SERIND Closing Seminar:
building blocks for eco-industries.
(Brussels, 12 December 2014)

A circular economy within the context of sustainable development.

The example of a new industrialisation of and for the metal sector

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The vast majority of stakeholders,

including (SME) managers,

do not have a clue of the challenges we are facing.

Empowerment of trade union representatives can therefore help to raise awareness.

- *“What are the opportunities in Flanders for the metal sector to move towards a ‘new industrialisation’ in a sustainable way? On what specific niches should/can enterprises focus on?*
- *In the longer term the fundamental question is how can societal systems such as housing, manufacturing, mobility, energy … substantially be rearranged ? Addressing these systems with a long-term perspective is called system-innovation within a framework of sustainable development. Both government and enterprises are focusing on the short term and not on the sustainable longer term. How can this modernization be accomplished?*"

Vers une 'nouvelle industrialisation' du et pour le secteur du métal.

Une économie circulaire dans le contexte du développement durable.

Résumé du rapport
demandé par la FGTB Métal
Septembre 2013

Naar een 'nieuwe industrialisering' van en voor de metaalsector.

Een kringloopeconomie binnen de context van duurzame ontwikkeling.

Eindrapport
in opdracht van ABVV-Metaal
Juni 2013

The metal sector ?

Division	Description
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machineryand equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment

Source: NACE Rev. 2 (2008)

Content

1. The so-called '*megaforces*'
2. The specific vulnerability: '*war on metals !*'
3. Towards a circular economy …
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Major societal challenges: linking '*megaforces*'

- **energy and fuel**
- **climate change**
- **scarcity of resources**
- scarcity of water
- **population growth**
- **welfare**
- **urbanisation**
- food security
- degradation of ecosystems
- deforestation

(rare earth) metals
biomass

+

Low carbon society,
in particular,
greening the supply.

Source: KPMG (2012)

Source: Mazijn B. en Devriendt S. (2013)

Source: Chatham House (2012)

The so-called *'megatrends'* in the news

- Changing demographic balances
- Increasing speed of technological development and its unforeseen impacts
- Scarcity of natural and other resources
- From a unipolar to a multipolar world
- Climate change
- Increasing fragility of natural and societal systems

Publication yesterday !

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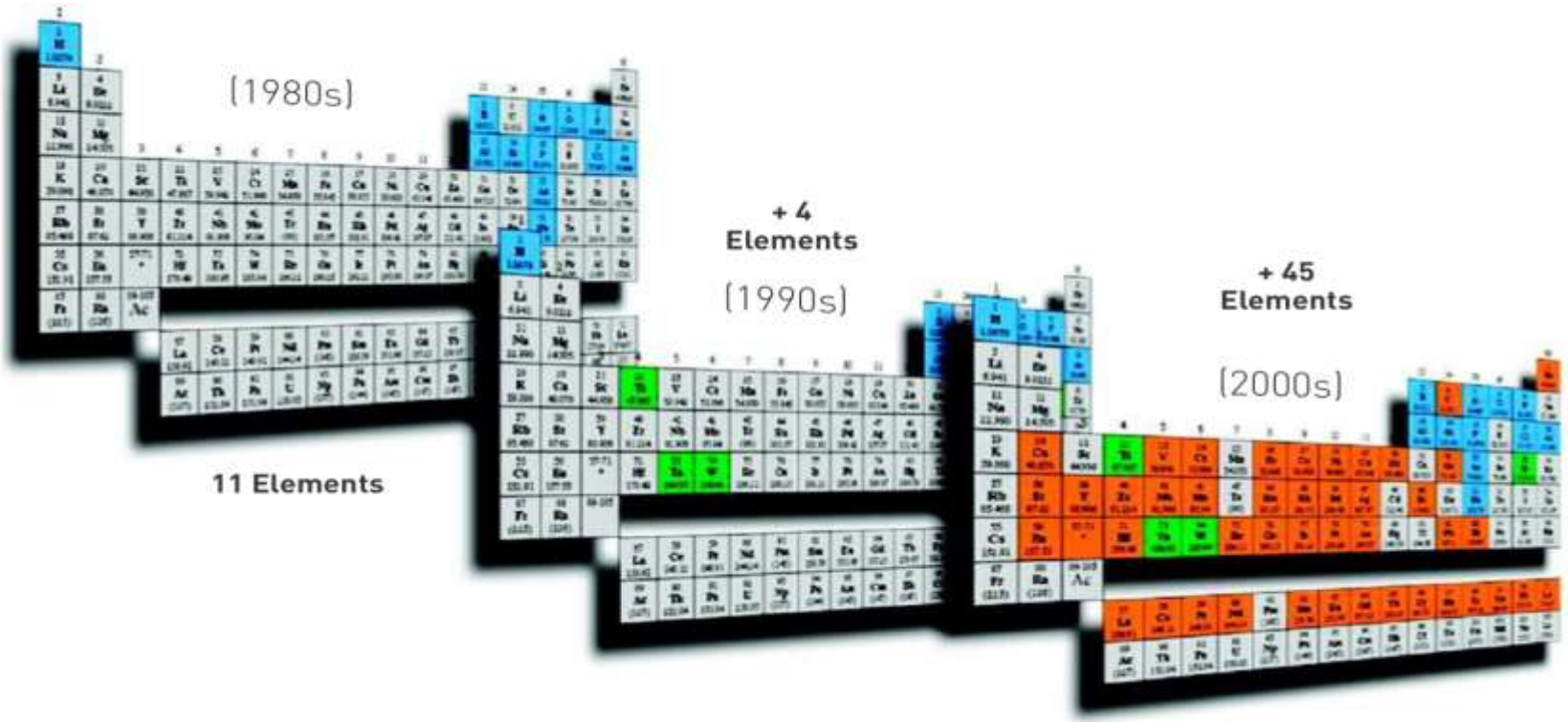
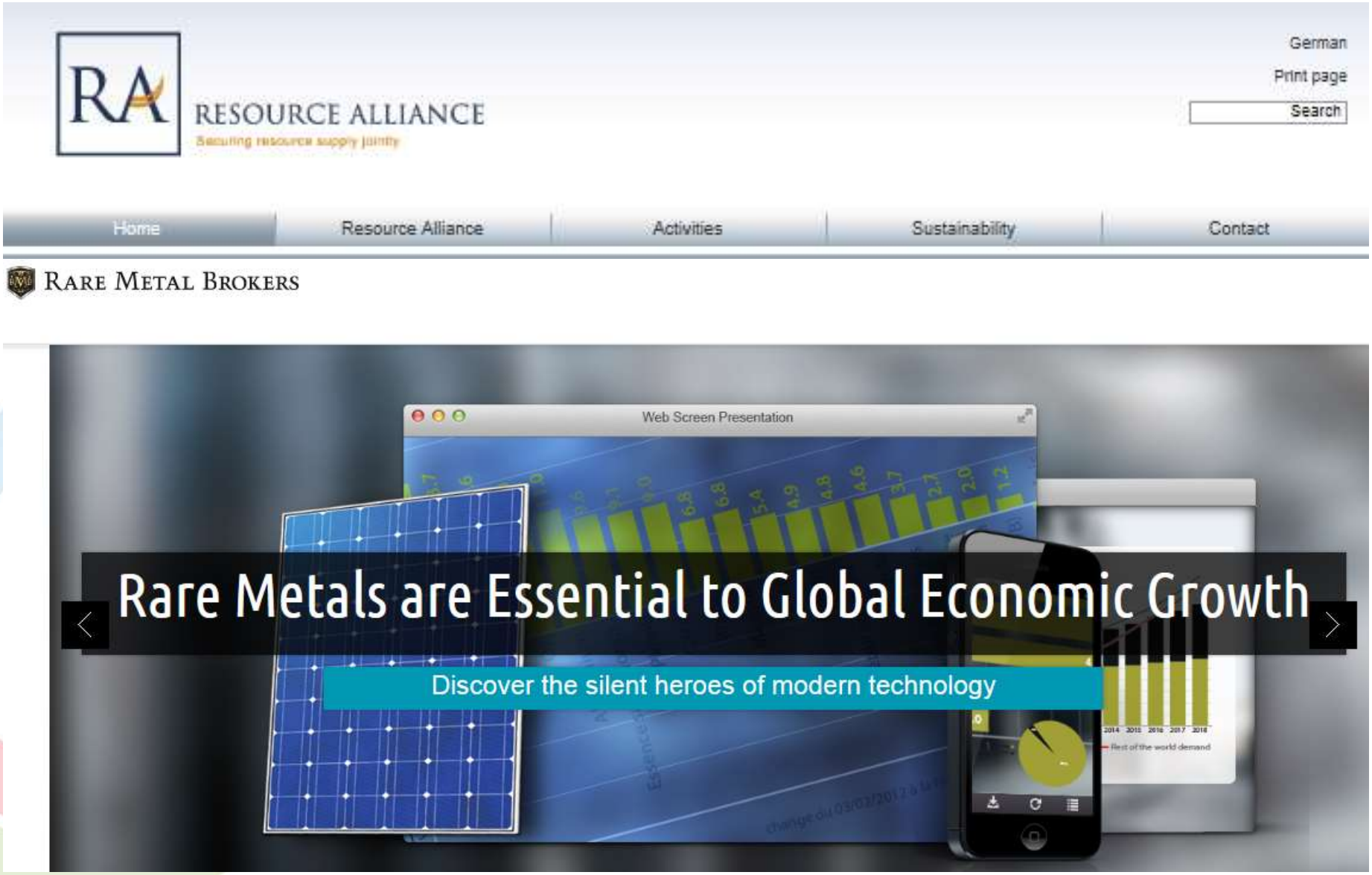
The specific vulnerability: ‘war on metals’ ! (1)

(Clean) Tech:
the performance increases by using a huge diversity of metals, but …



Source: OECD (2010)

The specific vulnerability: ‘war on metals’ ! (2)



The specific vulnerability: ‘war on metals’ ! (3)

REPORT

A Scarcity of Rare Metals Is Hindering Green Technologies

A shortage of "rare earth" metals, used in everything from electric car batteries to solar panels to wind turbines, is hampering the growth of renewable energy technologies. Researchers are now working to find alternatives to these critical elements or better ways to recycle them.

BY NICOLA JONES

With the global push to reduce greenhouse gas emissions, it's ironic that several energy- or resource-saving technologies aren't being used to the fullest simply because we don't have enough raw materials to make them.

For example, says Alex King, director of the new Critical Materials Institute, every wind farm has a few turbines standing idle because their fragile gearboxes have broken down. They can be fixed, of course, but that takes time – and meanwhile wind power isn't being gathered. Now you can make a more reliable wind turbine that doesn't need a gearbox at all, King points out, but you need a truckload of so-called "rare earth" metals to do it and there simply isn't the supply. Likewise, we could all be using next-generation fluorescent light bulbs that are twice as efficient as the current standard. But when the U.S. Department of Energy (DOE) tried to make that switch in 2009, companies like General Electric cried foul: they wouldn't be able to get hold of enough rare earths to make the new bulbs.

Haruyoshi Yamaguchi/Bloomberg
These bits of critical elements are bound for recycling at a Mitsubishi subsidiary in Japan.

The move toward new and better technologies – from smart phones to electric cars – means an ever-increasing demand for exotic metals that are scarce thanks to both geology and politics. Thin, cheap solar panels need tellurium, which makes up a scant 0.0000001 percent of the earth's crust, making it three times rarer than gold. High-performance batteries need lithium, which is only easily extracted from briny pools in the Andes. Platinum, needed as a catalyst in fuel cells that turn hydrogen into energy, comes almost exclusively from South Africa.

> In 2011, the average price of 'rare earth' metals shot up by as much as 750 percent.

Researchers and industry workers alike woke with a shock to the problems caused by these dodgy supply chains in 2011, when the average price of "rare earths" – including terbium and europium, used in fluorescent bulbs; and neodymium, used in the powerful magnets that help to drive wind turbines and electric engines – shot up by as much as 750 percent in a year. The problem was that China, which controlled 97 percent of global rare earth production, had clamped down on trade. A solution was brokered and the price shock faded, but the threat of future supply problems for rare earths and other so-called "critical elements" still looms.

Source: EC (2014)

The specific vulnerability of the metal sector

For sure there are other – more 'classical' – aspects of vulnerability,
but the specific vulnerability is about …

- **the volatile, increasing prices and the insecurity of supply of …**
  - **energy**
  - **raw materials**
- **possibly elsewhere in the chain, upstream or downstream.**

A SWOT-analysis by ECONOPOLIS: differences with the one from IDO vzw, in short (1)

‘strenghts’

- ECONOPOLIS stays within the framework of ‘globalisation’, while in our report we argue for **a ‘continentalisation’, i.e. a circular economy within Europa**;
- ECONOPOLIS do find the presence of **multinationals** a strength, while we analyse this as a weakness: the decision-makers – as could be observed at several occasions – are not based in Belgium; hereby **doubts** are arising **about the (financial) engagement to shape a circular economy**;

‘weaknesses’

- the issue of labour costs is outside the scope of our report;
- in the text of their publication ECONOPOLIS points at the need for “*the reform of the social partners and a modern governance in their structure*”, while in the matrix of the SWOT-analysis the focus is on the trade unions; in our report we point at **the vertical compartimentalisation of all stakeholders as problematic**;
- in our current report we didn’t focus on the decision-making structure of public authorities, but from the perspective of sustainable development we are advocating always a vertical and horizontal integration.

Source: Mazijn B. en Devriendt S. (2013)

A SWOT-analysis by ECONOPOLIS: differences with the one from IDO vzw, in short (2)

‘opportunities’

- ECONOPOLIS thinks ‘green economy’ is an opportunity; in our report we point at **the difference between ‘green economy’ and ‘circular economy’**;
- ‘energy costs and projects’ are indeed an opportunity; in our report we have added: ‘with a view for **trade offs and rebound effects**’;

‘threats’

- the increasing delocalisation is indeed a threat,
  but nowadays not only because of the ‘classical’ reasons from the past;
- ECONOPOLIS finds the shortage of skilled labour force a threat, but the question we put forward in our report: ‘**Schooling for what?’ ‘A circular economy?’**;
- “*the awareness of the seriousness of the situation and the need for a manufacturing industry is increasing to slowly*“ says ECONOPOLIS;
  in our report we endorsed this statement,
  but we are adding more and/or other reasons.

Source: Mazijn B. en Devriendt S. (2013)

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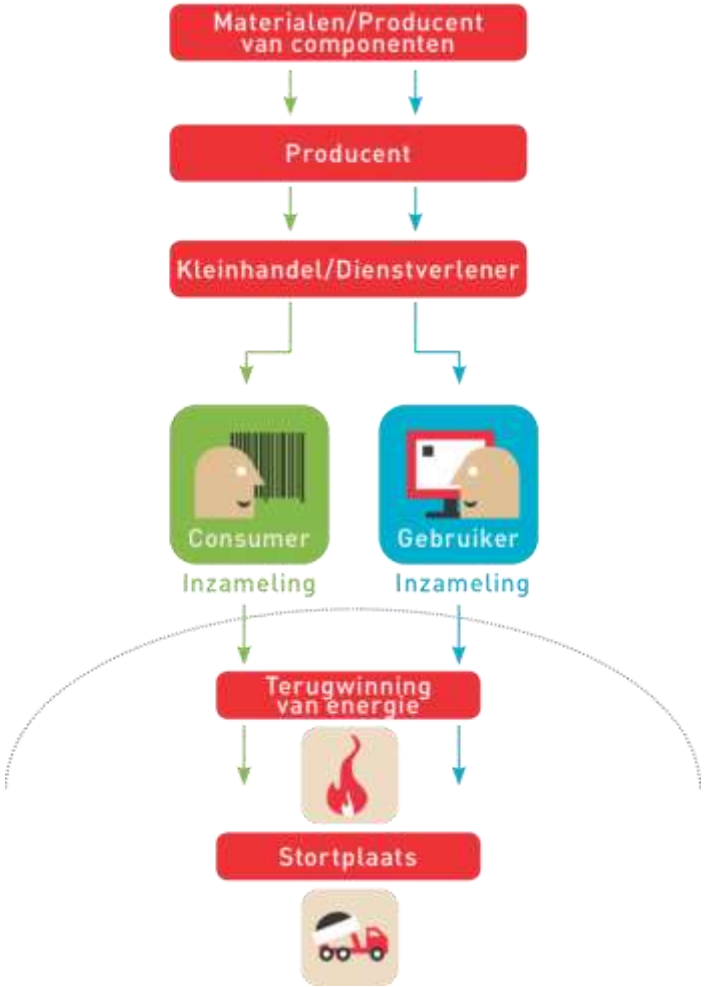
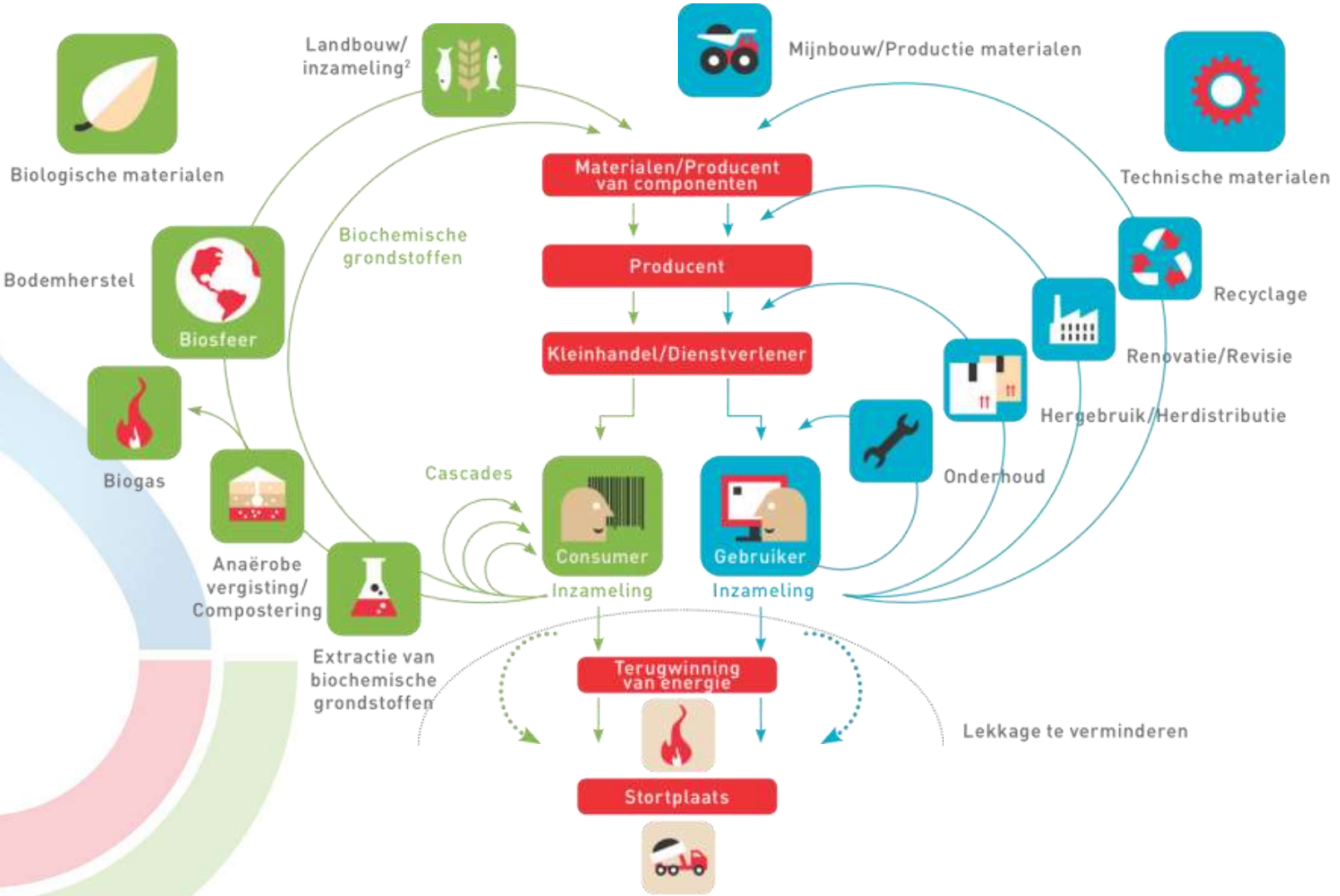
From the current ‘throughput’ economy …



Source: translated from Ellen MacArthur Foundation (2013)

… towards a circular economy
within the context of sustainable development.



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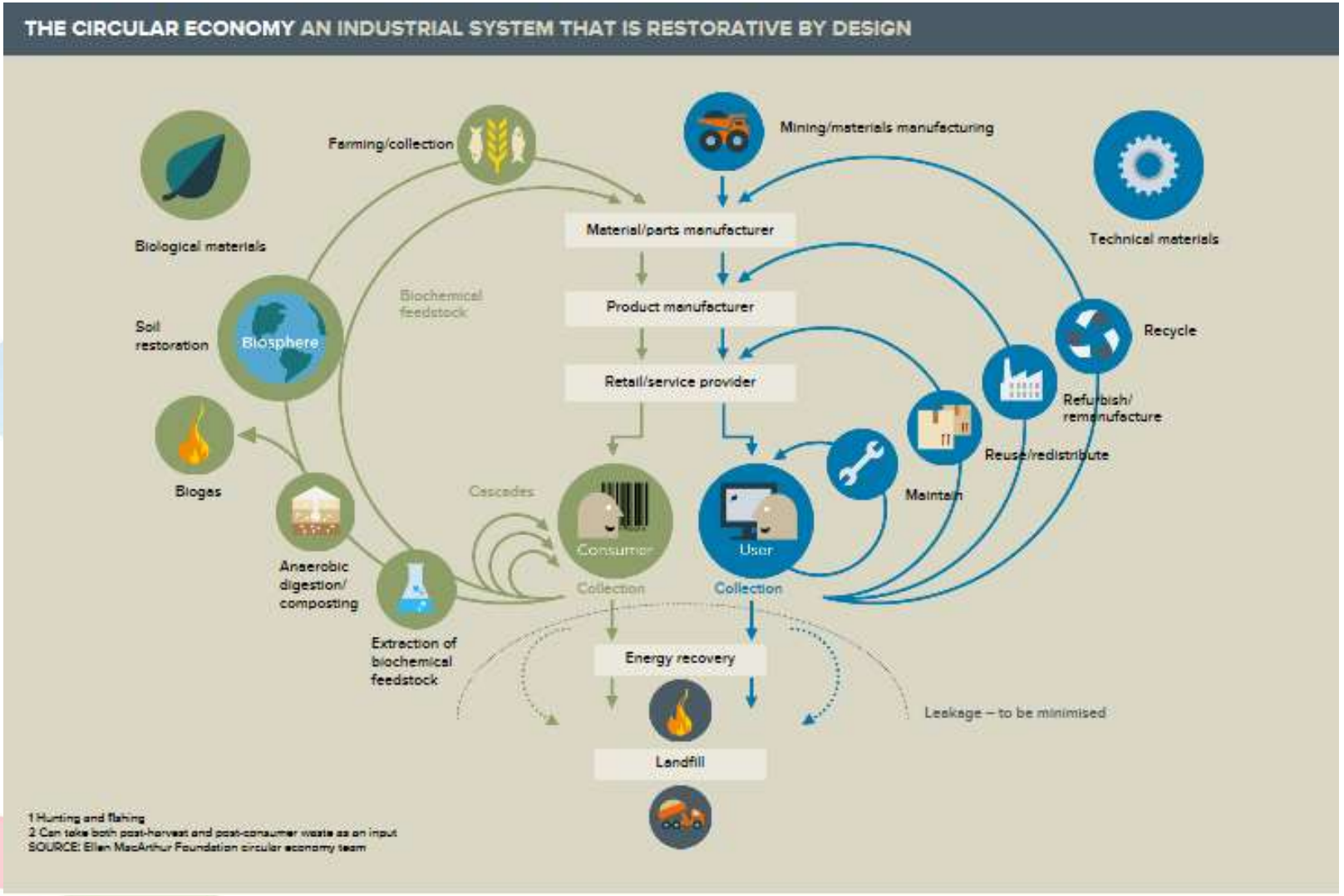

Source: Ellen MacArthur Foundation (2013)

Do we create space for biomass ?

@DeMorgen (3/2/2014):
"Producing own food?
You need 1.282 m² land."

Time for maintenance, reuse, renovation ?

Repair Café

Weggooien? Mooi niet!

“Instead of shredding, let’s reverse the belt at Ford”

Some prerequisites …

- **Design for scarcity**
- **Recycling for scarcity**

Source: Mazijn B. en Devriendt S. (2013)

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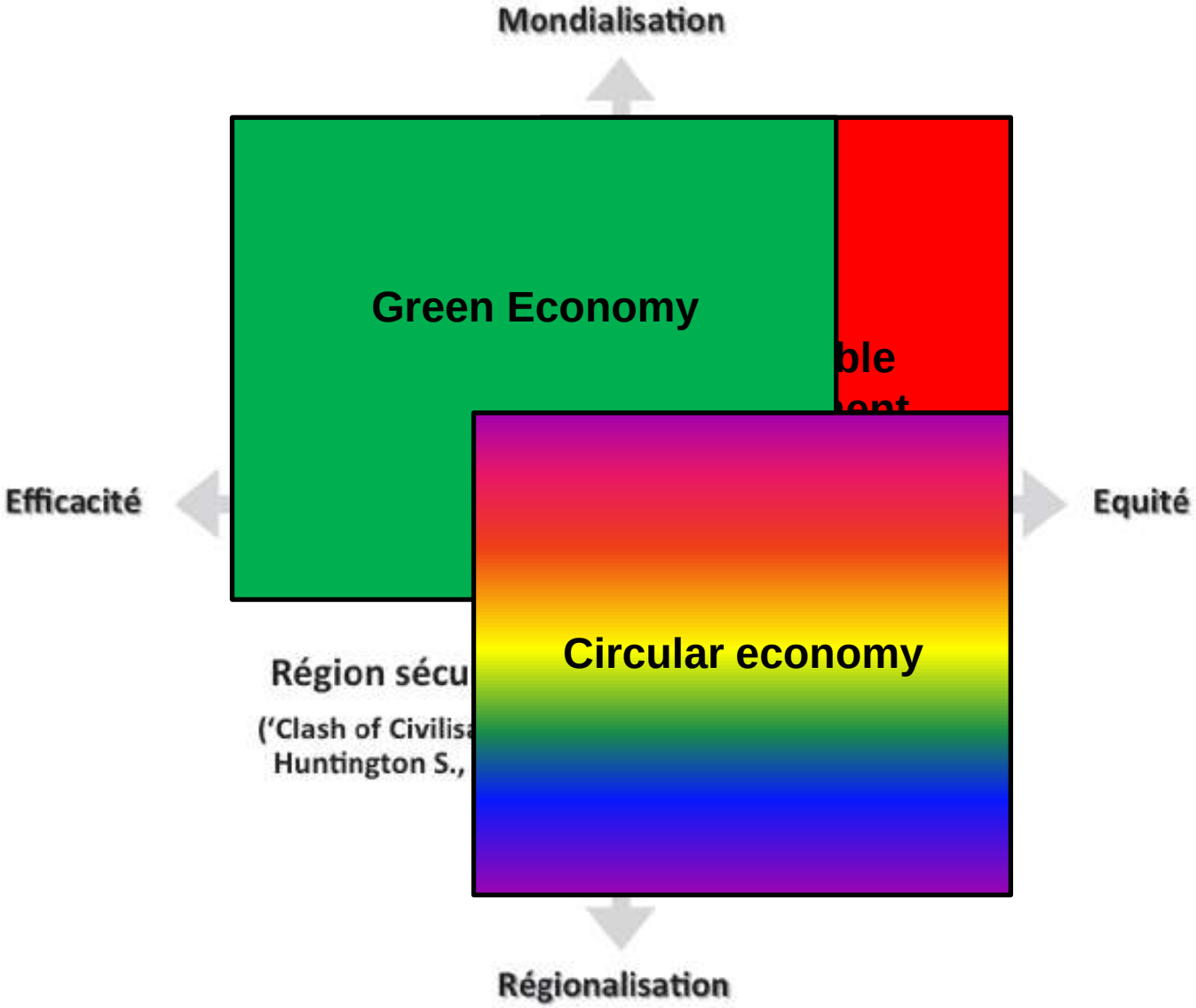
Transition towards a low carbon society, through a circular economy at the regional level.



Source: Mazijn B. et Gouzée N. (2012)

Towards a circular economy, but …

01 Circulaire economie

Justice as a necessary prerequisite

Dat we moeten streven naar circulaire economie waarin innovatieve product-dienstcombinaties bijdragen tot de toekomst, daarover zijn de meeste auteurs het in dit e-boek eens. Veel minder duidelijk is of we het eens zijn dat:

- het behoud van het 'leefmilieu' primeert om door middel van de circulaire economie de bescherming van de 'samenleving' en de invulling van haar noden tot doel te stellen;
- men circulaire economie moet zien in een context van duurzame ontwikkeling, in ruimte en in tijd;
- innovatieve product-dienstcombinaties deel uitmaken van een circulaire economie;
- de tijd dringt, zoals uit internationale rapporten blijkt: de tijdshorizon voor realisatie is 2020-2030.

Elk woord is belangrijk en onder meer gebaseerd op een **recente studie**. Ons streven is an sich een sociale doelstelling, waarmee op

elk niveau moet worden rekening gehouden bij het toepassen van een circulaire economie, dus ook product-dienstcombinaties, opdat sociale schokgolven doorheen de samenleving worden vermeden. Zonder hier te kunnen uitwijden, schuiven we enkele vragen naar voor die

At the macro level

- **How can the transition towards a circular economy be streamlined with securing the social security (health care, pensions, …) ?**

afnemen?

• op mesoniveau van sectoren:

~ hoe worden schotten tussen sectoren en hun organisaties, zowel bij werkgevers als werknemers, verwijderd?

~ hoe worden onderwijs en levenslang leren hervormd in functie van ons streven?

op microniveau van product-dienstcombinaties:

~ bestaat er geen gevaar voor analfabetisering bij toepassing van (bepaalde) product-dienstcombinaties?

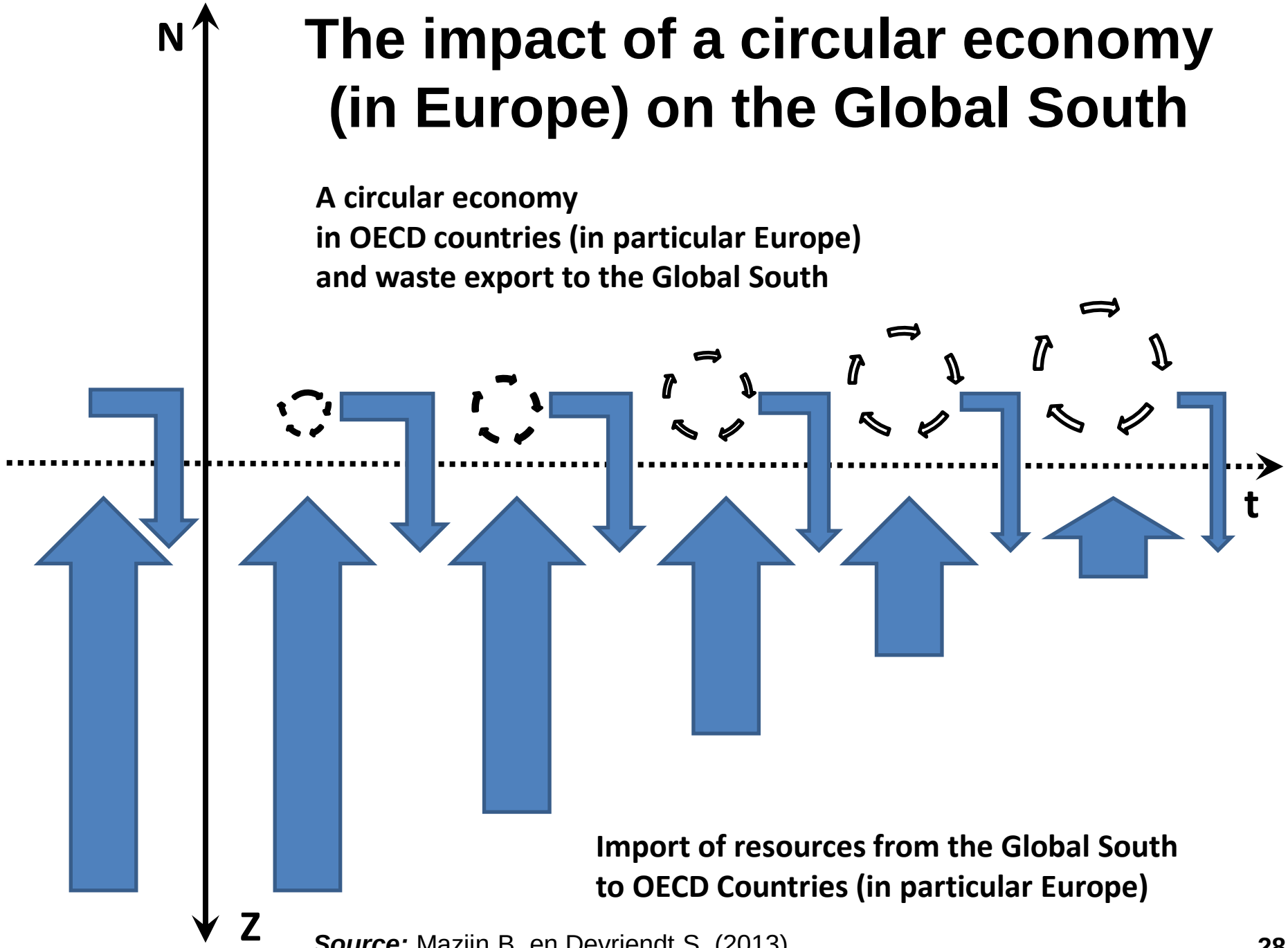
Begrijpelijk genoeg pleit één van de twee belangrijke sociale partners, de vakbond, eveneens stakeholder bij de omslag van een lineaire naar een circulaire economie, in de context van duurzame ontwikkeling voor een rechtvaardige transitie (just transition). Sociale bewegingen met hun kennis, ervaring én humane wetenschappers moeten ook worden gehoord. Dit is op korte termijn één van de belangrijke uitdagingen bij het opzetten van product-dienstcombinaties als onderdeel van een circulaire economie in de context van duurzame ontwikkeling.

Een 'nieuwe industrialisering' van de metaalsector

Source: Mazijn B. (2014)

The impact of a circular economy (in Europe) on the Global South

A circular economy
in OECD countries (in particular Europe)
and waste export to the Global South



Import of resources from the Global South
to OECD Countries (in particular Europe)

Source: Mazijn B. en Devriendt S. (2013)

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A practical approach: possible actions for the future (1)

One first question:
do we/you know if the financial flows are targeting a real economy we/you are looking for?

The answer is: no. But it could be realised if – inter alia - trade unions from now on (2015-2020) …

- would participate actively and financially in organising production and consumption in our society e.g. via cooperatives;
- would reorient existing financial flows – for which they are co-deciding – towards a circular economy (e.g. pension funds).

Examples …

- cooperatives for well developed *urban mining* (recycling of raw materials)
- Alliance for Work and Environment (energy & water: managing and sustainability of supply)

A practical approach: possible actions for the future (2)

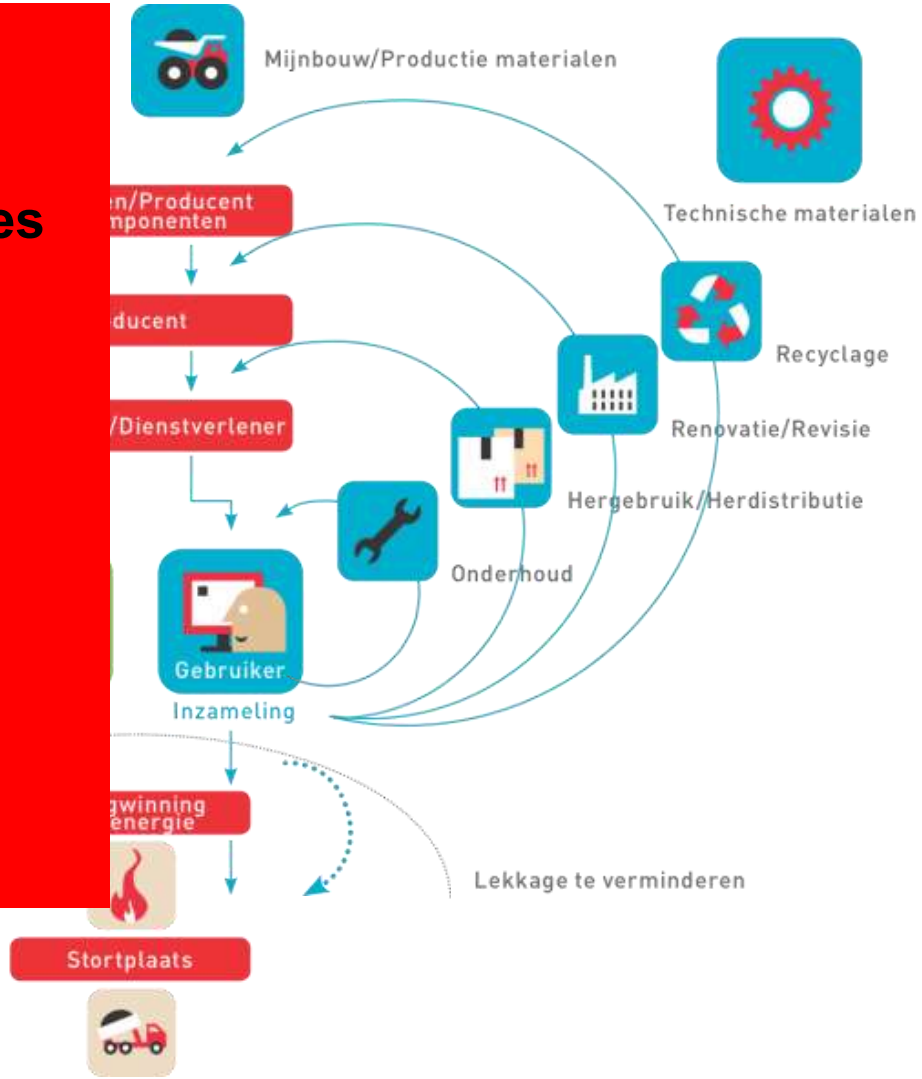
In the metal sector:

‘classical’ production processes

and

‘recycling’ processes

- **maintenance and repair**
- **refurbishment and reuse**
- **dismantling**



Source: translated from Ellen MacArthur Foundation (2013)

A practical approach: possible actions for the future (3)

Recommendations to take initiative with a result <u>in the short term</u>:

… by trade unions/public authorities:

- development of a vulnerability tool (cf. EFI's)
- identification of niches oriented towards a circular economy
- capacity building of trade union representatives
- solidarity with the Global South
- …

... by public authorities:

- one Minister of Raw Materials, Energy and Spatial Planning
- monitoring of raw material flows (biomass and minerals/metals)
- R&D and EESD: '*design for scarcity*' and '*recycling for scarcity*';
- blocking 'leaks' of raw materials (cf. export);
- supporting *recycling capacity* (no out-dated technologies!);
- …

Source: Mazijn B. en Devriendt S. (2013)

A practical approach: possible actions for the future (4)

Recommendations to take initiative with a result <u>in the medium term</u>:

- setting up, scaling up and expansion of new / existing transition arenas;
- stimulating product/service systems;
- special attention to an equipment plan for 'transport' and for 'energy';
- …

Source: Mazijn B. and Devriendt S. (2013)

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Tool to assess the vulnerability of enterprises

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regarding the supply of critical raw materials

Three categories of raw materials (based on inter alia the list of EC):

- rare earth metals
- metals with a volume supply risk
- other criticial materials

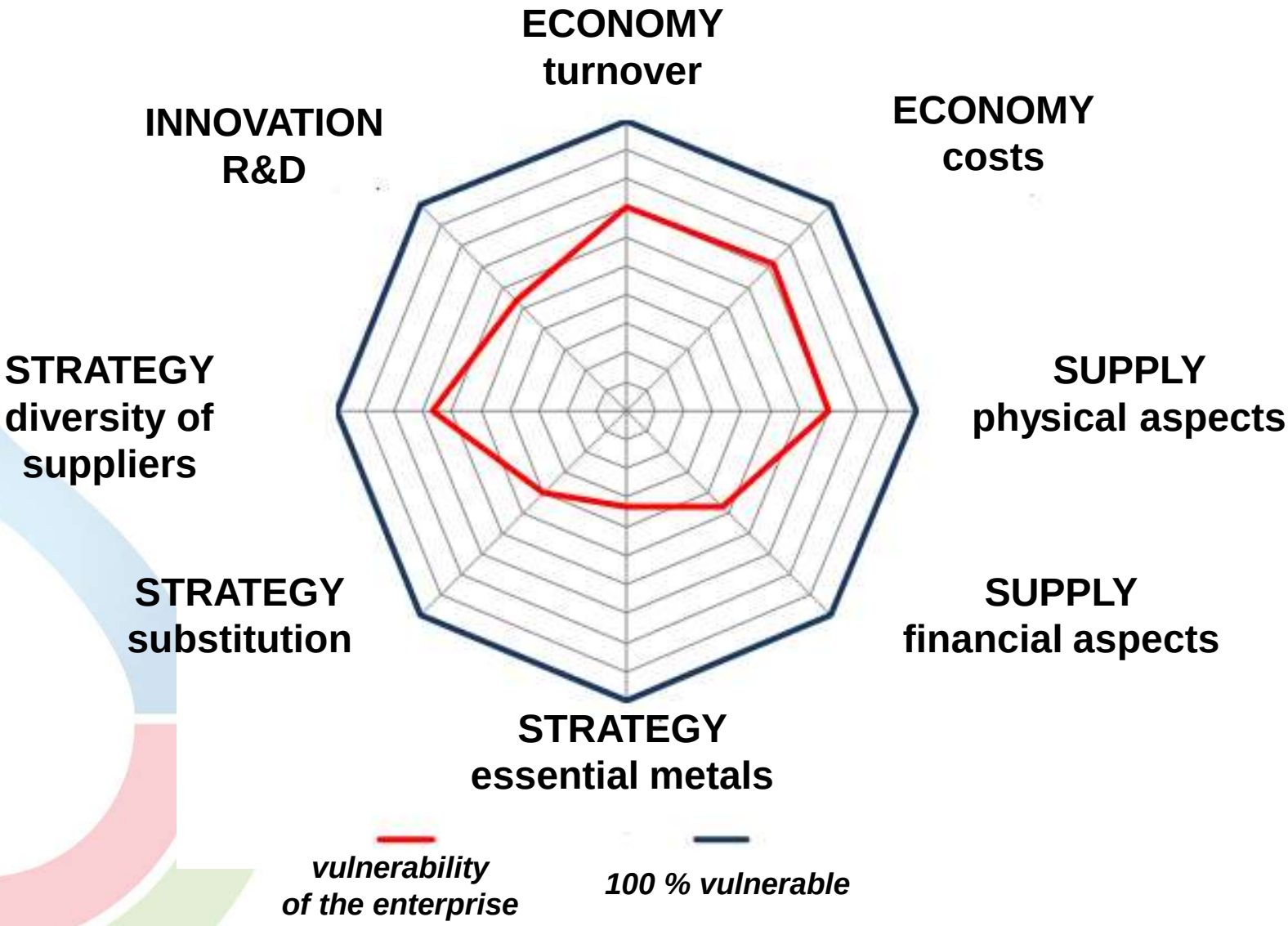
Source: Mazijn B. en Devriendt S. (2014)

The tool – webbased and user friendly – allows a screening of the enterprise in terms of vulnerability:

- ECONOMY: turnover ? costs ?
- SUPPLY: physical aspects ? financial aspects ?
- STRATEGY: essential ? substitution ? suppliers ?

INNOVATION: R&D ?

Source: Mazijn B. and Devriendt S. (2014)



Source: Mazijn B. en Devriendt S. (2014)

Royal Decree of 27 November 1973
concerning the regulation of economic and financial information to be provided to the works council

The so-called EFI's.

The use of the vulnerability instrument serves multiple objectives:

- at the level of the enterprise, for discussion at the works council,
  - in some enterprises, after filling out the screening tool by trade union representatives;
  - in other enterprises, after demanding the employer to fill out the screening tool;

  in order to increase the resilience;

- at the level of the RESOC's (regional socio-economic consultation committee's) in order to safeguard local employment;
- at the level of (sub-)sectors in order to identify niches;
- in view of setting up a dialogue between the employers organisation and public authorities
- enz.

Source: Mazijn B. en Devriendt S. (2014)

References (1)

- Ellen MacArthur Foundation (2013), ***The circular economy: an industrial system that is restorative by design.*** Website http://www.ellenmacarthurfoundation.org/circular-economy/circular-economy/interactive-system-diagram (last accessed in December 2014).
- European Commission (2014), ***Defining critical raw materials.*** Website http://ec.europa.eu/enterprise/policies/raw-materials/critical/index_en.htm (last accessed in December 2014).
- Eurostat (2008), ***NACE Rev. 2 - Statistical classification of economic activities in the European Community.*** European Communities, Brussels.
- Lee B., Preston F., Kooroshy J., Bailey R. and Lahn G. (2012), ***Resources Futures***. A Chatham House Report, The Royal Institute of International Affairs, London.
- Jones N. (2013), ***A Scarcity of Rare Metals Is Hindering Green Technologies.*** Website Yale Environment 360, http://e360.yale.edu/feature/a_scarcity_of_rare_metals_is_hindering_green_technologies/2711/ (last accessed in December 2014).
- KPMG, (2012), ***Expect the Unexpected: Building business value in a changing world.*** Part 1,2 and 3.
- Mazijn B. et Gouzée N. (red.) (2012), ***La société en mouvement : la Belgique sur une voie de développement durable?*** ASP Editions, Brussel.

References (2)

- Mazijn B. en Devriendt S. (2013), ***Naar een 'nieuwe industrialisering' van en voor de metaalsector. Een kringloopeconomie binnen de context van duurzame ontwikkeling.*** Rapport in opdracht van ABVV-Metaal. Instituut vóór Duurzame Ontwikkeling vzw, Brugge.
- Mazijn B. (2013), ***De transitie naar een koolstofarme samenleving.*** FRDO, Jaarforum, 26 november 2013.
- Mazijn B. (2014), ***Rechtvaardigheid als noodzakelijke voorwaarde.*** In: Plan C (2014) , Product ←→Dienst. Nieuwe business modellen in de circulaire economie, e-book.
- Mazijn B. en Devriendt S. (2014), ***Analyse-instrument om de kwetsbaarheid van ondernemingen te toetsen aan de bevoorrading van kritische niet-energetische materialen. In opdracht van ABVV-Metaal.*** Instituut vóór Duurzame Ontwikkeling vzw, Brugge.
- OECD, (2010), ***Materials Case Study 1: Critical Metals and Mobile Devices*** - Working Document. OECD Global Forum on Environment 'Focusing on Sustainable Materials Management' (Mechelen, 25-27 October 2010). OECD Environment Directorate, Paris.
- UNEP – International Resource Panel (2013), ***Metal Recycling – Opportunities, Limits, Infrastructure.*** UNEP-DTIE, Paris, 320 pp

Thank you !

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