts create a need for more knowledge on global footprint assessments.

SimRes Project – Group modelling process

Deniz Koca presented the systems science based group modelling process and its importance for analysing complex dynamic systems in transdisciplinary projects. In order to better understand systems it is important to bring stakeholders from different backgrounds together and have them develop a model of that system. Stakeholder identification is a major first step for participatory group modelling. The identification and selection of stakeholders depends on the system that is to be modelled.

In order to avoid misunderstandings, stakeholders from different backgrounds need to find ways to communicate. Causal Loop Diagrams (CLDs) can serve as a common language and ensure a good level of communication among the stakeholders. The CLDs do serve also as a visualisation tool making the assumed causal relationships between the different factors transparent, and visualising complex narratives. The group modelling process helps to improve our knowledge of complex systems and integrating a wealth of information from different disciplines and sectors. In the SimRes project, we identified four major sectors and (partly) conceptually modelled them through a series of group modelling workshops. These sectors include:

- Energy
- Transport
- Food system
- Manufacturing

Conclusion

CLDs and group modelling process help stakeholders to visualise, understand and communicate complex issues/systems/problems with causal interlinkages and feedbacks. Conceptual models developed with such process clarify decision making cycles.

The WORLD and GINFORS models and the SimRes project: Planning for a sustainable Germany and modelling the use of global resources and the connections to prosperity by Prof. Harald Sverdrup

In SimRes the two modeling approaches – the GINFORS model (econometric model, transactions and services model, bottom-up demand side) and the WORLD model (system dynamic, global level, supply, global market supply side and market price) – will be connected through soft-links. The global context is necessary to robustly model policy impacts of Germany as well as impacts of external/global developments on Germany, as Germany is strongly interconnected with world markets. By soft-linking both models via exchanging global material availability and prices through WORLD and global material demand effects (derived price effects) through GINFORS, a more consistent mapping of the international economic effects will be achieved than through individual model simulations.

Q&A

Q: To which extent can you model i.e. energy transition in other countries, especially as critical materials run out?

A: There are 38 countries (+ rest of world) in GINFORS that can be modeled. However, while it is for example possible to model the developments in China, the storylines are needed first: what do we assume might happen in 2050? The worlds created need to be consistent. In the current model version it is assumed that not only Germany will develop in a certain direction.

Q: There is social resistance to some resource extraction projects. Could that also be included in the model?

A: GINFORS does include a social model, but it needs further development. However, as with regards to social resistance, this may put the price for certain resources up and thus making recycling more profitable. These connections can be modeled and the further results shown.

Conclusion

Connecting different model types can be beneficial to target their respective “blind spots” and combine their strengths. Nevertheless all modelling needs assumptions and narratives first. The models function in a certain logic that the scientists (or participants of a group modelling process) need to define and understand first.



LUND
UNIVERSITY

HANDLING CRITICAL MATERIALS – RESOURCE STRATEGIES, VALUE CHAINS AND THEIR IMPACT

Organised by Foundation for Rare Metals (ESM)

Workshop chair(s) Margerethe Hofmann, ESM Foundation/ MatSearch Consulting

Defining and determining criticality by Prof. Tom Graedel, Yale University

Topics: Determining criticality has been a complex and sometimes contentious challenge ever since the topic was introduced early in this century. Criticality evaluations have been produced for the world, for countries, for regions, and for corporations. They tend to show a divergence of the elements designated as critical or not. Why is this the case, and can the situation be improved?

To explore criticality determination from an enhanced perspective of rigor and breadth, a comprehensive methodology has been developed by Yale University and applied to 62 elements of the periodic table. Factors that have been considered include aspects of geology, geopolitics, regulatory structures, environmental implications, substitutability, import dependence, and others. All of the results have been published in the peer-reviewed literature, and important ones are presented in this talk.

Discussion

- Should the term “essentiality” be used, instead or supplementary to “criticality”?
- Combination of the recycling potential by Yale and the technical possibilities defined by UNEP will be included into a new document according in spring 2016.
- The extraction efficiency of single materials is hard to determine as companies do not reveal this.
- In by-products, the uncertainty of data is much higher.

Conclusions

1. Yale has defined three axes of criticality: vulnerability and supply risk (together creating five “clusters” of critical materials as well as ecological impact). The different factors are rated as an equal mix of different criticality indices.
2. Properties leading to relatively high criticality are identified, but it is demonstrated that no single list of “critical metals” can be derived.
3. Criticality is a dynamic property – mines open and close, material demand evolves, recycling becomes more efficient, etc. As a consequence, periodic reassessment of criticality will always be needed.

Critical elements and their impact on a circular flow economy by Dr. Hans-Jörg Althaus, Lifecycle Consulting Althaus

Topics: The energy demand for closing material cycles depends on product design and use and on recycling technologies. But in any case, energy demand will rise with rising recovery rate. What is the solution for deciding on an optimal recovery rate of raw materials and a sustainable use of natural resources in general?

Discussion

- Also considering a 100% recycling rate, the demand on raw materials will rise.
- Total material requirement does not take into account scarcity, environmental impact, etc.
- There are different kinds of “use”: e.g. precious metals like platinum are “pooled” in jewellery with hardly any dissipation, but also in medication, dissipating completely when used.
- The use of natural resources should be included in the assessment of supply risk.

Conclusions

1. Circular Flow Economy is just a matter of how much energy one is willing to invest, but a 100% Circular Flow Economy is not a sustainable option. The optimal recovery rate depends on how the energy is provided and therefore on the geographic region and, if we are looking into a future with changing energy systems, on the time.
2. Material criticality can be solved by existing market mechanisms. This is not the case for natural resources other than raw materials. GHG emissions, land and water use and biodiversity loss kept rising at increasing rates despite growing awareness of and global initiatives to mitigate the criticality of those natural resources.
3. Material criticality cannot be addressed properly without internalization of external costs.

Critical conflict and strategic materials risks by Dr. James Goddin, Granta Design

Topics: Granta Design is the world-wide leader in material database solutions. Granta’s approach to integrate the identification of product specific supply chain risks from critical/conflict materials and restricted substances into an overall solution for material selection provides companies with a tool for better designing and forecasting the design of components and products.

Discussion

- The data on critical materials is updated on a yearly basis. But not all of Granta’s data is publically available and can therefore not be used for comparison with other approaches.
- How does the substitution potential by using other technologies influence the criticality?

Conclusions

1. For many companies understanding and responding to the environmental impacts of their products and operations is rising up the business agenda. Business drivers include legislation on energy consumption, hazardous substances and conflict minerals, volatile material and energy prices, product marketing, brand value and Corporate Social Responsibility and stimulus for product innovation and a transition to a circular economy.
2. Approaches such as Life Cycle Assessment (LCA) generally require significant knowledge and expertise, both to perform the analysis and to understand the results. Furthermore, the LCA approach is substantially divorced from product development activities as it is generally applied at the end of the product development process. This results in poor engagement of designers and engineers with environmental issues and a general lack of support (or capability) to address these issues within the organization. Similar challenges exist for critical materials where lists of critical elements that have been produced in order to advise broad economic and trade policies continue to be inappropriately applied in an attempt to guide the more specific technical, commercial and supply chain requirements of individual businesses seeking to identify and mitigate these potentially very significant supply chain risks for their products.

3. Several industry-based projects Granta Design is active in are attempting to overcome implementation barriers by adopting a product specific, risk-based approach to the management of product sustainability issues, the identification of product specific supply chain risks from critical/conflict materials and restricted substances, the substitution of materials and the design of products incorporating Circular Economy principles.

Product design for the efficient use of critical materials: the case of mobile information technology devices

by Karsten Schischke, Fraunhofer IZM

Topics: The content of critical and valuable material is manifold in today's electronics devices. The recycling industry can do a lot to achieve high recovery rates of some of these materials, but product design has to play at least a similarly important role. Different approaches are discussed in this talk.

Discussion

- Electronic industry is diversified in their production – not many standards – and depending on Asian suppliers which makes it difficult to introduce “green design” although it would be necessary.
- Electronic consumables are strongly dependent on a “fashion” design demanded by end-users and which leads to short lifetimes. New design approaches that introduce modularity and with that longer lifetimes and less change of overall design must either be accepted by the end-user or introduced by national or European/international laws.

Conclusions

1. Although laptops, tablets and smartphones are difficult to recycle, there are also some promising design options found among individual brands, including MicroPro's iameco D4R laptop, imasD's Click ARM tablet, Google's project ARA, the Puzzlephone by Circular Devices and the second generation Fairphone.
2. First of all, modularity means inevitably more material consumption, as additional sub-housing and universal connectors are required, partly also a larger total product volume to allow for incorporation of the maximum potential configuration and anticipated future technologies. This has to pay off through a significantly longer use of individual devices and modules.

Critical elements – strategies and advanced technologies for closed material loops

by Prof. Gerhard Sextl, Fraunhofer IWKS and University of Würzburg

Topics: The resource strategy described in this presentation is based on a comprehensive approach. Main elements are investigations into sourcing processes of critical elements that are applied in various products, recycling technologies for an efficient and energy saving recovery of materials after use of products, for example in the field of electronic systems and batteries, and the potential to substitute critical elements in high-tech applications like magnets in electric engines and wind turbines, energy materials and luminescent systems.

Discussion

- Criticality discussion is not only related to avoid certain elements and how to substitute them, but also to recycling opportunities that focus on “whole materials” re-use of e.g. same alloy or mixtures.
- Functional materials should be retained by using suitable processes instead of recycling elements.
- Also old technologies can be applied beneficially for new applications.

Conclusions

1. To satisfy the growing demand on functional materials in the future also secondary resources out of re-manufacturing, re-using and re-cycling procedures will become more important for the continuous and stable supply of critical metals and materials.
2. A computer-based material data model for critical elements describes for each element the scarcity of materials, state-of-the-art sourcing processes with regard to energy consumption and provides an overview on related technical applications.
3. Recycling concepts should be tailored to end-users needs, cost/benefit ratio and optimal energy and carbon footprint balance.

Mobilising industry to act on material criticality – how other domains can inspire concrete actions by Willem Bulthuis, Business Angel and Digitization Advisor

Topics: Reducing the use of and dependency on critical materials and improving the circulation of such materials within the value chain requires concrete actions by industrial companies. How can we motivate and support the management of individual companies to take action?

Discussion

- How to encourage companies, especially SMEs to discuss risks on critical materials in their normal risk strategy.
- Importance of opening the discussion on criticality also on the management level and to be aware of problems also in “low risk” times (low prices, availability of critical material).

Conclusions

1. Industry will only pay attention to the topic of materials criticality if it is perceived as a risk with major impact.
2. Industrial management should be motivated to consider materials criticality in established business concepts and risk management structures.

Expert debate on „What is materials criticality and how can it be assessed?“

Experts:

- Prof. Jo Dewulf, JRC (Introductory talk about “EU methodology for criticality assessment”)
- Alessandra Hool, ESM (Moderator)
- Prof. Armin Reller, University of Augsburg
- Dr. Luis Tercero Espinoza, Fraunhofer ISI
- Prof. Tom Graedel, University of Yale
- Dr. Hans-Jörg Althaus, Lifecycle Consulting Althaus
- Dr. James Goddin, Granta Design
- Dr. Patrick Wäger, Empa
- Dr. Christian Hagelüken, Director EU Government Affairs Umicore
- Willem Bulthuis, Business Angel and Digitization Advisor

Topics: The “criticality” of raw materials is a well-known term, but its exact definition differs widely dependent on the respective approach. In the expert debate, a variety of criticality concepts was highlighted by experts from a wide range of backgrounds who discussed the advantages of different approaches, their applicability and limitations.

Discussion

The panel discussion covered the following topics:

- EU methodology
- Definitional issues
- Criticality and risk
- Inclusion of ecological impact
- Substitution and recycling
- Criticality and the industry
- General discussion on methodology development and its value
- The detailed outcome of the session will be published, further information soon on www.esmfoundation.org

Conclusions

1. “Criticality” is used for a variety of concepts depending on the context.
2. The concept of materials criticality based on supply vulnerability, economic impact and additional life cycle parameters should be adapted to the field of application (stakeholder interest, sector).
3. The topic is a very complex and volatile one; the different variables change also in view of their relevance for “criticality”. It is therefore necessary to monitor and re-evaluate the topic on a regular basis. The discussion with such a variety of valuable experts as at the ESM Session at WRF should continue, and this network should be further fostered, opened and enlarged by stakeholders from additional areas.

SUSTAINABLE WATER USE – TARGET SETTING AND POLITICAL APPLICATION

Organised by the German Federal Environment Agency (UBA)

Workshop chair(s) Christopher Manstein, UBA

An approach for setting targets for sustainable water use

In the first input presentation, **Stephan Lutter (Vienna University of Economics and Business (WU))** gave an overview of how the IntRESS work on water targets had evolved during the last year and introduced the approach for identifying environmental thresholds and related targets developed in the IntRESS project. When discussing targets for water use different aspects have to be borne in mind, which are of high relevance and specific for the resource category water. These aspects cover, among others, the different types of water (blue, green, and grey water), the different types of water flows (abstraction vs. consumption) and the necessary spatial, temporal and sectoral differentiation. Available data and methods can so far only partially consider these aspects. However, the more difficult the quantification of water use and consumption the more complicated the design of specific thresholds and targets will be. In other words, for the identification of meaningful water use targets a reliable data basis is needed. Mr. Lutter presented existing approaches for water use targets such as the Water Exploitation Index of the European Environment Agency, the Water Stress Index or the approach taken by Rockström et al. in their "Planetary Boundaries". He indicated a possible way towards the elaboration of targets from the watershed to the global level, using a two-perspective approach: the production (territorial) perspective as well as the consumption (global, life-cycle) perspective.

Mr. Lutter finished with an outlook of the next steps in target development and implementation:

- Agree on principles for target setting
- Discuss and agree on targets for sustainable water use
- Improve data availability and quality
- Develop a consistent quantification method to account for water appropriation
- Develop a policy framework to ensure achievement of targets

Water use targets – a multi-layer approach

Ertug Ercin (Water Footprint Network (WFN)) started by giving a brief overview of the WFN and its activities. The WFN brings together expertise from academia, businesses, civil society, governments and international organisations as a platform for connecting diverse interests in sustainable, equitable and efficient water use. It also provides data, methods, guidelines, criteria, tools and support for Water Footprint Assessment.

Mr. Ercin explained the concept behind the Water Footprint indicator and stressed the importance of the spatial and temporal dimension of water, as availability, water stress, scarcity, impacts and problems are different per country, region, river basin, sub-basin, and cluster, and through the consumption of goods and products the water needed for their production is traded virtually across the

world, from the producer to the final consumer. The main suggestion for the development and application of water targets encompassed a two level approach which tackles both the river basin (and production) level as well as the global (and consumption) level (see Figure below).



The presentation was finalized with an emphasis on the circumstance that, while target development is an important step towards sustainable water use, the political negotiations of allowances on the production, as well as the consumption level will certainly constitute a crucial requirement.

The application of targets in policy making

Adrian Tan (E&Y) started with an introduction to environmental policy indicators which are used to monitor, communicate and analyse state, change or performance of environmental circumstances. However, it is not always possible to measure, what one is really interested in. He distinguished lagging and leading indicators as well as process- and outcome-oriented indicators and gave examples for these in the context of the resource water (see table below).

	Lagging	Leading
Process-oriented	e.g. river basin management plans implemented	e.g. budget for environmental protection
Outcome-oriented	e.g. water stress	e.g. freshwater abstraction

It was further shown how indicators can be used in the context and at different stages of the DPSIR framework, where in the context of environmental policy making distinguishes Driver, Pressure, State, Impact, and Response are distinguished, to understand the chain of causal links.

In a next step the role of indicators and targets in EU environmental policy was explained and the main phases of environmental policy were described. As one main example the Roadmap to a Resource-Efficient Europe launched by the Environment Directorate-General of the European Commission in 2011 as outcome of the Flagship Initiative “A resource-efficient Europe”, part of the Europe 2020 strategy, was described in more detail. In the Roadmap it was foreseen to set up an international process involving all key stakeholders, to discuss and agree on indicators and targets on materials, land, carbon – and water, by the end of 2013. The European Resource Efficiency Platform (launched in 2012) was meant as a stakeholder platform to provide guidance towards a first proposal for milestones to be reached by 2020. While advances were reached, no precise thresholds could be identified. Mr. Tan stressed the relevance of both type of indicators – for the production as well as the consumption level as well as the necessity to bear in mind that the uses of different types of resources are interlinked; the latter being of specific relevance when elaborating thresholds for sustainable water use, as one threshold for one type of resource can strongly influence the use of other resources.

The presentation concluded with an overview of the main steps towards the set-up and implementation of political targets. In a first step, on the basis of environmental and economic rationale the right indicators should be chosen. Then, building on evidence about what is economically feasible, socially preferable and technically possible targets can be identified. Disaggregating the indicator results by country, sector, company, etc. allows for the design of adequate policy instruments.

Guests contribution

Ernst Ulrich von Weizsäcker, president of the Club of Rome and member of the UNEP International Resource Panel, stressed the importance of water pricing as a means to achieve sustainable water use. He argued that with water having no price – and hence no value – there would be no incentive to use water more efficiently. He further stressed that even for poor people having to pay for water would not constitute a development problem, as long as the minimum requirements are met.

Mr. Lutter agreed in that once the right way to measure water appropriation is decided on and meaningful targets identified, water pricing is an important tool to achieve these targets.

Marilyn Mehlmann from GAP International underlined the need for a consideration of every human being's right to water. When discussing thresholds for sustainable water use one would have to bear in mind that many people do not even have access to enough water to fulfill their main necessities.

During the workshop discussion the participants agreed that, while methodologically the main aspects seem to be clear, the challenge lies also in data availability and quality.

Overall conclusions

1. For the management of water, comprehensive indicators are needed which cover all the aspects relevant for the resource water.
2. Targets have to be identified which are applicable on different geographical levels.
3. While one important aspect is the technical development of and the agreement on the right indicators and meaningful thresholds, the political aspect of agreeing on water allowances as well as allocations is a challenge of considerable dimension.

FROM INVESTMENT TO IMPACT: SOCIAL INNOVATION FOR SUSTAINABLE CONSUMPTION AND PRODUCTION (SCP)

Organised by UNEP and WRF

Workshop chair(s) Bas de Leeuw, WRF

Transforming investment in to impact: mechanisms for funding social innovation in SCP
by Angel Versetti, WRF

Presentation

An overview of the existing mechanisms for funding social innovation that aims to make shifts to more sustainable modes of consumption and production. Emphasis was placed on a definition of social innovation which gives central importance to the actual transformation of social interactions.

A potential example of a concrete mechanism to move towards this shift was given. The IBIS project (Igniting investment in business for sustainable lifestyles), a concept which is being led by the WRF in partnership with several interested partners, aims to link up investors and ideas. Social innovation is a potential hook to catch the interest of the private sector, and provide them an entry point to investing in SCP.

Some of the current barriers – thematic and structural – to investing in social innovation for SCP, were also presented. The following presentations and discussions would aim to raise these issues and propose potential solutions.

Scaling up partnerships and networks for investment
by Fabienne Pierre and Andrew Schmidt, 10 YFP Secretariat (UNEP)

Presentation

The 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP) was adopted by Heads of State at Rio+20, with an international mandate to accelerate the transition to SCP on both the developed and developing world. Thematic and sectoral programmes act as umbrellas, bringing together projects, expertise and resources towards common objectives.

The links between social innovation and SCP were presented. Like SCP, in order for social innovation to be effective, it must be a driver of systemic change, altering the way that those in a society interact with one another.

The 10YFP was presented as a mechanism that can use its convening power and focus around common objectives to help link up the right investments with the right ideas. It is not designed to be a layer of bureaucracy to which investors and innovators must sign on, but rather a hub of resources and expertise that can facilitate collaborations.

Inclusive innovation outside the box to disrupt the system: an entrepreneur's perspective by Joshua Bicknell, Balloon Ventures

Discussion

Began with a few stories from Kenya. The fact that so much of the economy is informal, and that people need to do what they can to survive, engenders a thriving entrepreneurial culture in the country. However, the emphasis is understandably often times on short terms profits rather than the long-term sustainability of the venture. In order to innovation to take root in the long term, failure must be tolerated in the short term. Unfortunately, in a developing market like Kenya, investors are not willing to tolerate failure, which in turn does not encourage innovation. Balloon Ventures is a social enterprise that supports innovation by providing risk capital. They train fellows to work with budding entrepreneurs in Kenya, to design a viable, bankable business models from the ideas which are thriving on the ground. Resources are then provided for these new ideas. The challenges of running such a social business are not negligible. When people are hustling to survive, how can sustainability be built into such an environment? Another major challenge is coming up with the right metrics to be able to report back to investors on environmental and social criteria.

Seizing the innovation high-ground through investment in SCP: a business perspective by Gunter Pauli, Blue Economy

Discussion

When designing projects and considering where and how to invest, it is imperative to have a long term vision which will keep money and other resources in the local economy. There needs to be a radical shift in the types of business models that we are using, which encourage the types of innovations that will nudge entire societies towards sustainability. For example, instead of traditional models which encourage recycling and limiting resource use, there needs to be exploration into models which simply do not use the resources in the first place.

Panel discussion

Panellists: Angel Versetti, Gunter Pauli, Dianne Dillon-Ridgley, Markus Zils, Joshua Bicknell

Topics and Discussion

The second session of the workshop was an interactive panel discussion in order to dig deeper into the issues raised during opening speeches. Questions to be discussed included: What makes social innovation transformational and inclusive, and why should business care? How can the investors and innovators speak the same language, harmonizing diverse objectives and incentives to move towards viable, bankable business plans? What are the challenges of and solutions for managing the gap between seed funding and market viability?

The issue of language gap between the investors, international organizations, and the investors on the ground came up multiple times. It is often times not easy to communicate to the traditional investment community when talking about social and environmental concerns. The ideas are there, and they are good, but they need to be translated into something that a classical investor will understand. A potential avenue towards this, particularly in developing markets, are involving medium to large national companies who really understand the local context. This can be more effective than trying to bring in multinational private sector entities who do not understand the particularities of specific markets.

Another important issue is the fact that in traditional venture capital, the returns are higher and so businesses can afford to take more risks. In social business, this is not the case and so funds need to be much more conservative. The funding gap between seed funding and market viability is a space that needs to be filled. There are huge opportunities for large companies to move in and find new revenue streams. Startups are set up to innovate but cannot deliver at scale, and big companies are not set up to innovate but can help to deliver at scale. This is a symbiosis that needs to be exploited.

The technology for massive social innovation for SCP is available, so how do we scale up innovative efforts on the ground? Frameworks like the 10YFP provide a mandate and a backbone to organize efforts around common objectives. Investors and innovators are willing to go into the kinds of collaborations which can be facilitated by the 10YFP, but they need some sort of concrete mechanism to latch on to. Something like the IBIS proposal, that links up investments and ideas, could be such a mechanism, to stimulate connections between investors and innovators through the focused work areas of the 10YFP programmes.

Conclusions

1. Social innovation and SCP are mutually reinforcing, as each of them imply a systematic shift in the way individuals within a society interact. Social innovation for SCP does not imply revolutionary new ideas, but rather exploring how existing ideas and behaviors can be adjusted to nudge societies towards exponentially increasing collective impact.
2. There is no shortage of capital nor of ideas. The major challenge of investing in social innovation for SCP involves linking up the right investments with the right ideas. Innovative models that allow entrepreneurs to take risks must be fostered. The 10YFP has a role to play, as a hub of resources and expertise, in making connections between the investment community and the innovators on the ground.
3. To date, there has not been sufficient buy-in of the private sector in the 10YFP. Social innovation can be an effective entry point for the private sector, because it speaks to their desire to invest in cutting edge developments. With a general increasing desire of the private sector to be more sustainable, the 10YFP can be the framework that connects the investments and the ideas around concrete areas of work across regions and sectors.
4. All conversations need to include the relevant actors. This means talking with chambers of commerce, business associations and others who represent the interests of the private sector and can communicate what it is they need to hear in order to invest in social innovation for SCP. Frameworks such as the 10YFP need to include these actors in the next steps, in order to foster a dialogue that leads to the development of concrete mechanisms and tools for investing in SCP.



Panel discussion

MATERIAL-EFFICIENCY IN SWISS INDUSTRY BASED ON SYSTEMATIC ECODESIGN – 3 CASE STUDIES WITH BIG POTENTIAL

Organised by the Swiss Federal Office for the Environment (FOEN) and Reffnet.ch

Workshop chair(s) Rainer Züst, Züst Engineering

Ecodesign – 3 cases from industry

Contributions

- Bruno Oberle, FOEN: Opening
- Rainer Züst: From small improvements to big jumps – Ecodesign in Swiss Industry
- Stefan Gürtler: Ecodesign and economy – which are the challenges?
- Michael Biemann, COMET/ebeam: Packaging industry: „natural light“ instead of expensive chemistry – how ebeam-Technology is revolutionizing the systems efficiency of Tetrapack
- Christian Berg, Inficon: Production of measuring instruments: Vacuum-Sensors for efficient processes in production equipment – intelligent systems as an example for scaling effects
- Christoph Klahn, inspire/ETH Zurich: Lighter, faster, better...: how additive manufacturing processes are reducing material input in production and usage phases of new product

Conclusions:

1. General remark: From a world perspective, Switzerland consumes even more than three Earths. In other words: after April we live on ecological credit. The Earth is solid bank, but also a strong bank might collapse having too many open credit.
2. Position of industry: Industry and especially “ecodesign” has the potential to reduce significant material and energy input; a major challenge is to design better products.
3. Designing better products: The goal of ecodesign is to minimize – as a preventive approach – ecological impacts over the entire product-life by increasing the product benefits; therefore the focus should be more on the usage phase: find hidden opportunities and novel solutions for the customer of your customer – open your perspective, enlarge your area of influence... and make profit from Ecodesign 3.0!
4. Four industrial cases: In the workshop 4 ecodesign examples from Swiss and Liechtenstein industry have been shown and discussed; the extended benefit with at least 1:25 and more.... That was possible by implementing the concept of Ecodesign 3.0.
5. Pull...: Don't push green solution anymore – make much more attractive solution from an economic viewpoint – that's our future job!

CIRCULAR ECONOMY IN ACTION – EXPERIENCES OF RECP^{NET} AROUND THE WORLD

Organised by Global Network for Resource Efficient and Cleaner Production (RECP^{net}), UNIDO and UNEP

Workshop chair(s) Vladimir Dobes, EMPRESS

Africa: RECP for low-carbon production and eco-innovation in agroindustry by Silver Ssebagala, Uganda Cleaner Production Centre (CPC)

This session focused on showcasing the diversity and richness of experiences from around RECP^{net}, in service of contributing to a circular model of economic development and growth. The examples selected aimed to reflect the scalable and replicable nature of existing and effective RECP solutions at the enterprise and sector level.

A low-carbon production and eco-innovation project was launched for the Ugandan agro-industry in 2011. The reasons for choosing the agro-sector were fourfold:

- Carbon intensive industries populate the agro value chain due to high energy consumption required in processes such as cleaning, refrigeration, pasteurization, cooking, blanching, bottling, conservation, and drying.
- High energy consumption accounts for the majority of carbon emissions and other GHG emissions
- There is in practice a huge potential to reduce carbon emissions by improving resource efficiency through application of RECP.
- A high potential exists for fuel switching due to abundance of biomass in the sector.

The project started with verification and refining of baseline energy and material consumption data for 30 enterprises covering tea, sugar, leather, dairy, breweries, textile and fish sectors. In addition to RECP assessments carried out in Ugandan agro-industries, and the implementation of RECP measures, capacity building activities, including training material development, were undertaken, as well as a review of policies and instruments to promote low-carbon production. Information on relevant environmentally-sound technologies and their providers was also collected and disseminated.

Conclusions

1. The Ugandan agro-industrial sector offers large economic and environmental opportunities, through the application of RECP on a sector level.
2. Case studies from individual industries demonstrate that savings from the implementation of RECP measures are concrete, and investments often have short payback periods.
3. Notable improvements have been achieved with regard to energy efficiency and GHG reductions.

Arab Region: The MED-TEST Programme

by Rachid Nafti, Transfer of Environmentally Sound Technologies (TEST) Programme Tunisia and Carolina Gonzales, UNIDO

A presentation of the MED-TEST Programme was given by Ms. Carolina Gonzalez, UNIDO, and Mr. Rachid Nafti, TEST Programme Tunisia. The programme aims to facilitate the shift towards Sustainable Consumption and Production (SCP) in the southern Mediterranean region by building capacity, implementing pilot actions, engaging with policy-makers and creating partnerships toward sustainable consumption.

The TEST approach embeds traditional «one-stop improvement» or «audit-like» approaches to resource efficiency in the system approach, driving continuous learning and improvement. As such, TEST's basic tools consist of:

1. Cleaner Production Assessment (CPA)
2. Material Flow Cost Accounting (MFCA)
3. Core elements of an Environmental Management System (EMS) and an Energy Management System (EnMS) to sustain performance

The benefits of the TEST approach for service providers was seen as consisting of building capacity in:

- How to conduct integrated resource efficiency with:
 - energy efficiency audits with focus on process optimization
 - environmental management systems for continuous improvement
 - material flow cost accounting techniques to reveal the actual economic losses due to inefficient use of resources
- Benchmarking techniques for environmental performance of industries
- Best practices and eco-innovative technology for specific industrial sectors
- How to market sustainable production services to industry

The TEST approach also offers added value for industry, consisting mainly of increased productivity; minimized environmental compliance costs; access to new markets; long-term supply of production inputs; and, improved relationship with stakeholders.

The presentation furthermore outlined how to conduct integrated resource efficiency, use benchmarking techniques for environmental performance of industries, apply best practices and market SCP services to industry.

The business case for SCP measures in the region was also clearly outlined, as well as the economic and environmental gains achieved.

Conclusions

1. TEST approach leads to the efficient use of resources and reduction in waste, thus improving enterprise performance and achieving economical and environmental gains.
2. TEST approach reveals the «real cost» of waste by identifying, quantifying and putting monetary value on «non product output».
3. TEST approach addresses changes at the strategic, managerial and operational levels of the enterprise with the objective to achieve sustainable development goals.
4. TEST approach is flexible and customized for SME needs.
5. TEST approach aims at building capacity at enterprise level for sustainability and continued improvement.

Asia-Pacific: *Green Co* – Green Ratings for Companies in India by Kiran Ananth, CII Green Business Centre India

From the Asia Pacific region, the Confederation of Indian Industry's *GreenCo* company rating system was introduced, as a catalyst for the greening of Indian industry. The ratings target the manufacturing and service sector and set out to reward exemplary environmental performance of companies. The system is a framework to define and assess the performance of a company according to "green" metrics. The approach is holistic by design and aims to monitor and sustain green initiatives, as well as guide phased growth.

Typical parameters used to assess companies include: energy efficiency, water conservation, use of renewables, GHG reduction, waste management, material conservation/recycling, green supply chain, product stewardship, and lifecycle assessment. Currently, over 147 companies are implementing the *GreenCo* ratings system, with 49 companies already rated. To illustrate the achievements of rated companies, the presentation included best practice examples from select companies taking part in the ratings scheme.

Companies benefit from *GreenCo* through:

- Resource conservation and cost reduction opportunities
- Benchmarking and performance in environmental areas
- Boosting of the green corporate image
- Roadmaps for long term resource conservation
- Risk reduction and preparation for future markets and regulation
- Driving new concepts and innovation

Conclusions

1. As the first of its kind, the *GreenCo* ratings system provides companies with multiple benefits, while helping catalyse a systematic greening of Indian industries.
2. The system rates environmental performance at sector and company level according to ten parameters and helps further development.
3. Multiple best practices from a wide variety of sectors are showcased and disseminated.

Eastern Europe, Caucasus, Central Asia: EaP GREEN by Malkhaz Adeishvili, EaP GREEN Georgia

In the Eastern European region, the EaP GREEN programme was showcased, which aims to green economies through governance and financing tools, environmental impact assessment tools and demonstration projects supporting corporate action, as follows:

- Governance and financing tools: Mainstream sustainable consumption and production into national development strategies
- Use of Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) as planning tools: Promote the use of the SEA and EIA
- Demonstration projects in support of corporate action: Apply sustainable consumption and production practices in selected economic sectors (agriculture and manufacturing)

The overall objective of the programme is to enable countries of Eastern Partnership region to move towards a green economy.

RECP assessments form a core component of the EaP GREEN programme and will continue to guide the programme's activities as a core methodology in the future. As such, an RECP Primer was developed as a comprehensive introduction and overview of RECP in national languages and in a manner that speaks to enterprises in terms of their concerns, opportunities and challenges. The primer strives to be locally relevant and present appropriate arguments to industry, in particular SMEs, for the implementation of RECP solutions.

Furthermore, RECP Clubs primarily targeting small businesses were established to scale up the implementation of RECP. Around 12 businesses were led jointly through an intensive training and coaching programme, resulting in a customized RECP action plan and awards scheme for each. Results of the EaP GREEN programme were described by example of the case study of Georgia.

Conclusions

1. There is a considerable potential for improving the busyness, reducing the environmental impact and enhancing the workers health and safety.
2. Approximation with the EU can provide an incentive for improving the environmental performance of companies.
3. Longer term East-West cooperation is needed to build capacities and promote application of RECP in Eastern Partnership (EaP) countries.

Latin America and the Caribbean: Eco-Industrial Parks by Marcio Torres, CNTL Brazil SENAI

In Latin America, the twin concepts of industrial symbiosis and eco-industrial parks were presented in the Brazilian context. Mr. Marcio Torres, CNTL Brazil SENAI, introduced a project with the aim to promote the industrial symbiosis between five local clusters in Rio Grande do Sul state (metal-mechanical and automotive, metal-mechanical postharvest, furniture, stones and jewelry, fashion and textile). In pursuit of this objective, the project will:

- encourage companies to practice industrial symbiosis
- map and quantify the waste generated by businesses, ranking the potential risk for the environment and public health
- develop software with georeferenced map, adding qualitative and quantitative waste from companies that enable the achievement of business information
- indicate to local government new ventures in the area of recycling/utilization of waste
- develop solid waste management plan for clusters
- develop solid waste management plan manual

Over 200 companies were involved in the project with the result that hundreds of synergies were established through only six targeted workshops. Two main eco-industrial park initiatives (Natura, Candiota) were also introduced as a means to illustrate that the large eco-industrial park potential in Brazil and Latin America is as of yet untapped.

Conclusions

1. Industrial symbiosis and eco-industrial park is still unexploited in Brazil and South America.
2. The pilot industrial symbiosis project shows clear benefits for companies.
3. Brazil and the region would benefit from a clear legal framework, based on successful international policies, to incentivize industrial symbiosis and eco-industrial park development.



RESOURCE EFFICIENCY AND THE CIRCULAR ECONOMY: POLICY MIXES AND SCENARIOS

Organised by University College London (UCL) and Ecologic Institute

Workshop chair(s) Prof. Paul Ekins, UCL
Dr. Martin Hirschnitz-Garbers, Ecologic Institute

Understanding why resources are used inefficiently: the «web-of-constraints» to resource efficiency by Marc Dijk, ICIS, Maastricht University

Due to a complex web of interacting constraints or barriers, such as technology or market barriers, conflicting policies, individual behaviour, firm cultures, infrastructure lock-ins, we are not using resources more efficiently. As there are many different barriers from different sides (including on individual, on policy or on business level), we need to take a systemic perspective in order to design and apply policy support measures that can effectively tackle the web of constraints.

This requires policy making and the designed policies to anticipate systemic effects, including primary and collateral effects of any policy to be made part of a policy mix. As designing successful policy mixes strongly depends not only on the links between policy objectives and the instruments used to achieve those, but also on political processes, policy mixing needs to be based on an understanding of policy interaction.

Conclusions

Policy learning must be enhanced, for instance through setting up sectoral platforms for multi-actor, multi-level discussions. As using only economic instruments will not be sufficient to foster more efficient resource use, inter alia because of collateral effects of the instruments and strategic effects, we need to engage with a wide group of stakeholders to discuss the policy mixes, to formulate and to monitor them.

Policy packaging in support of resource efficiency and absolute decoupling: A conceptual model by Martin Hirschnitz-Garbers, Ecologic Institute

Due to increasing large-scale, wicked and complex social-environmental problems, policy mixes addressing both the input side (targeting resource use/consumption) and the output side (targeting environmental impacts of resource use/consumption) are needed. In contrast to so-called policy layering, policy mixes require long-term and strategic thinking to match objectives and targets with instruments able to support achieving the objectives and targets. Furthermore, as policy formulation and implementation takes place in multi-actor and multi-interest settings, political processes (politics) must be taken into consideration and used proactively to the extent possible. Therefore, it is important to combine both primary instruments (aiming to achieve the policy mix' objectives and targets) and supportive, complementary instruments (aiming to mitigate unintended side effects of the primary instruments and hence increasing acceptance of and support for it). In the process of policy mixing, the different policies and instruments should be consistent – i.e. avoid using conflicting instruments – and as much as possible also coherent – i.e. creating synergies and positive interactions.

Conclusions

The process of policy mixing requires constant monitoring of the instruments' effects and their impact on the objectives and targets as well as any unintended side effects. Then, instruments can be replaced, re-designed, phased out or complemented that help over the longer-term to achieve the objectives and targets.

Dynamic policy mix for efficient use of metals and other material resources by Tomas Ekvall, Swedish Environmental Research Institute (IVL)

The main objective of the materials policy mix is to reduce virgin material use by 2050 by 80% compared to 2010 levels. In order to support that objective, the policy mix aims to increase recycling, foster material efficiency and substitute metals for other materials where appropriate.

To reach these objectives, the mix of primary instruments in the materials policy mix encompasses stronger Extended Producer Responsibility (EPR) systems; introducing a tax on all materials used in the EU; setting technical requirements (for use/non-use of specific metals in certain products); a Green Fiscal Reform to strengthen the internalisation of external costs; and removal of Environmentally Harmful Subsidies (EHS).

A set of supporting instruments has been selected to reduce barriers and mitigate unintended side effects. These include research & development support; establishment of advanced recycling centres; education programmes; information campaigns; and support for sharing systems.

As some of the primary instruments are currently very controversial (e.g., material taxation), a dynamic policy seems promising that gradually introduces the different instruments, i.e., starting from the current level of environmental taxation and a very low materials tax and gradually increasing them. Half of the revenues from this increase in taxes is initially used for the supporting instruments. When these reach a sufficient level a greater share of the revenues is dedicated to reducing labour taxes. Environmental Tax Reform (ETR) seems politically unfeasible even in the Netherlands nowadays – the theory is right, but the practice is lagging behind or even lacking. But despite all lagging, a lot of countries have adopted some environmental taxation.

Conclusions

Any policy mix would need to focus on different sectors/areas and then combining targeted, but complementary instruments. Environmental taxation is suggested as the way to get the required sustainability and resource efficiency changes most cheaply. Regulations can be effective, too, but can also go wrong and would need much monitoring and enforcement – and hence would be more costly for the society. The power of price mechanisms in a market economy must not be underestimated – if prices tell the truth much more, we would not need regulation so much. But overall, policy mixes would need both Market-Based Instruments (MBI) and regulatory instruments. This is partly because environmental taxation can be politically unfeasible and partly because a price signal is not always sufficient to overcome the barriers on the path towards resource efficiency. However, if you leave MBI out of the mix, then all the other instruments will be less effective and you end up paying more for the changes than with MBI.

What policies are necessary for achieving a resource efficient economy in Europe in 2050: Modelling results

by Martin Distelkamp, Institute of Economic Structures Research (GWS)

To investigate the quantitative impacts of resource policies and behavioural changes a model has to be assessed that covers all (global) interdependencies between society, economy and environment. In the POLFREE project the global EE-MRIO GINFORS has been linked with the bio-physical model LPJmL for this purpose. Modelling results show that clear and comprehensive policy interventions are needed to achieve a resource-efficient Europe by 2050. Necessary policies as part of a policy mix are: 1. Set the prices right; 2. Regulation; 3. Information and incentives; 4. Behavioural changes of consumers/citizens. While the first three afore-mentioned policies would also target behavioural changes, the assumption behind suggesting the fourth instrument (4. behavioural changes of consumers/citizens) above is that these changes are not driven by prices, but by attitudes, practices, mental models, etc. This will to some extent remain a hen-and-egg-problem of behaviour and policies – what needs to be first? Why should people behave the way a policy intends them to?

Conclusions

1. Conceptually mixing the policies, designing the policy mixes and also modelling their potential effects is rather easily possible, but implementing the mixes and putting the design into practice is a great challenge. When designing and implementing a policy mix it is therefore necessary to tailor and adapt it to the national or sectoral context. The benefits of investing into resource efficiency improvements are expected to be also large for emerging economies. For instance, opportunities for resource efficiency improvements in South Africa are potentially greater than in the EU, hence the benefits would likely also be greater than for the EU. But South Africa would of course be needing to think about how it could renew/change its infrastructures so that it aids these resource efficiency changes – so there will be opportunities to not repeat the EU infrastructure mistakes.
2. Models are hugely complicated systems with need for many assumptions. Without the model we could not think through all the implications and modelling also forces you to be specific about your assumptions – no policy mix can be modelled in the detail we would want to know; you just assume that it happens, so you need to know the assumptions – the real world does not operate on the assumptions made.

PUBLIC - PRIVATE PARTNERSHIPS FOR WATER STEWARDSHIP

Organised by UNIDO and HEINEKEN

Workshop chair(s) Stephan Sicars, UNIDO

HEINEKEN's sustainability strategy «brewing a better world» and water stewardship engagement in Monterrey, Mexico
by Jan-Willem Vosmeer, HEINEKEN

The objective of the workshop was to inform participants of the WRF 2015 of activities undertaken under the UNIDO-HEINEKEN Public Private Partnership (PPP) to promote water stewardship activities in water-stressed catchment areas in Algeria, Egypt, Ethiopia, Indonesia, Mexico and Nigeria. Furthermore, the workshop aimed at informing RECPnet members about this initiative so that they could assess the usefulness of comparable initiatives for their own activities.

To set the scene and to provide background information, Mr. Vosmeer presented HEINEKEN's sustainability strategy "Brewing a Better World". The focus of the strategy revolves around six main areas:

- Protecting water resources
- Sourcing sustainably
- Promoting health and safety
- Reducing CO₂ emissions
- Advocating responsible consumption
- Growing with communities

These aim to reflect HEINEKEN's values of passion for quality; brands that people love; enjoyment of life and respect for people and planet.

The presentation outlined ways in which HEINEKEN is working to reduce its CO₂ emissions, which have so far taken the form of a number of green policies aimed at reducing energy use and optimizing its freight operations, resulting in 30% CO₂ emission reductions since 2008 and savings of EUR 63.5 million.

By sourcing sustainably based on supplier codes, farming standards and support for local economies, HEINEKEN has created sustainable collaborations with farmers and suppliers to ensure the sourcing of raw materials (20% [barley], 40% [hops], 60% [apples]) from sustainable sources by 2015, and the aim to source at least 50% of all main raw materials from sustainable sources by 2020. This step is further bolstered by the aim to deliver 60% of agricultural raw materials in Africa via local sourcing within the continent by 2020.

Another point of emphasis is HEINEKEN's advocacy for responsible consumption, consisting of a three-tiered approach working with industry, through partnerships and through its brands.

Lastly, the presentation emphasized HEINEKEN's reliance on water in the brewing process and its commitment to decreasing water consumption and protecting water resources. As one of the world's largest beer companies and a signatory to the United Nations CEO Water Mandate, HEINEKEN recognizes that it has a responsibility to promote responsible water use in catchment areas shared by HEINEKEN with other users. Under its water stewardship approach HEINEKEN has committed to:

- Reduce water consumption in its breweries to 3.5 hl/hl overall, and 3.3 hl/hl on average for breweries in water-stressed areas
- Protect water resources in water-stressed areas
- Aim for significant water balancing in these areas

The company has already reduced water consumption by 23% since 2008 and is now collaborating with UNIDO to ensure the scaling of sustainable management of water resources on a global level.

Conclusions

1. HEINEKEN has made clear commitments that state its sustainability ambitions for 2020, with three-year milestones to be achieved by 2015 in the areas of CO₂ emissions reductions, sustainable sourcing, responsible consumption and water resource protection.
2. Through global PPPs, such as the collaboration with UNIDO on promoting water stewardship activities in water-stressed catchment areas, its expertise and experience in the sustainable management of resources can be scaled at the regional and global levels.

UNIDO-HEINEKEN Public-private partnership on water stewardship by Christian Susan, UNIDO

Mr. Susan presented a video on UNIDO's business partnerships and gave a presentation of the concrete activities undertaken so far under the partnership. He presented the workshop methodology applied by UNIDO to engage stakeholders in the identification of root causes for water stress and participatory identification of priority collaborative measures for water stress reduction. In this context he also shared the results from the first stakeholder engagement workshop that was held in early September in Ethiopia.

In a stakeholder mapping exercise, governments, civil society and industries with an interest in water or influence on water use decisions are identified. The 30 most relevant stakeholders in each catchment area will be invited to a stakeholder workshop moderated by UNIDO. In order to best utilize the know-how and experiences of different stakeholders, a cybernetic management approach is utilized. The results obtained will serve to identify the most effective water balancing projects to be implemented by HEINEKEN as well as the mobilization of complimentary measures for scaling up these activities so that the overall pressure on water resources can be reduced through collaborative efforts supported by all stakeholders.

The first stakeholder engagement workshop was successfully held from 2-4 September 2015 in Jimma, Ethiopia. Some of the measures that were identified by stakeholders to reduce water stress in the Dabena catchment area are the reforestation of degraded upstream catchment areas, the promotion of sustainable land use and agroforestry practices, and the establishment of community-based water retention facilities.

Outlook:

- Capitalizing on the first success, continue to engage with stakeholders in 10 additional catchment areas in which HEINEKEN operates breweries.
- The next stakeholder engagement workshop will be organised in November 2015 in Nigeria (Ogun Oshun catchment area).

- UNIDO and HEINEKEN are presently engaging with various donors to mobilize funding for complimentary measures building up on the water-balancing activities that HEINEKEN will facilitate in the Dabena catchment area.
- It is expected that more partnerships with other companies will be created, that the systematic approach to promote Cooperate Water Stewardship for industry will be further fine-tuned and that the approach to engage multiple stakeholders in water stewardship activities will be further disseminated through RECPnet.

Other Information: Both participants of the WRF, as well as representatives from RECPnet, showed a high levels of interest in this public private partnership and considered this an initiative which is worthwhile for replication and up-scaling. RECPnet members expressed high interest in obtaining more in-depth information on the workshop methodology.

Conclusions

1. To achieve inclusive and sustainable industrial development, water use efficiency has to drastically increase; in other words, water consumption as well as water pollution per unit of industrial output have to be significantly reduced. This requires collaborative efforts by all water users, with industries having a chance to play a catalytic role.
2. To reduce stress on and threats to limited water resources shared by various stakeholders, it is indispensable to implement management approaches that embrace stakeholder participation in identifying the causes for water stress, creating stress reduction programmes and implementing them.
3. It was concluded by the RECPnet members that water stewardship approaches constitute promising opportunities for them to interact with interested industries.



MOVING TOWARDS A CIRCULAR ECONOMY BY BRIDGING TOP DOWN AND BOTTOM-UP APPROACHES

Organised by Public Waste Agency for Flanders (OVAM) – Flanders and Ministry of Infrastructure and the Environment (I&M) – The Netherlands

Workshop chair(s) Dirk Jan Koch, Ministry of Foreign Affairs – The Netherlands

Flanders and the Netherlands have shared their innovative and best practices on Circular Economy

Speakers

- Jorn Verbeeck, OVAM Flanders
- Vincent van der Werff, Ministry of Infrastructure and the Environment of the Netherlands
- Olivier Vanden Eynde, Close the Gap
- Ton Bastein, TNO
- Peter Vercaemst, VITO
- Freek van Eijk, Acceleratio
- Stefan van Uffelen, MVO Nederland

Discussion/Questions

- Why do Green Deals not involve financial support?
- South Africa is interested to participate in initiatives from Close the Gap.
- Can other countries join the North Sea Resources Roundabout?
- Are there scarce (secondary) resources being lost within the next couple of years which are not addressed by bottom up initiatives?
- Are there (evidence based) quality standards or protocols for recycled concrete?

Conclusions/practical results

1. Concrete interest of Switzerland to promote the Green Deal approach in December 2015 in a public-private gathering.
2. Interest of South Africa to introduce the digitruck developed by Flanders Close the Gap, that showcases and trains teachers in selfcontaining ICT-containers.
3. Open call from MVO Nederland to NGO's to participate in the to be erected Concrete Sustainability Council as a critical partner.



Ministry of Infrastructure and the
Environment of the Netherlands



MANAGING THE SOCIAL AND ECONOMIC CHALLENGES FOR THE DEVELOPMENT OF RESOURCE TARGETS

Organised by the German Federal Environment Agency (UBA)

Workshop chair(s) Harry Lehmann, UBA

The feasibility of global resource targets in the areas of land, water and materials

In his keynote, **Fritz Hinterberger (SERI, Austria)** presented the main contents of IntRESS. IntRESS is a project for the German Federal Environment Agency (UBA) which is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. The project duration is for October 2012 to January 2016. Research ID (FKZ): 37 12 93 10.

First of all, Mr. Hinterberger outlined the main challenges and reasons for resource targets. He mentioned biodiversity loss, desertification, depleting freshwater resources, climate change and peak oil which represent, at least partly, consequences of the extensive resource use in our society. Because of this fact, the reduction of carbon will not be enough. We will have to reduce our overall resource use. The IntRESS project is focused on the following resource categories: abiotic materials (incl. fossil fuels), biotic materials, water and land. The resource use in all four categories rose between 48% (biomass) and 202% (abiotic materials/fossil fuels) and without change will continue to soar until 2050 reaching over 200% compared to 2010. IntRESS aims to support those changes by developing targets for sustainable resource use while taking into consideration the Planetary Boundaries.

Johan Rockström and colleagues developed a model which identifies nine relevant earth system processes. All of those have boundaries which define a “safe operating space” (SOS) for humanity with respect to the Earth system. Three of them have already been surpassed (Climate change, biodiversity loss and the global nitrogen cycle). According to that, the relationship between human demand for resources and the capacity of the ecosystem got out of balance in 1970 (for environmental reasons). IntRESS suggests the reduction of Total Material Consumption to 45 bn tonnes as well as sub-targets for sand and gravel and for critical materials like rare earths or certain biotic materials. One big part of getting there is recycling, to balance the use of primary and secondary materials and end the extraction of primary materials (more at www.polfree.eu.) Other important measures will be to establish targets on land use, explained by Alexa Lutzenberger (next presentation) and principles for threshold development on water use.

Furthermore, several relevant socio-economic challenges have to be considered:

- questions of equity and fair share: adequate mechanisms for compensatory financial support of poorer economies
- existing limitations in the access to or availability of natural resources
- internationally recommended minimum standards for basic human, social and economic development needs
- trade and finance policy: as “missing links” within the debate on sustainable development and resource standard/ target setting
- resource productivity needs to be enhanced at least by a factor of 5

Finally, Mr. Hinterberger referred to SDG implementation as one of the most relevant political processes at the international level to ensure a safe and fair use of natural resources. In detail, he presented five resource-related goals and targets.

Land targets for sustainable development

Alexa Lutzenberger (ARLENE, Germany) presented some important facts regarding land as a resource:

- 83% of the Earth's land surface has been converted by human activities
- about 60% of Earth's ecosystems are considered degraded or unsustainably used
- Croplands and pastures have become one of the largest terrestrial biomes on the planet with ~ 40% of the terrestrial surface whereas the intensification of cropland covers alone ~12%

Achieving food security and health, mitigating and adapting to climate change, protecting biodiversity, protecting people from natural disasters, supporting sustainable land management, etc. are only a few of the specific land resource challenges. The following part of her presentation opposed the topics land cover and land use. Up next, following the concept of the Planetary Boundaries Ms. Lutzenberger concluded that no more than 15% of the global ice-free land surface should be converted to cropland. Further she introduced the Oxfam Framework for Sustainable Development, a model which combines the concept of Planetary Boundaries with the complementary concept of social boundaries which aims at securing equal access to resources for all people in order to satisfy their basic needs.

At the end, following target proposals for land resources were presented:

1. Biome Approach to Protect Biodiversity, ESS
 - 100% protection of the 14 terrestrial ecoregion biomes identified by Olson and Dinerstein with immediate effect
 - No less than present biome intactness
 - Immediate zero degradation and deforestation
 - Increase of designated protection areas to 17% by 2020 (CBD, Aichi Target 11)
2. Land Cover and Land Use
 - Zero net forest degradation by 2025
 - Maintenance of 85% tropical, 85% boreal and, 50 % of temperate forests with min. 75% biome intactness (Steffen, 2015)
 - Mangrove protected areas increase to 25% by 2025
 - Mangrove zero net deforestation and degradation by 2025
 - Zero net land degradation by 2025 (IntRESS)
 - No more global cropland than 15 % by 2020, prompt reconversion and ecological intensification on permitted areas of the 15% only
3. Land Cover and Land Use
 - No more people living below \$1.25 per day by 2035 with focus on Sub-Saharan Africa and Southern Asia
 - Universal access to energy and clean cooking fuels by 2025
 - More efforts are needed to reduce undernourishment to a halve by 2015 and three quarter by 2025 (IntRESS)

Conclusion

1. Integrative approaches and political strategies are required.
2. It is important to link local choices to global risks.
3. Control variables have to consider interrelations of trends and drivers.
4. The precautionary principle has to be applied.
5. Adaptable targets, governance and management mechanisms have to be defined.
6. The ability to downscale global targets to regional scale is necessary.

Operationalizing the safe operating space: Reconciling social and environmental goals

In his presentation, **Michael Obersteiner (International Institute for Applied System Analysis (IIASA), Austria)** focused on the Sustainable Development Goals (SDGs) and their relation to certain scenarios for resource use. For visualising this he used various figures, showing the goals' impacts on resource use. The SDGs he presented include goals for hunger, regulated harvesting and fishing, sustainable consumption and production, climate change, sustainable management of water and conservation. He underlined the following items as crucial aspects:

- The attainability of SDGs
- Trade-offs between food and environment and
- The complexity of policy coordination

Opportunities and risks of global resource targets

Paul Ekins (UCL, UK) focused on opportunities and risks of global resource targets. Therefore, he introduced following basic facts about resources:

- Resources are different: metals, minerals, fossil fuels, land, water, biomass.
- The scarcity/availability is very different for different resources. It makes no sense to talk about 'peak stuff' on the supply side.
- Resource use has very different environmental impacts for different resources.
- Mass of resource use is therefore a crude proxy for environmental impact.
- Resource use may be of concern because of either depletion or pollution or both.
- Depletion may raise issues of security or sustainability (economic/resource supply), or both.
- Pollution raises issues of human and ecosystem health, or environmental sustainability, or both.
- The great majority of resources are subject to national sovereignty. This seems unlikely to change anytime soon.
- Targets need to be formulated with these facts in mind.

Mr. Ekins concluded with the following questions for consideration and discussion:

1. Should quantitative targets be part of a well-articulated vision for the use of our planet's natural resources?
2. Are differentiated targets for different income country groups politically feasible?
3. What are the (pre)conditions of effective resource governance and the implementation of global/regional resource targets (institutions, policies, laws, strategies etc.)?
4. How can local, regional and global approaches be brought together, taking into consideration for example the uneven distribution of resource stocks, arable land etc.?
5. Are global resource targets compatible with international human rights standards, especially with economic, social and cultural rights?
6. In which way could resource targets contribute to worldwide sustainable development and a rights-based approach to development?

In the discussion with the audience the necessity of breaking down global targets to regional and national levels as well as the consideration of the respective baselines and the determination of a clear time path for their implementation were underlined. Furthermore, the audience urged the "translation" of targets and concepts like the planetary boundaries for political actors in order to raise their communicability and to introduce them to governance processes.

COMPLEMENTING GDP AND HDI: TOWARDS AN INTEGRATED RESOURCE USE INDEX OF NATIONS AND BUSINESS

Organised by WRF, CML – Leiden University, FOEN and the Cement Sustainability Initiative (CSI)

Workshop chair(s) **Barbara Dubach, engageability**

The WRF aims at developing an index for resource efficiency (and therefore portray the ecological dimension) as a counterpart to GDP and HDI, which illustrate respectively the economic and social pillars of sustainable development. Resource efficiency refers to the sustainable use of the Earth's limited resources. It allows for the optimization of productivity and value while minimizing input and wastage. Ranking countries and businesses in this regard will induce stakeholders to take action in order to increase natural resources efficiency, productivity or sufficiency. In view of this, the WRF wishes to develop both a resource efficiency index for countries and a resource efficiency index for businesses. The objectives of the foreseen indices are:

- The indices will become a thermometer of the state of the planet, raise awareness about the need for taking action and inspire people in order to increase natural resource efficiency, productivity or sufficiency.
- The indices highlight the most natural resource-efficient, productive or sufficient businesses and countries as well as the ones that are doing the most and provide an incentive for others to adopt effective measures and instruments.
- The indices need to be easily understood and communicated, to be credible and to be innovative.

The results of the country and business indices will be presented annually in the frame of the World Resources Forum. The goal of this workshop, moderated by **Barbara Dubach (engageability)** was to present the work done until now and to gather feedback and inputs from participants. Two documents resume the first steps of this project. These have been shortly presented during the workshop, after the opening speech given by **Bruno Oberle (director of FOEN)**:

Prof. Arnold Tukker (CML, Leiden University and TNO) presented the work done for countries summarised in the report 'Towards a resource index of nations'. In the report - developed together with Laurant van Oers, Jeroen Guinee, Ester van der Voet - he suggests to consider carbon, water, land and material footprints. One of the main questions rising from the report refers to the aggregation method: how to combine them? In a first attempt, Tukker and his group tested four 'off the shelf' weighting methods stressing that this was a very low-cost exercise, which was funded for weeks, not months. In the exercise, it appeared that there are clear points for discussion in indicator calculation and weighting. It is striking however that even this simple exercise gave already quite robust rankings across methods (remember that the well accepted HDI is not based on a much more profound basis). It seems hence feasible to develop an accepted 'Resource index of nations' with reasonable effort, if supported by a good stakeholder process.

Maria Rosario Chan, senior consultant on sustainable development at **LafargeHolcim** and representative for this session of the Cement Sustainability Initiatives, presented the work undertaken in order to establish resource efficiency indices in the cement and ready-mix concrete sector. Concrete is a key material for any country's economic and social development as it is the most important man-made material. To reduce its impact, the cement and ready-mix concrete industry has been active, both in reducing the emissions from and increasing the efficiency of the cement production. The three levers used are: 1) Increasing energy efficiency; 2) Using alternative fuels and raw materials as well as 3) Clinker substitution. A resource efficiency index could highlight the efforts undertaken to improve resource efficiency and circularity in the industry. Some major points:

- Cement is a resource intensive industry for energy, material, water, land. These four components should be included in the index (from cradle to gate).
- Economic reference indicator proposed is "per ton product" produced.
- Data availability on energy use is highest in comparison with other categories. Data gaps exist, in particular, for water, land, and materials.
- Aggregation within resource categories (and between resource categories) proves quite challenging. A possible method: ecoscarcity.
- What indicators constitute "social – economic impacts" are still to be defined.
- The index could become an example for other sectors.

In the second part of the workshop, **Dr. Mathis Wackernagel (Global Footprint Network)** and **Dr. Harald Mattenberger (SERI)** were invited to join a podium discussion. Dr. Mathis Wackernagel stressed the importance to clearly define the question to be addressed, to identify what grabs the attention of policy makers and which is the important information that brings a physical reaction. Without these components, the developed index would be in danger to remain unused. A consensus among participants has been set that it will be important to create a good platform of stakeholders in order to develop the indices in the upcoming years, tapping into synergies with e.g. UNEP IRP and the Global Footprint Network.

For both indices the following opportunities and challenges have been identified:

Opportunities	Challenges
These indices can: ▪ Help guide decisions ▪ Enable meaningful competition – for example within industry sectors ▪ Be a benchmark between today and tomorrow To guide efforts, targets would be helpful	How can we ▪ identify the right questions to be answered ▪ break down complexity ▪ ensure reliability of the concepts and data ▪ avoid the risk that indices are politicized How can these indices be integrated into official statistics and how can they reflect human-well being as well. When weighting the indices, abundance of the resource should not be the only factor that is considered. Overall impact throughout the life cycle should also be considered (e.g. shale gas, biodiversity impact of land use) Furthermore human well-being should be reflected as well.



Barbara Dubach, Harald Mattenberger, Arnold Tukker and Maria Rosario Chan



Participants during panel discussion



3 SELECTED MASTER CLASSES HIGHLIGHTS

DECOUPLING FOR BUSINESS: WHAT AND HOW

Organised by Cornis van der Lugt, Stellenbosch University Business School

The “Decoupling for Business” Master Class was presented by Cornis van der Lugt of Stellenbosch University Business School (Centre for Corporate Governance) in South Africa with the support of Claude Fussler of the CO2 Forum in France.

The interactive session took 15 participants through the Resource Revolution Trainer, a decoupling guide for business being developed for the WRF.

The guide introduces and translates the scientific research of the International Resource Panel (IRP) – notably its Decoupling Reports – into a language that speaks to the business community, interpreting its findings for suggested follow-up actions at enterprise level.

The class targeted business managers and research experts focused on business performance. It provided participants with a suggested response strategy for any business that desires to take on the resource productivity revolution, including goals such as zero waste. Case examples and questions for interactive discussion were presented.

The class was structured around six components, namely:

1. The global resource challenge
2. Decoupling as response strategy (incl. at enterprise level)
3. – 5. Principles, building blocks and organizational requirements to become a Resource Revolution Enterprise
6. Time and scale

Group discussion on response strategies considered the example of Unilever which committed itself to decoupling under its Sustainable Living Plan (2010 – 2020), including the role of its CEO in being a champion for the circular economy agenda. Considering drivers behind the resource challenge, it was felt that in addition to population growth and higher income levels the growth in cost of externalities is also an important driver.

Principles discussed included circularity and substitution. Examples were given of how systems integration and embedded software are used in the delivery of new “product-as-service-models”. The latter requires products being designed with intelligent use of software (incl monitors and big data use) from the start to be more functional and resource productive. Historical innovations including commitments to zero waste by enterprises such as Interface and DIRT were highlighted.

Discussion on the building blocks noted that consideration of biotechnologies and nanotechnology needs to consider not only (technical) efficiency improvements, but also the social and ethical implications of their use. This includes the application of precaution where scientific uncertainty around the use of new technologies exists. The discussion also highlighted the challenge to effectively mobilize employees with select, focused issues whilst also having to consider a comprehensive range of environmental and social agenda items.

Participants welcomed the development of the Resource Revolution Trainer, which the VRF intends to launch as an online, self-training course in 2016. The main sources of content of the Resource Revolution Trainer are the IRP Decoupling I (2011) and Decoupling II (2014) reports, as well as the book Resource Revolution (Amazon 2014) by Stefan Heck of Stanford University and Matt Rogers of McKinsey & Company.

The IRP content provides the public science input, while content from McKinsey and other select business publications are employed to turn the implications of the scientific research into an action plan for any business. References are also made to the Zeronauts role model defined by John Elkington.

Master Class facilitators Van der Lugt and Fussler brought their wealth of international experience in business and sustainability, including work with diverse industry sectors and organizations such as the UN Global Compact and World Business Council for Sustainable Development (WBCSD).

Fussler noted the need for the guide to include practical action steps for managers, steps that are equally relevant to large and small enterprises. This was a lesson taken from the 2000s when the two presenters collaborated in the writing of the book *Raising the Bar: Creating Value with the UN Global Compact* (Greenleaf 2004).

SUSTAINABLE COMMUNICATION DESIGN TRAINING

Organised by Helmut Langer, Nagoya University of Arts

Radical rethinking in terms of production and consumption of communication materials is necessary.

For instance, the production of paper and board requires several natural resources, high amounts of energy and water. Additionally, printing inks contain toxic components. The more colour is printed, the more chemicals are needed for the de-inking and recycling process. Therefore, paper must be used more carefully and thoughtfully. The aspects to be considered are quality, size, weight, and quantity.

Paper waste, i.e. producing hefty packaging for minor content must be stopped. The total life cycle including production, packaging, transportation, space during delivery, space in storage and stores, etc. should be considered as well.

Sustainable communication design comprises electronic media as well. It is essential to consider electronic instead of print media when possible. The aim should point at high effectiveness, e.g. short loading times, clearness of the communication purpose, easy access to the content, etc. All electronic media with their computer screens, smart phone displays, etc., need energy.

But this is not the least: the high fraction of blue light of all screens and displays is harmful for the retina; it causes eye diseases. Therefore, sustainable communication design is a responsible design as well.

Conclusion:

We must make all communications sustainable for:

- Social responsibility
- The benefit of the consumer and the environment
- Resource conservation
- Climate protection

BUSINESS MODEL INNOVATION FOR AN ACCELERATED TRANSITION TOWARDS A CIRCULAR ECONOMY

Organised by Returnity Partners

More and more companies are becoming aware of the necessity of transitions towards a circular economy. However, it remains unclear how companies should best capture the created value. In a classical transactional sales-based approach, large parts of the created value cannot easily be translated into top and bottom line contributions. In addition, required investments in the necessary capabilities risk to worsen ROCE-performance. As a result, many of these technical innovations are not implemented as there is no positive business case. Business model innovation is a key pre-requisite to overcome this gap between the technical possibilities and the economic viability of many of the improvement levers. In this Master Class **Dr. Markus Zils** and **Tomoko Kobayashi**

- Explained the concept of a circular economy and its embedded sources of value creation
- Established a systematic framework for creating, capturing and sharing this value across the network of business partners
- Invited participants to experience first hand the opportunities and challenges to transform a linear to a circular business model in a simulation exercises
- Synthesized learning to excite and enable participants to explore circular business model innovations for their companies and institutions

In order to learn effects and impacts of the transformation to a circular business model, participants spent most of time in simulation exercises. In four rounds, participants had the task in small working groups to

1. Determine measures to improve profitability under current linear take-make-dispose setup
2. Generate ideas to transform the linear setup into a more circular setup
3. Determine appropriate levers to improve Earnings Before Interest and Tax (EBIT) and Return On Capital Employed (ROCE)
4. Think through business model innovations, that allow them to reap the created value and to establish robust arrangements along their value chain

After each round, working groups submitted decision sheets and presenters scored them against the simulation model. The presenters drew the necessary conclusions and tie-up the next round of the simulation. Each of the groups had the chance to present their decisions and rationale behind.

Most participants were from business, consulting and research institutes. Facilitators received quite positive feedbacks after the session.

Key learning from the simulation and discussion includes:

1. Traditional measures, such as operational improvement and procurement efforts, may not be enough to cope with drastic increase in middle-class consumers and steep rise in material costs.
2. When a company implements circular measures, it is essential to discuss innovation in business model. Technical measures, such as new designs and innovative technologies, may hurt margins.
3. When a company changes its business model, it may face a decline in profitability for the first few years and it may take a few more years to revamp. Developing a mid to long-term business plan and obtaining buy-in from stakeholders are essential.

4 OVERVIEW SCIENTIFIC SESSION AND AWARDS

This year, four topics were selected for the scientific sessions:

- Circular economy and decoupling – for ideas and concepts on possible and existing solutions
- Technological innovation, business and finance – exploring technological and economic options and ways to finance these solutions
- Targets, indicators, and benchmarks for resource use – collecting ideas and examples on how to measure if these ideas and options are effective
- Lifestyles and Education – presenting how this is linked with our everyday life and our education

More than 160 abstracts from over 37 countries were sent this year to the WRF, 86 of which were finally accepted by the Scientific Committee for oral presentation during one of the 12 scientific sessions organized in Davos. These gave place to highly interesting and inspiring speeches and very stimulating discussions with the public. Four of them have been particularly appreciated and were prized by the Scientific Session Chairs - Prof. Christian Ludwig (PSI and EPFL, Chair Scientific Committee) and Prof. Helga Weisz (HU Berlin, Vice Chair Scientific Committee) - with the support of the public. These were:

- Cost-benefit analysis of WEEE Recycling in Germany – Case study of mobile phones and smart-phones, presented by Nicoleta Gurita (TU Bergakademie Freiberg, Germany) in the “Circular Economy and decoupling” sessions
- Integrating environmental and resource efficiency issues in the investment decisions of institutional investors, presented by And Adrian Tan (Ernst & Young, France) in the “Technological innovation, business and finance” sessions
- VDI framework guideline on resource efficiency: Towards the standardization and reduction of natural resource use in the industrial sector, presented by Holger Rohn (Faktor 10 - Institut für nachhaltiges Wirtschaften gemeinnützige GmbH, Germany) in the “Targets, indicators, and benchmarks for resource use” sessions
- Radical Crowd based Open Innovation and Design for Sustainability, presented by Ursula Tischner (econcept, Germany) in the “Lifestyles and Education” sessions



A presentation during a Scientific Session

These and other WRF 2015 presentations can be consulted on the World Resources Forum website. In addition, a selection of manuscripts will be published in the course of 2016.

The Scientific Committee in charge of the review of abstracts submission, headed by Prof. Ludwig and Prof. Weisz, consisted of several experts from all around the world. We would like to thank them all once again for their great and professional work!



Prof. Helga Weisz and Prof. Christian Ludwig, the chairs of the Scientific Sessions



Prof. Christian Ludwig with Nicoleta Gurita, one of the winners of the Scientific Sessions Awards

4 OVERVIEW SIDE EVENTS

17th MEETING OF UNEP'S INTERNATIONAL RESOURCE PANEL (IRP) AND JOINT MEETINGS

The 17th meeting of the UNEP's IRP and of its Steering Committee was held in Davos from 11 – 15 October 2015, in conjunction with the World Resources Forum 2015.

UNEP's Division of Technology, Industry and Economics (DTIE), in association with the Swiss Federal Office for the Environment (FOEN) and WRF, organised all related activities, including the Panel Meeting, Joint Meetings and the IRP's Steering Committee Meeting.

Additionally, an Expert Workshop took place from 15 – 16 October 2015, where IRP members and external experts gathered to discuss progress on resource governance. Besides, an IRP-WRF joint plenary session was part of the agenda. IRP members, external experts and government representatives exchanged knowledge on key aspects of resource efficiency, circular economy and resource governance and shared this know-how with WRF 2015's wide audience.

The IRP has produced over 12 scientific assessments. Its latest publication "International Trade in Resources: A Biophysical Assessment" was launched by its lead author and expert member of the IRP, Marina Fischer-Kowalski, during WRF 2015. Find here the full publication.

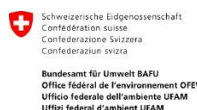
The Panel consists of 34 eminent experts in resource management issues, who seek to build and share knowledge for the improvement of resource use worldwide through the application and diffusion of technologies, and the development of policies.

For more information on the IRP visit www.unep.org/resourcepanel.

All IRP Publications can be downloaded from the World Resources Forum website.



*Marina Fischer-Kowalski presenting
"International Trade in Resources: A
Biophysical Assessment"*



GLOBAL NETWORK CONFERENCE ON RESOURCE EFFICIENT AND CLEANER PRODUCTION (RECP)

DELIVERING RECP TOWARDS THE SUSTAINABLE DEVELOPMENT GOALS 2030

UNIDO, in cooperation with UNEP, organised the Global Network Conference on Resource Efficient and Cleaner Production (RECP) from 12 – 16 October, 2015 in Davos. The conference was held jointly with the WRF 2015 and celebrated 20 years of achievements in resource efficiency by showcasing the success and retrospective of RECP related activities.

Government officials, leading international RECP practitioners, representatives of development financial institutions, and cleaner production experts were brought together to discuss best practices and explore innovative approaches to RECP in the framework of the 2030 Agenda for Sustainable Development.

The conference featured various RECPnet Regional Chapter Meetings, an Executive Committee Meeting and a Full Members' Assembly, in which a new Executive Committee was elected.

The RECPnet is the global network for promoting Resource Efficient and Cleaner Production in developing and transition economies. It aims to enable and contribute to the effective and efficient development, application, adaptation and replication of RECP concepts, methods, policies, practices and technologies and to facilitate effective North-South and South-South collaboration and transfer of RECP relevant knowledge, experiences and technologies.

For more information on the RECPnet visit www.recenet.org



Marcos Alegre, President RECPnet's Executive Committee and Regional Representative of the LAC Region



ISO IWA WORKSHOP SESSION #1 ON GUIDANCE PRINCIPLES FOR SUSTAINABLE METAL RECYCLING

The ISO IWA Workshop Session #1 took place on 14-16 October 2015 in Davos, Switzerland, back to back with the WRF 2015 Conference.

The ISO process, kicked off with 50 participants from 16 countries, develops Guidance Principles with the aim to influence the development of policies, regulations and frameworks on secondary resources management, related corporate codes of practice, and standards and certification schemes – in particular for the context of micro, small and medium enterprises and the informal sector in developing countries.

The aim of the first stakeholder workshop was to discuss the Draft 'O' of the background and first section on principles and objectives of the Guidance Principles.

Key recommendations were to ensure sustainable practices in metal recycling included the definition and allocation of appropriate responsibilities to the key stakeholders along the secondary metal value chain. Constructive and intense discussions developed around the issue of informality in the recycling sector. Many votes pointed towards the importance of carefully decouple the state of formality from legality and the activity from the people who perform it. The need to gradually formalise the informal sector was seen as a constant target. However Laila Iskandar, former Egyptian minister of Urban Renewal and Informal Settlements and former minister of the Environment, clearly stated that "to preserve space for informality is of crucial importance, otherwise the most vulnerable people would drop out completely from any social protection". Hence it was suggested that the guidance principles should strongly focus on building bridges between formal and informal activities. To do so it was also agreed that their inclusion in the development of the Guidance Principles is pivotal. Hence a local consultation process in SRI partner countries will be organized in February and March of 2016. The fifteen-page Meeting Report is available online.

The ISO workshop is part of a process convened by the Sustainable Recycling Industries (SRI) Roundtable through the World Resources Forum (WRF), the Swiss Federal Institute for Material Science and Technology (Empa) and the Swiss Association for Standardisation (SNV) and is funded by the Swiss Secretary of Economic Affairs (SECO). This process supports SRI's overall objective to promote the integration and participation of small and medium enterprises from developing and transition countries in the global recycling of secondary non renewable resources. It is held as an ISO International Workshop Agreement (IWA), and was organized back-to-back to the 2015 WRF Conference. ISO confirmed the full name of the process and the resulting document of the Guidance Principles as ISO IWA 19.

ISO members, metals associations, recycling companies, Cleaner Production Centres, international NGOs and experts from research organizations and the academia were among the participants.



ISO IWA Workshop participants

A draft 'O' of Section 2 is to be completed by 23 December 2015 for review by ISO IWA members and a revised complete version will be available from 1 February through 31 March 2016 for public review. Next teleconference (session #2) of ISO IWA members is planned for the 12th of April and next face-to-face meeting (session #3) on 7 and 8 July at the premises of IUCN in Gland, Switzerland. Presentations of the workshop can be downloaded from our SRI website. If you are interested in joining the ISO IWA process, want to be informed on dates of our next events or just would like to know more about it please contact sri@wrforum.org.

5 WRF CINEMA

This year the WRF launched the WRF Cinema, where films, documentaries and short videos related to the sustainable use of natural resources were displayed. The aim of WRF Cinema was to bring crucial topics to the table as well as to encourage people to pursue their initiatives by showcasing successful examples.

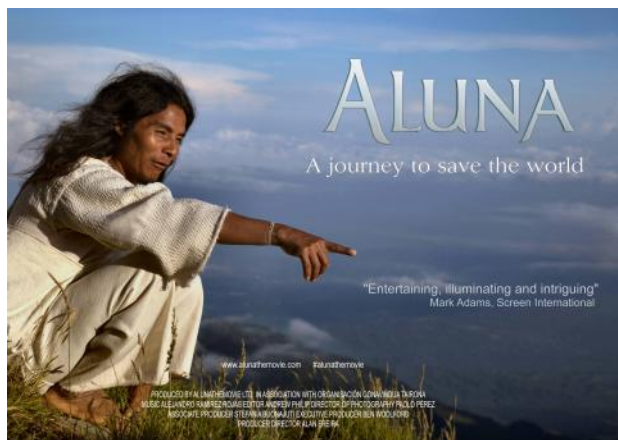
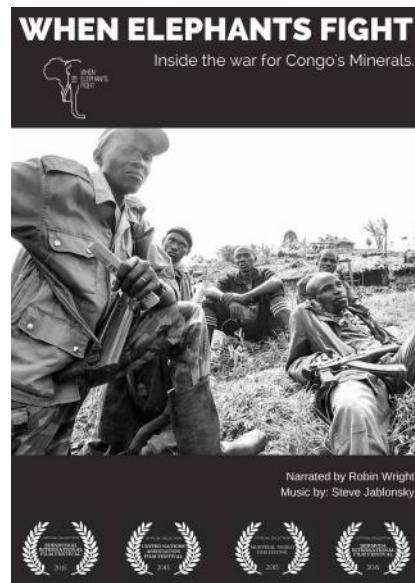
WRF Cinema was open for all participants of WRF 2015, and a total of 16 films were screened during the three-day conference. Despite of the varied agenda offered to participants, they also had time to appreciate the screenings and enjoy them with some Maya Popcorn. Some of the documentaries were followed by discussions led by their directors or collaborators. Attendance to sessions was up to 40 participants.

"The E-Waste Tragedy" (by Cosima Dannoritzer), **"Aluna"** (by Alan Ereira), **"Behind the Dirty Gold"**, (by Audrey Córdova) and **"When Elephants Fight"** (by Michael Ramsdell) were the long documentaries of this first edition of the WRF Cinema. Other shorter projections included **"Forest Man"** (by William Douglas McMaster), **"Gyre: Creating Art from a Plastic Ocean"** (by J.J. Kelley), **"It's a Plastic World"** (by Andreas Tanner), **"Conservation Agriculture in Zimbabwe"** (by M.T. Mtshanga); **"The Scavengers of Mumbai"** (by Krsh Chawla), **"How many trees are in the world?"** (by Nature) and videos from The Story of Stuff Project, among others. Finally, WRF Cinema also gave our partners the opportunity to present their projects. For instance, UNIDO, UNEP, the Federal Environment Agency of Germany (UBA) and CREE/Rhomberg/CREE informed the participants about their latest initiatives through short videos.

Next editions of WRF Cinema will take place in future WRF events.



WRF Cinema's first edition



6 EXHIBITION AND UN LOUNGE

WRF 2015 EXHIBITION

The exhibition at the WRF 2015 included 12 stands from different organizations. At the exhibition “**Observe to take action**” from the Federal Office for the Environment (FOEN) the audience could learn about the fascination of “measurement” and “political relevance” nationally and globally on the basis of the specific examples climate, water, noise and biodiversity. FocusTerra from the ETH Zurich presented two units from their exhibition “Earth’s Treasures” in Davos. “Responsibility” discusses what companies and consumers can do to ensure that resources are extracted in an economical, environmentally friendly and socially responsible way. “Refuse, reduce, reuse, recycle – rethink!” addresses ways to save and protect our resources. The exhibition presents the raw materials cycle from the geological formation, to extracting and processing, to the use of mineral resources as well as their disposal, recovery or reuse. Entwicklungsgesellschaft indeland, as another example, showcased the stand “Factor X”. Factor X materializes the idea to carefully plan climate protection and resource preservation from start to finish. From sophisticated floor plans, which adapt future changes in utilization, to custom-made foundations, climate-friendly and resource-conserving structural designs and meticulously selected materials, sound and durable technology is offered that can be modularly extended and is easy to repair. The exhibition allowed participants to capture a myriad of insights about different projects and information about the organizations.

Exhibitors at the World Resources Forum 2015 in Davos:



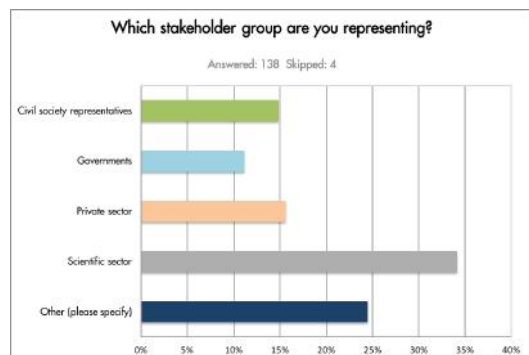
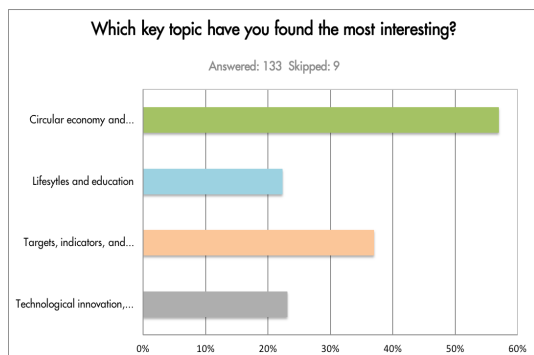
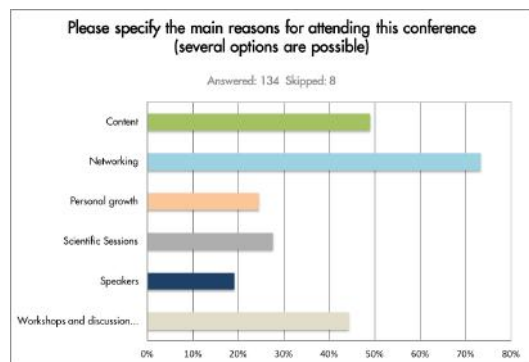
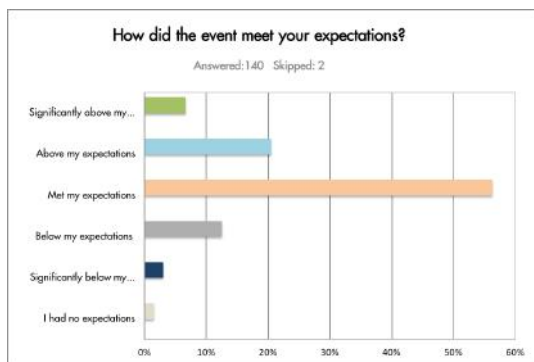
UN LOUNGE

This year the UN Lounge was introduced at the WRF 2015, where the latest UNEP and UNIDO reports were displayed and made available for WRF attendees. Participants were able to use this space to get to know global UNEP and UNIDO initiatives closer.

The UN Lounge was introduced with the support of **Climate-KIC**, EU’s main climate innovation initiative. It is Europe’s largest public-private innovation partnership focused on mitigating and adapting to climate change. Climate-KIC consists of companies, academic institutions and the public sector.

7 PARTICIPANTS SURVEY

For the 5th consecutive year, the WRF carried out a survey after the conference. 142 people of the about 600 participants replied (response rate: 24%). Results show that the event met the expectations (or more) of a big majority of respondents (84%). For 27% of the respondents the event was above or significantly above their expectations. Among the four topics of the conference, 'Circular economy and decoupling' gained the most attention (56% of the respondents found it the most interesting), followed by 'Targets, indicators, and benchmarks for resource use' (38%) and 'Technological innovation, business and finance' (24%). Networking was an important reason for attending the conference (74%), followed by the content (49%) and workshops and discussion groups (45%). Participants were quite heterogeneous, with 34% coming from the scientific sector, 17% from the private sector, 14% from the civil society, 11% from governments and the remaining 34% from other sectors (including RECPnet members). Even if responses are very positive; they show that there is still room for improvement. This is true in particular in relation to the catering service or the length of the panel sessions (perceived as too long). The comments will be considered by the organising committee to further improvement of the WRF events. We will always be pleased to get your feedback at any point in time. Please check our WRF website or send us an email at info@wrforum.org.



APPENDICES

APPENDIX A: PROGRAMME

Sunday October 11 – Arrival and Registration

- 15h00 – 18h00 Registration and pre meetings
- UNEP International Resource Panel (by invitation only)
 - Meeting of the International Factor 10/X Club (by invitation only)

Monday October 12 – Let's Get Circular – Science and Arts

07h00 – 07h50 **Registration**

08h00 – 09h50 **Workshops and Scientific Sessions**

- WS 1: Update on Cities with Zero Waste Goals – by Zero Waste (Room: Sertig)
- WS 2: Food – The Circular Food Society – by GAP and Eaternity (Room: Seehorn)
- SS1: Targets, indicators, and benchmarks for resource use (Room: Flüela)
- SS2: Technological innovation, business and finance (Room: Schwarzhorn)

10h00 – 11h50 **Plenary Session: Opening and WRF Parade**

- Welcome Remarks: Xaver Edelmann, WRF, Bruno Oberle, Swiss Federal Office for the Environment (FOEN) and Brigitte Buchmann, Empa
- From Arequipa and Sydney to Davos: Marcos Alegre, Grupo GEA/CER Peru and Nick Florin, UTS Sydney
- Video Message Achim Steiner, Under-Secretary-General of the United Nations and UNEP Executive Director
- Agenda Overview and WRF Workshop Parade moderated by Bas de Leeuw, WRF
- Children Drawing Competition by SQS

11h50 – 12h30

Stand Opening by the Swiss Federal Office for the Environment FOEN and Lunch to go

12h30 – 14h20

Workshops, Scientific Sessions and WRF Cinema

- WS 1: Update on Cities with Zero Waste Goals – by Zero Waste (Room Sertig)
- WS 3: Sustainable Recycling Industries: Legacy Substances in WEEE-plastic – Current Status and Policy Lessons for a Transition to Circular Economies – by Sustainable Recycling Industries (SRI) (Room: Seehorn)
- SS3: Lifestyles and Education (Room: Schwarzhorn)
- SS4: Targets, indicators, and benchmarks for resource use (Room: Flüela)
- WRF Cinema (Room A Forum)
 - It's a plastic world (5min)
 - Gyre - Creating Art from a Plastic Ocean (23min)
 - The Scavengers of Mumbai (6min)
 - Decoupling (5min)
 - Inclusive Sustainable Industrial Development (6min)
 - The Cleaner Production Centre of Serbia (10min)
 - Time lapse video - Construction LCT ONE (6 min)

14h30 – 15h50

Plenary Session: Sustainable Lifestyles and Education

Session chairs: Harry Lehmann, UBA and Sonia Valdivia, WRF

- Lewis Akenji, Institute for Global Environmental Strategies
- Captain Moore, ALGALITA Marine Research and Education
- Mila Popovich, World Academy of Art and Science
- Marilyn Mehlmann, Global Action Plan (GAP) International
- Victoria W. Thoresen, UNESCO

16h00 – 18h50

WRF Master Classes, Workshops and WRF Cinema

- MC 1: Decoupling for Business: What and How – by Cornis van der Lugt, Stellenbosch University Business School (Room: Sertig)
- MC 2: How to Get Money for your Project: Introducing the Logical Framework Approach – by Sean Bonnes, Peregrine Consulting (Room: Wisshorn)
- MC 3: Sustainable Communication Design Training– by Helmut Langer, Nagoya University of Arts (Room: Seehorn)
- MC 4: Business Model Innovation for an accelerated Transition towards a Circular Economy by Returnity Partners (Room: Schwarzhorn)
- MC 5: Telling your Story through Data – by Pro Journo (Room: Flüela)
- WS 4: Built Environment and the Nexus of Human Development, Resource Efficiency, and Climate Change Mitigation – by WRF, Empa, NTNU & SATW (Room: Dischma)
- WS 5: The E-waste Tragedy – or how illegal e-waste trafficking affects our industries by Cosima Dannoritzer (Room: A Forum)
- WRF Cinema (Room A Forum):
 - The Story of Electronics (8min)
 - The E-Waste Tragedy (86min) + Workshop 5 with Cosima Dannoritzer

Tuesday October 13 – The Circular Economy Business Challenge

08h00 – 09h50

Workshops and Scientific Sessions

- WS 6: Developing a Business Plan for Manual E-waste Recycling – by SRI and UNIDO (Room: Sanada II)
- WS 7: System Dynamics and Econometric Approaches: potential limits of modeling resource efficiency – by Ecological Institute (Room: Sertig)
- WS 8: ESM workshop and Criticality Debate – by ESM (Room: Seehorn)
- SS5: Circular economy and decoupling (Room: Schwarzhorn)
- SS6: Lifestyles and Education (Room: Dischma)
- SS7: Targets, indicators and benchmarks for resource use (Room: Flüela)

10h00 – 11h50

Plenary Session: Circular Economy – The Business Case

Session chair: Anders Wijkman, IRP UNEP

- Dianne Dillon-Ridgley, Interface, Inc.
- Gunter Pauli, The Blue Economy
- Saana Due-Sjöström, Nordic Waste Group
- Jocelyn Blériot, Ellen MacArthur Foundation
- Stephan Sicars, UNIDO
- Seta Thakur, ÖBU
- Peter White, WBCSD
- Lorenz Isler, IKEA Switzerland

11h50 – 12h30

Lunch to go

12h30 – 14h20

Workshops, Scientific Sessions and WRF Cinema

- WS 8: ESM Workshop and Criticality Debate – by ESM (Room: Seehorn)
- WS 9: Sustainable Water Use – Target Setting and Political Application – by UBA (Room: Sertig)
- WS 10: From Investment to Impact: Social Innovation for Sustainable Consumption and Production – by UNEP and WRF (Room: Sanada II)
- WS 11: Material-efficiency in Swiss Industry based on Systematic Ecodesign – by FOEN (Room: Wisshorn)
- WS 12: Towards a Comprehensive Accounting of the Societal Metabolism – experiences from the DESIRE project – by Leiden University, CML (Room: Sanada I)
- SS8: Circular economy and decoupling (Room: Flüela)
- SS9: Circular Economy and decoupling (Room: Dischma)
- WRF Cinema (Room A Forum):
 - Flow (10min)
 - Aluna (90min)

14h30 – 16h20

Plenary Session: Investing in Circular Economy

Session chairs: Cornis van der Lugt, Stellenbosch University Business School and Barbara Dubach, engageability

- Ernst Lutz, European Institute for Innovation & Technology (EIT)
- Walter Stahel, ProductLife Institute
- Angel Versetti, Igniting Business Investments in Sustainable Lifestyles (IBIS)
- Femke Groothuis, Ex'tax
- Hans-Peter Egler, Ecos
- Mari Pantsar, Finnish Innovation Fund SITRA
- Mathias Schluep, Sustainable Recycling Industries (SRI)

16h30 – 18h20

Workshops, Scientific Sessions and WRF Cinema

- WS 8: ESM Workshop and Criticality Debate – by ESM (Room: Seehorn)
- WS 12: Towards a Comprehensive Accounting of the Societal Metabolism – experiences from the DESIRE project – by Leiden University, CML (Room: Sanada I)
- WS 13: Circular Bioeconomy: Circular Economy meets bioeconomy – by SITRA (Room: Sertig)
- WS 14: Circular Economy in Action – Experiences of RECPnet around the World – by RECPnet, UNIDO and UNEP (Room: Sanada II)
- WS 15: Behind the Dirty Gold – illegal mining in the Amazon basing – by IUCN The Netherlands and Peruvian Society for Environmental Law (Room: A Forum)
- SS10: Lifestyles and Education (Room: Schwarzhorn)
- SS11: Circular Economy and decoupling (Room: Dischma)
- WRF Cinema (Room A Forum):
 - How many trees are in the world? (3min)
 - Forest Man (19min)
 - Conservation Agriculture in Zimbabwe (5min)
 - Behind the Dirty Gold (30min) + WS 15 by IUCN The Netherlands and Peruvian Society for Environmental Law

19h00 – 21h00

WRF Conference Gala Dinner

21h00 – 23h00

WRF Party with Justina Lee Brown and Roberto Morbioli Band

Wednesday October 14 – WRF Circular Economy Policy Dialogue

08h00 – 09h50

Workshop and Scientific Sessions

- WS 16: Transformative Future Education – by the World University Consortium (Room: Wisshorn)
- WS 17: Resource Efficiency and the Circular Economy: Policy Mixes and Scenarios – by UCL (Room: Sertig)
- WS 18: Public – Private Partnerships for Water Stewardship – by UNIDO and Heineken (Room: Sanada II)
- SS12: Targets, indicators and benchmarks for resource use (Room: Flüela)
- SS13: Technological innovation, business and finance (Room: Schwarzhorn)
- SS14: Scientific Session: Circular Economy and decoupling (Room: Dischma)

10h00 – 11h20

Plenary Session: Resource Efficiency and Circular Economy – Understanding the Concepts

Session chairs: Giulia Carbone, IUCN and Heinz Leuenberger, UNIDO

- Mathis Wackernagel, Global Footprint Network
- Claude Fussler, CO2 Forum
- Arnold Tukker, CML Leiden University
- Maria Amelia Enríquez, Bureau of Industry & Mining of State of Pará, Brazil
- Markus Reuter, Outotec
- Edmund Nickless, Geological Society of London
- Laila Rashed Iskandar, former Minister of Urban Renewal and Informal Settlements, former Minister of the Environment, Egypt

11h20 – 12h00

Lunch to go

12h00 – 13h50

Workshops, Scientific Sessions and WRF Cinema/Press Conference

- WS 19: Moving Towards a Circular Economy by Bridging Top down and Bottom-up Approaches – by OVAM and I&M (Room: Sertig)
- WS 20: Eco-Innovation by UNEP (Room: Wisshorn)
- WS 21: Managing the Social and Economic Challenges for the Development of Resource Targets – by UBA (Room: Seehorn)
- WS 22: Complementing GDP and HDI: Towards an integrated Resources Use Index of Nations and Business – by WRF, CML and FOEN (Sanada II)
- SS15: Technological innovation, business and finance (Room: Schwarzhorn)
- SS16: Circular Economy and decoupling (Room: Dischma)
- WRF Cinema (Room: A Forum):
 - When Elephants Fight (90min)

14h00 – 16h00

Plenary Session: Political Solutions for Global Resource Efficiency

Opening

- Bruno Oberle, Director of the Federal Office for the Environment (FOEN), Government of Switzerland
- Ligia Noronha, Director, UNEP Division of Technology, Industry and Economics (DTIE)
- Philippe Scholtès, Programme Development and Technical Cooperation Division, United Nations Industrial Development Organization (UNIDO)
- Mariano Castro Sánchez-Moreno, Vice-Minister of Environmental Management, Ministry of Environment Republic of Peru

Part I: Circular Economy and Resource Efficiency

Session chair: Janez Potocnik, Co-Chair of the International Resource Panel; Former European Commissioner for the Environment

- Alice Kaudia, Environment Secretary, State Department of Environment and Natural Resources, Kenya.
- Astrid Schomaker, Director of the Strategy Directorate, DG Environment, European Commission
- Ester van der Voet, Member of the International Resource Panel; Head, Industrial Ecology Department, Institute of Environmental Sciences (CML), Leiden University
- Maarten Hajer, Member of the International Resource Panel; Distinguished Professor of Urban Futures, Utrecht University, the Netherlands
- Shardul Agrawala, Head, Environment and Economy Integration Division, Organisation for Economic Co-operation and Development (OECD)
- Nabil Nasr, Associate Provost for Academic Affairs & Director, Golisano Institute for Sustainability Rochester Institute of Technology, United States

Part II: Resources Governance

Session chair: Ashok Khosla, Co-Chair of the International Resource Panel; Founder and President of Development Alternatives, India

- Antonio M.A. Pedro, Member of the International Resource Panel; Director, Sub-regional Office for Eastern Africa, United Nations Economic Commission for Africa (ECA)
- Mark James Mwandosya, Parliament Member, Tanzania
- Paul Ekins, Member of the International Resource Panel; Director, UCL Institute for Sustainable Resources and Research at the School of Sustainable Resources and Energy, University College London
- Dirk-Jan Koch, Special Envoy Natural Resources, Netherlands Ministry of Foreign Affairs
- Helge Wendenburg, Director General for Water Management and Resource Conservation, Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany.

16h00 – 17h30

Chairman's Summary, Awards and Closing

- Xaver Edelmann / Bruno Oberle
- Christian Ludwig / Helga Weisz
- Isabel Montero de la Cámara, Ambassador of Costa Rica in Switzerland

18h30

NCPC's 20th Anniversary Celebration Cocktail (by invitation only)

Sunday October 11 – Friday October 16 – Back to Back Meetings and Workshops (invitation only)

- International Resource Panel UNEP and Joint Meetings (Oct 11-15, 2015)
- UNEP Workshop on Resource Governance and Poverty (Oct 15 -16, 2015)
- Global Network Conference on Resource Efficient and Cleaner Production (RECP) – Delivering RECP towards the Sustainable Development Goals (Oct 12-16, 2015)
- ISO Kick-off Meeting and Workshop Session nr.1 of the International Workshop Agreement (IWA) on "Guidance Principles for Addressing Sustainability Criteria in Secondary Resources Management: Focus on Metals" (Oct 14-16, 2015)

APPENDIX B: SCIENTIFIC SESSIONS PROGRAMME

October 12, 2015 (8:00 – 9:50)

SS 1: Targets, indicators, and benchmarks for resource use

Session Chair(s): Dr. Sonia Valdivia, World Resources Forum – Switzerland
Dr. Xiaoyue Du, Empa – Switzerland

- On the road to a resource efficient Europe – Recent findings from POLFREE research
Martin Distelkamp, Bernd Meyer, Mark Meyer, Beringer Tim – Germany
- Experiences of Small Electronics Companies to Underpin Circular Economy Approaches by Means of Simplified Life Cycle Indicators
Karsten Schischke, Nils F. Nissen, Klaus-Dieter Lang – Germany
- Historic Move of Current Global Flow of Strategic Metals
Kohmei Halada – Japan
- VDI framework guideline on resource efficiency: Towards the standardization and reduction of natural resource use in the industrial sector
Holger Rohn, Franz Georg Simon, Mario Schmidt, Anke Niebaum, Christof Oberender – Germany
- The Distribution of Solar Radiation across Nations
Colin Paul Hargreaves – Australia
- Accelerating the circular economy: outcome on Resources of the Springtij Forum 2015 in the Netherlands
Arthur ten Wolde – The Netherlands

SS 2: Technological innovation, business and finance

Session Chair(s): Dr. Franz Georg Simon, BAM Federal Insitut for Materials Research – Germany
Dr. Mathias Schluep, World Resources Forum – Switzerland

- Can a Circular Economy provide a backbone for a more sustainable, fair and social market economy in Europe?
Ludwig Hermann – Germany
- Case studies of circular economy business models
Raphael Fasko, Elisabeth Karrer – Switzerland
- Business Plan Calculation Tool for Manual Dismantling Facilities
Markus Spitzbart, Elisabeth Herbeck, Mathias Schluep – Austria; Switzerland
- Business model innovation as core enabler to accelerate adoption of a circular economy
Markus Zils – Germany
- Creating a Competing Demand for Waste Resources: A Strategy for Waste Minimization in Nigeria
Sridhar K. C. Mynepalli – Nigeria

October 12, 2015 (12:30 – 14:20)

SS 3: Lifestyles and Education

Session Chair(s): Dr. Harald Mattenberger – Austria
Dr. Lewis Akenji, Institute for Global Environmental Strategies – Japan

- Developing a low-resource society – frameworks and scenarios towards a decoupled future
Holger Berg, Liedtke Christa, Maria Schnurr, Holger Glockner, Michael Schipperges, Ullrich Lorenz, Katrin Bienge – Germany

- Ecological lifestyles: Benefits of second-hand products sold through Internet platforms
Martin Lehmann, Conrad Leuthold – Switzerland
- Learning Factory – Transferring Resource Efficiency in Practical Implementation – An example of flood coolant in machining processes
Beatrix F. Becker, Alessio Campitelli, Mihir Joshi, Liselotte Schebek, Eberhard Abele – Germany
- Households resource consumption: impact and potentials of social practices
Carolyn Baedeker, Kathrin Britta Greiff, Christa Liedtke, Jens Teubler, Klaus Wiesen, Monika Wirges – Germany
- Future Households: Smaller Footprint, Better Life
Michael Lettenmeier, Senja Laakso, Viivi Toivio – Finland; Germany

SS 4: Targets, indicators, and benchmarks for resource use

Session Chair(s): Marilyn J. Mehlmann, Global Action Plan International – Sweden
Dr. Patrick Wäger, Empa – Switzerland

- Criticality of water – aligning water and mineral resources assessment
Thomas Sonderegger, Stephan Pfister, Stefanie Hellweg – Switzerland
- Assessing sustainable limits for meals – first results from the project NAH_Gast: Developing, Testing and Dissemination of concepts for sustainable production and consumption in the food service sector
Holger Rohn, Melaie Lukas, Tobias Engelmann, Christa Liedtke – Germany
- The Good Growth Plan farm network – Monitoring resource efficiency of crop production systems
Elisabeth Fischer, Juan Gonzalez-Valero, An Segers – Switzerland
- Resource efficiency and sustainable management of natural resources and raw materials: the need for a common understanding of the terminology in policy making
Jo Dewulf, Lorenzo Benini, Lucia Mancini, Serenella Sala, Gian Andrea Blengini, David Pennington – Italy
- Applicability of environmental impact assessment indicators on the use of natural resources in the built environment
Holger Wallbaum, Alexander Passer, Stefan Bringezu, Jun Kono – Sweden; Germany
- Destroying circular economy in order to save it
Elmer Rietveld – The Netherlands

October 13, 2015 (8:00–9:50)

SS 5: Circular economy and decoupling

Session Chair(s): Prof. Arnold Tukker, Leiden University and TNO – The Netherlands
Prof. Kiichiro Hayashi, Nagoya University – Japan

- Modelling the future secondary resource availability and recycling potential of aluminium in Austria
Hanno Buchner, David Laner, Helmut Rechberger, Johann Fellner – Austria
- Circular Economy and Life Cycle Assessment (LCA): how to make circular economy happen
Soledad Contreras, Mark Goedkoop – The Netherlands
- The regional resource flow model for promoting circular economy at the regional level
Joonas Hokkanen, Riina Känkänen, Heikki Savikko, Ari Sirkiä – Finland
- Substitution of metals in times of potential supply limitations: What are the mitigation options and limitations?
Kristin Vala Ragnarsdottir, Harald Sverdrup, Deniz Koca – Iceland; Sweden
- Finding and offering resource efficient technologies with the Enterprise Europe Network
Ernst-Jan van Hattum – Switzerland
- Cool life cycle thinking. Mainstreaming trends and opportunities for national life cycle initiatives creation and expansion
Sonia Valdivia, Guido Sonnemann, Sanjeevan Bajaj – Switzerland; France and India

SS 6: Lifestyles and Education

Session Chair(s): Dr. Lewis Akenji, Institute for Global Environmental Strategies – Japan
Dr. Harald Mattenberger – Austria

- Untying the Gridlocks: Changing our Hermeneutics to Bifurcate for Good
Carlos Alvarez-Pereira – Spain
- Developing more impactful, effective and sustainable sustainability programs – An integrated systems model based approach.
Himanshu Ardawatia – Norway, UK
- Food System Transition towards Sustainability: Individuals Engaging in Change
Katariina Koistinen, Satu Teerikangas, Mirja Mikkilä, Lassi Linnanen – Finland; UK
- Radical Crowd based Open Innovation and Design for Sustainability
Ursula Tischner – Germany
- Multidimensional Assessment of Sustainability: Harmony vs the Turning Point
Stanislav Shmelev – UK

SS 7: Targets, indicators and benchmarks for resource use

Session Chair(s): Heinz Böni, Empa – Switzerland
Dr. Xiaoyue Du, Empa – Switzerland

- Renewable Energy (RE) for the Mining Industry: Case Studies, Trends and Developments, and Business Models
Kateryna Zharan – Germany
- Resource Demand of Pathways towards Electric Mobility: Analyzing material demand, critical resources and emissions
Ole Soukup, Katrin Biengen, Michael Rittthoff, Peter Viebahn – Germany
- Responsible and sustainable mineral production – what does it mean?
Karen Hanghøj, Per Kalvig – Denmark
- Cross-border electricity infrastructures and efficient use of renewable energy sources
Karolis Gudas – Switzerland
- Integrating anthropogenic material stocks and flows into modern resource classification frameworks
Andrea Winterstetter, David Laner, Helmut Rechberger, Johann Fellner – Austria
- Socio-metabolic graphs and socio-metabolic tables: tools for the design of policies for circular economic systems
Stefan Pauliuk – Germany

October 13, 2015 (12:30 – 14:20)

SS 8: Circular economy and decoupling

Session Chair(s): Dr. Michal Miedzinski, Technopolis Group – Belgium
Prof. Kiichiro Hayashi, Nagoya University – Japan

- Challenges to the transition to a circular economy: understanding of the web of constraints to more efficient use of resources
Teresa Domenech, Marc Dijk, Rene Kemp, Paul Ekins – UK; The Netherlands
- Dynamic interaction of market and behavioural barriers in the transition towards a circular economy: a heterogeneous-agent approach
Saeed Moghayer, Hettie Boonman, Trond Husby – The Netherlands
- Putting Circular Economy principles into practice
Jonathan Perry, Markus Stutz – Germany
- The Zero Waste Approach to Resource Management
Richard Anthony – US
- Students Are Learning Circular Economy with Companies in the REISKA Project
Sakari Autio, Katerina Medkova, Kirsti Cura – Finland
- Using life cycle approaches for regional sustainable development in the context of a circular economy
Guido Sonnemann, Fritz Balkau, Stefania Massari – France; Italy

SS 9: Circular Economy and decoupling

Session Chair(s): Dr. Nick Harley Florin, University of Technology Sydney – Australia
Eliette Johana Restrepo Gomez, Empa – Switzerland

- Municipal Water/Wastewater Agency Services: Shifting from Linear to Circular
Steven E. Sherman – US
- Policy Mixes for Resource Efficiency – Theoretical and practical challenges
Henning Wilts, Bettina Bahn-Walkowiak, Nadja von Gries – Germany
- Prospecting Secondary Raw Materials in the Urban Mine and Mining Wastes (ProSUM)
Patrick A. Wäger, Daniel Cassard, Sarah Downes, Jaco Huisman, Vera S. Rotter – Switzerland; France and Belgium
- Cost-benefit analysis of WEEE Recycling in Germany – Case study of mobile phones and smartphones
Nicoleta Gurita, Jan C Bongaerts – Germany
- Implementation of circular economy business models by small & medium-sized enterprises (SMEs): Barriers and enablers
Vasileios Rizos, Arno Behrens, Wytze van der Gaast, Erwin Hofman, Terri Kafyeke, Martin Hirschnitz-Garbers, Corrado Topi, Roberto Rinaldi, Anastasia Ioannou, Alexandros Flamos – Belgium; The Netherlands; Germany; UK and Greece

October 13, 2015 (16:30 – 18:20)

SS 10: Lifestyles and Education

Session Chair(s): William Anthony Worrell, San Luis Obispo County Integrated Waste Management Authority – US
Richard Anthony – US

- Greenhouse Gas Emissions: Correlations to Income and Environmental Concern
Heidi Bruderer Enzler – Switzerland
- Supporting sustainable lifestyles by communicating benchmarks for resource consumption with help of a novel environmental accounting system
Laura Echternacht, Justus von Geibler, Klaus Wiesen, Anne Kimmel – Germany
- A Roadmap of Resource Education as a key factor for implementation of Resource Preservation and Efficiency
Carolyn Baedeker, Holger Rohn, Michael Scharp, Jaya Bowry, Marco Hasselkuß, Martina Schmitt – Germany
- Challenges of Implementing the Environmental Protection Laws in Sri Lanka
E. A. D. Anusha Edirisinghe, M. G. L. Mahesh Premarathna – Sri Lanka; India
- Climate-KIC Innovation Framework: Addressing the Barriers to Innovation in the Circular Economy
Katherine Foster – Switzerland

SS 11: Circular Economy and decoupling

Session Chair(s): Prof. Helga Weisz, Humboldt - Universität zu Berlin – Germany
Dr. Cecilia Matasci, World Resources Forum – Switzerland

- Towards responsible prosperity: progressing a circular economy in Australia
Elsa Dominish, Nick Florin, Damien Giurco – Australia
- Innovation in finance to unlock the full potential of a circular economy
Markus Zils – Germany
- Cradle to Cradle® – Parquet for Generations
Reinhold Herkströter, Kälin Albin – Switzerland
- Towards companies that perform within the earth's regenerative capacity
Annemarie Kerkhof, Jeroen Scheepmaker, Gerben Meijer, Elmer De Boer, Kornelis Blok – The Netherlands
- Urban Metabolism as framework for Circular economy design for cities
Yuliya Kalmykova, Leonardo Rosado – Sweden

October 14, 2015 (8:00 – 9:50)

SS 12: Targets, indicators and benchmarks for resource use

Session Chair(s): Prof. Daniel Beat Müller, NTNU – Norway
Dr. Cecilia Matasci, World Resources Forum – Switzerland

- Sustainable Development and Resource Efficiency as Drivers for the Circular Economy – The Case of the Swiss Building Sector
Erdjan Opan, Jan Robra – Switzerland
- Direct and Indirect Uses of Urban Forest Resources – case in Nagoya, Japan
Kiichiro Hayashi – Japan
- Intensity assessment and global accounting for non-metallic minerals used for construction
Alessio Miatto, Tomer Fishman, Hiroki Tanikawa, Heinz Schandl – Japan; Australia
- Thanatia and thermodynamic rarity: assessment of mineral resource depletion
Antonio Valero, Alicia Valero – Spain
- Concept and development of a factor four building in Inden (D)
Klaus Dosch, Jens Bröker – Germany
- Polluting Water with a Veritable Source of Energy: the Situation in the Urban City of Lagos-Nigeria
Timothy Oluwabenga Ajayi, Godwin Ikechukwu Chinemerem, Grace Jadesola Ajayi – Nigeria

SS 13: Technological innovation, business and finance

Session Chair(s): William Anthony Worrell, San Luis Obispo County Integrated Waste Management Authority – US
Eliette Johana Restrepo Gomez, Empa – Switzerland

- The economic, environmental and local employment benefits of remanufacturing (a case study)
Nicolas Schnebelen, Guillaume Moënné-Loccoz, Adrian Ronald Tan – France
- Recovery of Precious Metals from Incineration Bottom Ash
Roland Weippert – Switzerland
- Material stocks and well-being: connecting steel use and services
André Cabrera Serrenho, Julian Allwood – UK
- Moving three industrial parks towards eco-industrial parks in Vietnam
Heinz Leuenberger – Switzerland
- Mining of rare earth metals from hydro mineral resources in Siberia: trends and prospects
Olga Ulanova – Russian Federation

SS 14: Circular Economy and decoupling

Session Chair(s): Dr. Franz Georg Simon, BAM Federal Insitut for Materials Research – Germany
Dr. Michal Miedzinski, Technopolis Group – Belgium

- Wood products as resource-saving circular products
Nikolaus Lienbacher – Austria
- How the energy budget scheme contributes to decoupling and deep decarbonisation
Klara Hajdu, Veronika Kiss – Hungary
- Decoupling of economic growth and environmental impacts in Germany
Michael Lettenmeier, Iina Heikkilä – Finland; Germany
- Modelling the copper, zinc and lead mining rates and co-extraction of dependent metals, supply, price and extractable amounts using the BRONZE model
Harald Ulrik Sverdrup, Kristin Vala Ragnarsdottir, Deniz Koca – Iceland; Sweden
- Sustainable Industrial Areas: The Place for Circular Economy
Detlef Wolfgang Schreiber, Katrin Gothmann, Philip Jain – Germany

October 14, 2015 (12:00 – 13:50)

SS 15: Technological innovation, business and finance

Session Chair(s): Prof. Helga Weisz, Humboldt - Universität zu Berlin – Germany

- Exploring the potential of e-mobility to improve resource efficiency through scenario building
Teresa Domenech, Marc Dijk, Sara Evangelisti, Carla Tagliaferri, Paul Ekins, Paola Lettieri – UK; The Netherlands
- Are metal resources under severe pressure from E-mobility?
Saskia Ziemann, Daniel Beat Müller, Armin Grunwald, Liselotte Schebek, Marcel Weil – Germany; Norway
- Integrating environmental and resource efficiency issues in the investment decisions of institutional investors
Adrian Ronald Tan, Caroline Delerale, Antoine Helouin – France
- An innovation promoting sustainable construction in developing countries aims at changing the market EDGE brings together the Construction & Financial Sectors in Central America
Ana Quiros, Jose Cordero, Mario Quiros, Philip Strothman – Costa Rica; Germany
- Linking decoupling to social progress and global solidarity
Klara Hajdu – Hungary

SS 16: Circular Economy and decoupling

Session Chair(s): Dr. Cornis Van der Lugt, Centre for Corporate Governance in Africa, Stellenbosch University Business School, South Africa
Dr. Nick Harley Florin, University of Technology Sydney, Australia

- Estimating critical extraction rates for the main metals for a sustainable society within the planetary limits
Harald Ulrik Sverdrup, Kristin Vala Ragnarsdottir, Deniz Koca – Iceland; Sweden
- Modelling the global primary extraction, supply, price and depletion of the extractable geological resources using the COBALT model
Harald Ulrik Sverdrup, Kristin Vala Ragnarsdottir – Iceland
- Closing the Loop in the Automotive Sector in India: The Role of End-of-life Vehicles
Uwe Becker, Rachna Arora, Manjeet Singh Saluja, Abhijit Banerjee – India
- Policy packaging in support of absolute decoupling – a conceptual model
Martin Hirschnitz-Garbers, Susanne Langsdorf, Christian Hudson – Germany
- The climate impacts of feebate on cars in future scenarios
Rafael Laurenti, David Palm, Tomas Ekvall – Sweden

APPENDIX C: SCIENTIFIC POSTER EXHIBITION

Circular economy and decoupling

- Climate change: And if Cape Verde adopted a circular economy of water?
Mahugnon Serge Djohy – Cape Verde
- Role of design in circular procurement
Ilija Neudecker – The Netherlands
- Integrated modelling for resource policy assessment – the SimRess-project approach
Martin Hirschnitz-Garbers; Susanne Langsdorf; Harald Sverdrup; Deniz Koca; Martin Distelkamp; Mark Meyer – Germany, Sweden
- Circular Economy & Sustainable Systems
Lakshmi Raghupathy – India
- Future Consciousness
Kim Junker; Per Eriksen; Dr. Jill Edwards – Denmark

Lifestyles and Education

- Challenges of Implementing the Environmental Protection Laws in Sri Lanka
E. A. D. Anusha Edirisinghe; M. G. L. Mahesh Premarathna – Sri Lanka; India
- Revitalization of Indonesia education based Nusantara ancient through integrated system to build Indonesia human character
Muhammad Fauzi – Indonesia
- Leadership and Volunteerism
Trokon Bosco Wleyou – Liberia
- Why Zero Waste
Richard Anthony – US

Technological innovation, business and finance

- Agro e-Climate Initiatives, Ghana
Albert Yeboah Obeng; Samuel Kwame Quansah – Ghana

APPENDIX D: COMMITTEES

SCIENTIFIC COMMITTEE



Prof. Christian Ludwig, Chair
Paul Scherrer Institute and EPFL –
Switzerland



Dr. Heinz Böni
Empa – Switzerland



Prof. Helga Weisz, Co-Chair
Humboldt - Universität zu Berlin –
Germany



Prof. Stefan Bringezu
Wuppertal Institute for Climate,
Environment and Energy –
Germany



Prof. Bina Agarwal
University of Manchester – UK



Prof. Halina Brown
Clark University, Worcester – US



Dr. Lewis Akenji
Institute for Global Environmental
Strategies – Japan



Prof. Martin Charter
Centre for Sustainable Design – UK



Richard Anthony
Richard Anthony Associates – US



Prof. Enrico Drioli
Institute on Membrane Technology
(ITM-CNR) – Italy



Prof. Xuemei Bai
Fenner School of Environment and
Society, Australian National Univer-
sity – Australia



Dr. Xiaoyue Du
Empa – Switzerland



Prof. Paul Ekins
UCL Institute for Sustainable Resources,
University College London - UK



Dr. Harald Mattenberger
Vienna – Austria



Prof. María Amélia Enríquez
Bureau of Industry and Mining,
State of Pará and International
Resource Panel UNEP – Brazil



Michal Miedzinski
Technopolis Group – Belgium



Prof. Damien Giurco
University of Technology – Australia



Prof. Daniel Müller
Norwegian University of Science
and Technology – Norway



Dr. Christian Hagelüken
Umicore – Germany



Prof. Claudia A. Peña
ADDERE Research and Technology
and Latin American Hub, International
EPD System - Chile



Prof. Kiichiro Hayashi
Ecotopia Science Institute, Nagoya
University, Nagoya – Japan



Dr. Timothy Prior
ETH Zürich, Centre for Security
Studies – Switzerland



Jennifer Helgeson
Organisation for Economic
Co-operation and Development –
France



Prof. Helmut Rechberger
Vienna University of Technology –
Austria



Prof. Lorenz Hilty
Empa and University of Zurich –
Switzerland



Prof. Armin Reller
University of Augsburg – Germany



Prof. Markus Reuter
Outotec – Finland



Prof. Sangwon Suh
Bren School of Environmental Sciences and Management, University of California – USA



Simonne Rufener
Swiss Federal Office for the Environment – Switzerland



Prof. Arnold Tukker
Leiden University and TNO Strategy & Policy – The Netherlands



Prof. Janeth Sanabria Gómez
Universidad del Valle-Sede Meléndez – Colombia



Dr. Sonia Valdivia
World Resources Forum – Switzerland



Dr. Heinz Schandl
Commonwealth Scientific and Industrial Research Organisation – Australia



Dr. Cornis Van der Lugt
Centre for Corporate Governance in Africa, Stellenbosch University Business School – South Africa



Dr. Mathias Schluep
World Resources Forum – Switzerland



Dr. Patrick Wäger
Empa – Switzerland



Dr. Franz Georg Simon
Federal Institute for Materials Research – Germany



Prof. Markku Wilenius
Finland Futures Research Centre, Turku/Helsinki – Finland



Dr. Walter Stahel
The Product-Life Institute and The Geneva Association – Switzerland



William Worrell
San Luis Obispo County Integrated Waste Management Authority – US



Prof. Ron Zevenhoven
Åbo Akademi University – Finland



Prof. Suojiang Zhang
Institute of Process Engineering, Chinese Academy of Sciences – China



Prof. Dajian Zhu
Tongji University – China



Christian Zurbrugg
EAWAG – Switzerland

ORGANISING COMMITTEE



Xaver Edelmann
President, World Resources Forum – Switzerland



Bas de Leeuw
World Resources Forum – Switzerland



Martine Rohn-Brossard
Federal Office for the Environment – Switzerland



Petra Schwager
United Nations Industrial Development Organization (UNIDO)



Mathias Schluep
World Resources Forum – Switzerland



María Lucía Híjar
World Resources Forum – Switzerland



Cecilia Matasci
World Resources Forum –
Switzerland



Nicole Nussbaumer
World Resources Forum –
Switzerland



Hilda Leitner
Davos Congress – Switzerland



Sonia Valdivia
World Resources Forum –
Switzerland



Maria Sureda
World Resources Forum –
Switzerland



Angel Versetti
World Resources Forum –
Switzerland



Salomé Gaehwiler
World Resources Forum –
Switzerland



Soner Avci
World Resources Forum –
Switzerland

APPENDIX E: SPONSORS AND PARTNERS



ISBN 978-3-906177-11-3

Contact information Lerchenfeldstrasse 5, CH-9014 St. Gallen, Switzerland
WRF Secretariat Phone + 41 71 554 09 00
info@wrforum.org
www.wrforum.org
Visit us on Facebook, Twitter and LinkedIn

