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Die Zulieferindustrie nach der Krise - Perspektiven
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Challenges of materials security for the automotive industry

Current issues and outlook



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CHANGEONS DE VIE
CHANGEONS L'AUTOMOBILE



SUMMARY

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The context

The future of our business is linked to resources

02

Evaluate the risk

Establish a criticality matrix to know your exposure

03

Develop a materials security strategy

Ensure the robustness of your supply chain

04

Take action

Join forces to increase your leverage

05

Conclusions

... and recommendations

Main messages

- Automobiles are complex systems in terms of the elements contained, and thus highly exposed to materials risk
Zn, Ni, Al, Mg, *and then*: Li, Cu, Mn, Co, REE ...
- These risks are multi-faceted
costs, availability, regulation, geopolitics
- Resource strategies to counter these risks are thus needed at technical, purchasing and public action levels
- Recycling will not be sufficient to meet demand
- Our interest & action must radiate up & downstream, worldwide

01



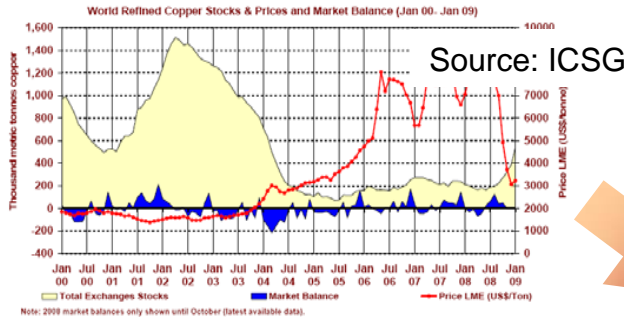
The context

The future of our business is linked to resources

The context is putting pressure on materials

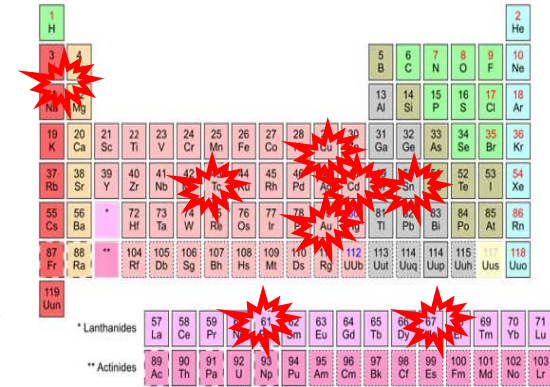
Resources

- **Strategic metals & elements**
- **Limits on availability**



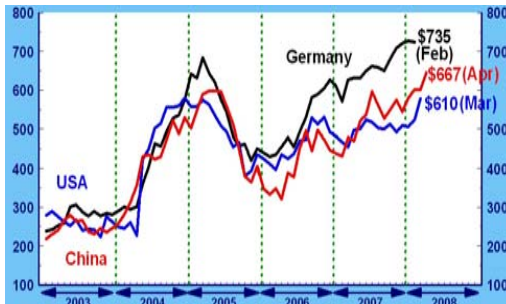
Rapidly evolving technologies

- ***New demand for materials***
- ***Constraints on production capacities***



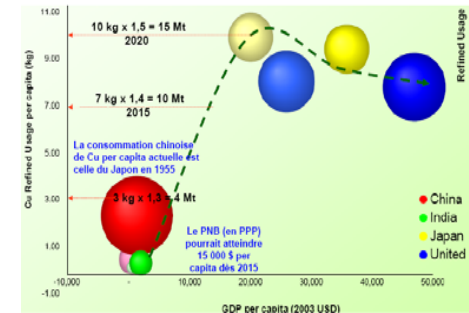
Materials price instability

- ***Speculative markets***
- ***Supply-demand balance***



Competitive international context

- **China & India**
- ***Monozukuri***

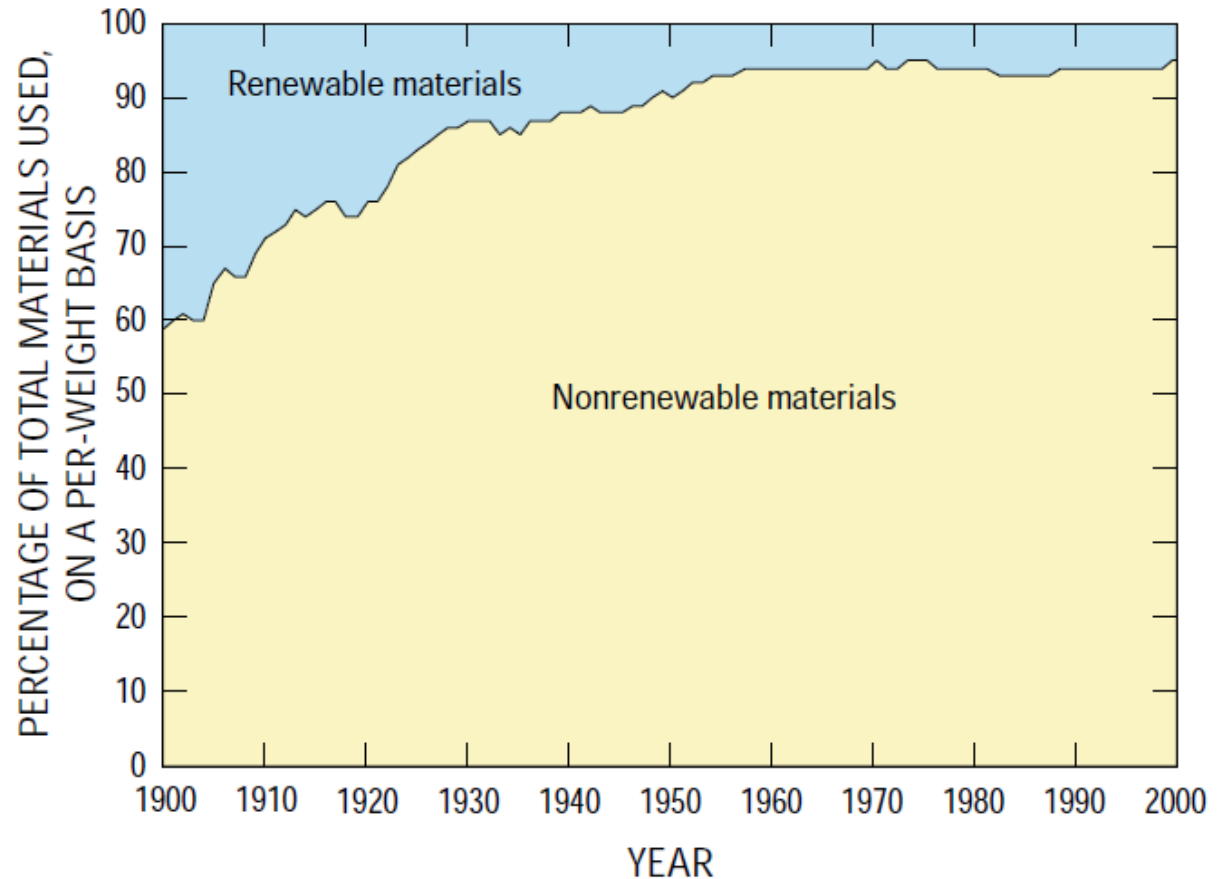


Hot spots of our materials security

- **China & India**, and to some extent **Russia** will be major market drivers influencing materials availability & price
- Mining countries are realizing and setting up to use their **geopolitical leverage**; also, **corporate concentration** effects are increasing
- **New technologies** will create temporary but sudden shifts in demand
- **Costs linked to energy** and **externalities such as water & environmental** (incl. CO₂) **taxes** *throughout the materials supply chain* are on the verge of increasing drastically & will become a major constraining factor
- **Other national & regional governments** are moving faster /stronger and more pragmatically than the **EU** on their Raw Materials initiatives & policies

Our industries have become material addicts

We have
steadily
progressed
towards an
economy
based on
non-renewable
resources

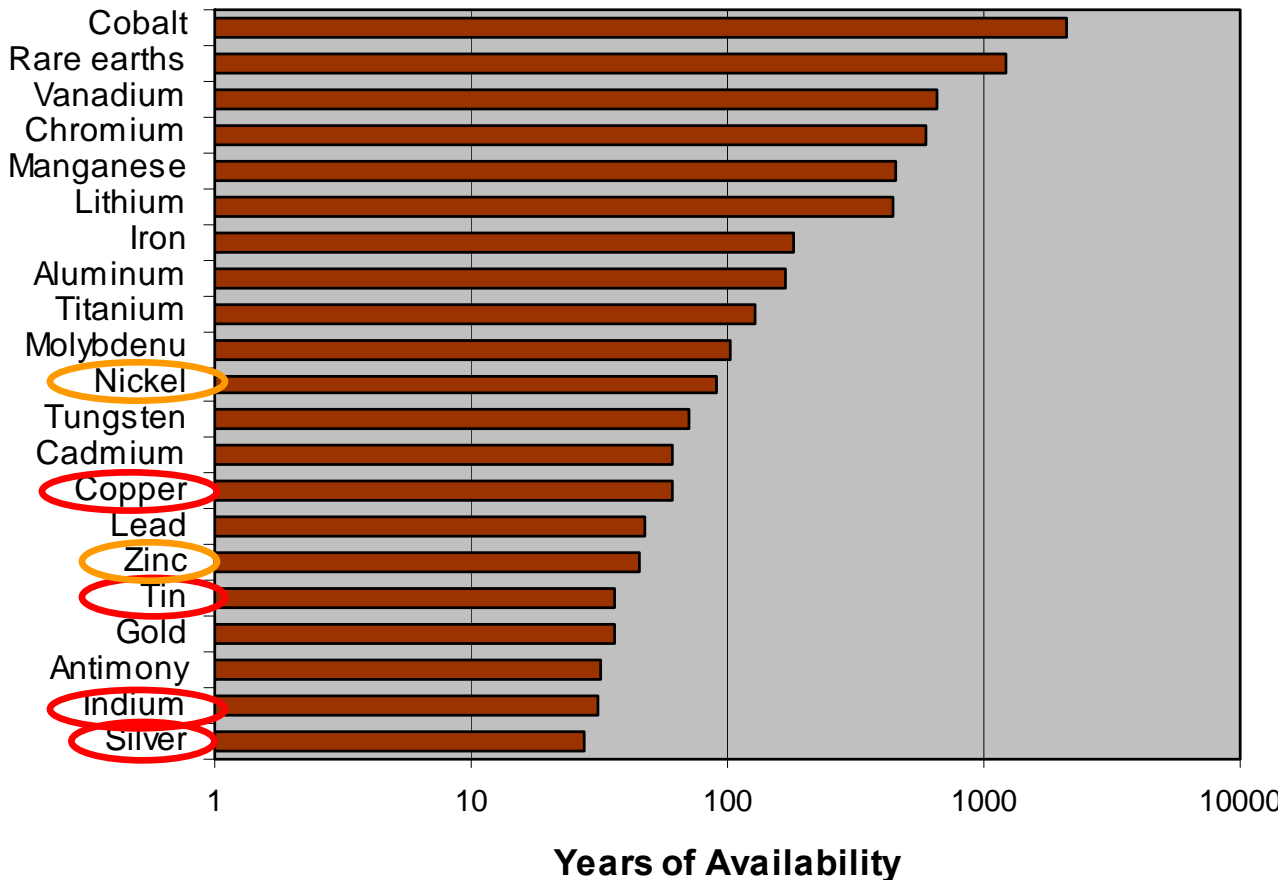


Source: Materials in the economy, USGS 1221-508 (2002)
& Matos, G.R., and Wagner, L.A., 1998, Consumption of materials in the United States, 1900–1995: Annual Review of Energy and the Environment 1998, v. 23, p. 107–122

We're running out of some (key) materials

Non-Fuel Mineral Resources

(Source: USGS Mineral Commodity Surveys 2007)

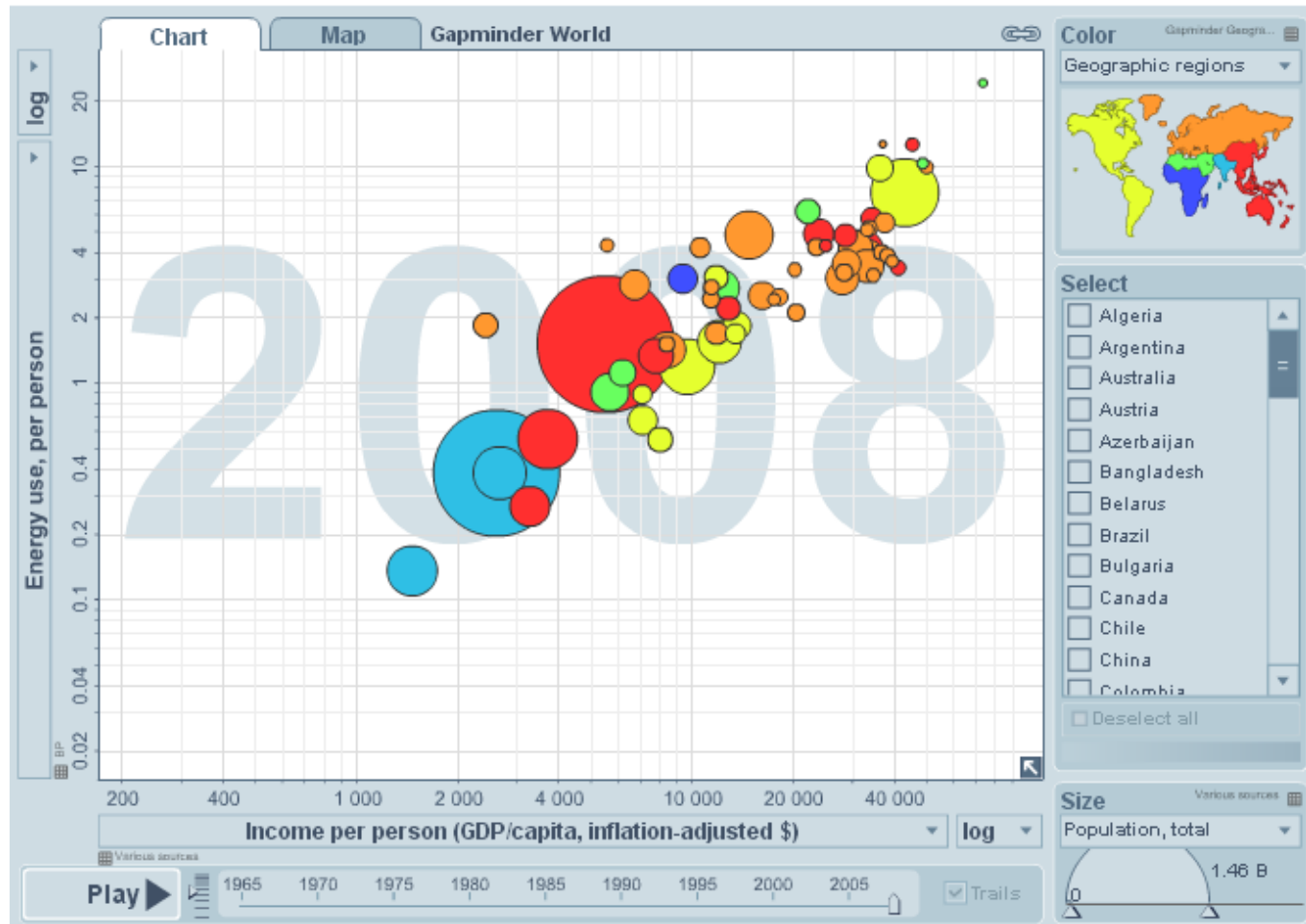


Note: the diagram is based on *reserve base* & zero-growth demand

For materials such as Ga, Nd, In, Ge, Sc, Pt, demand linked to new technologies is expected to exceed current world production by a factor of **1.6 to 6** by 2030

Sources: USGS 2007, Rohstoffe für Zukunftstechnologien", Fraunhofer ISI, 2009

Energy is at the basis of our economy

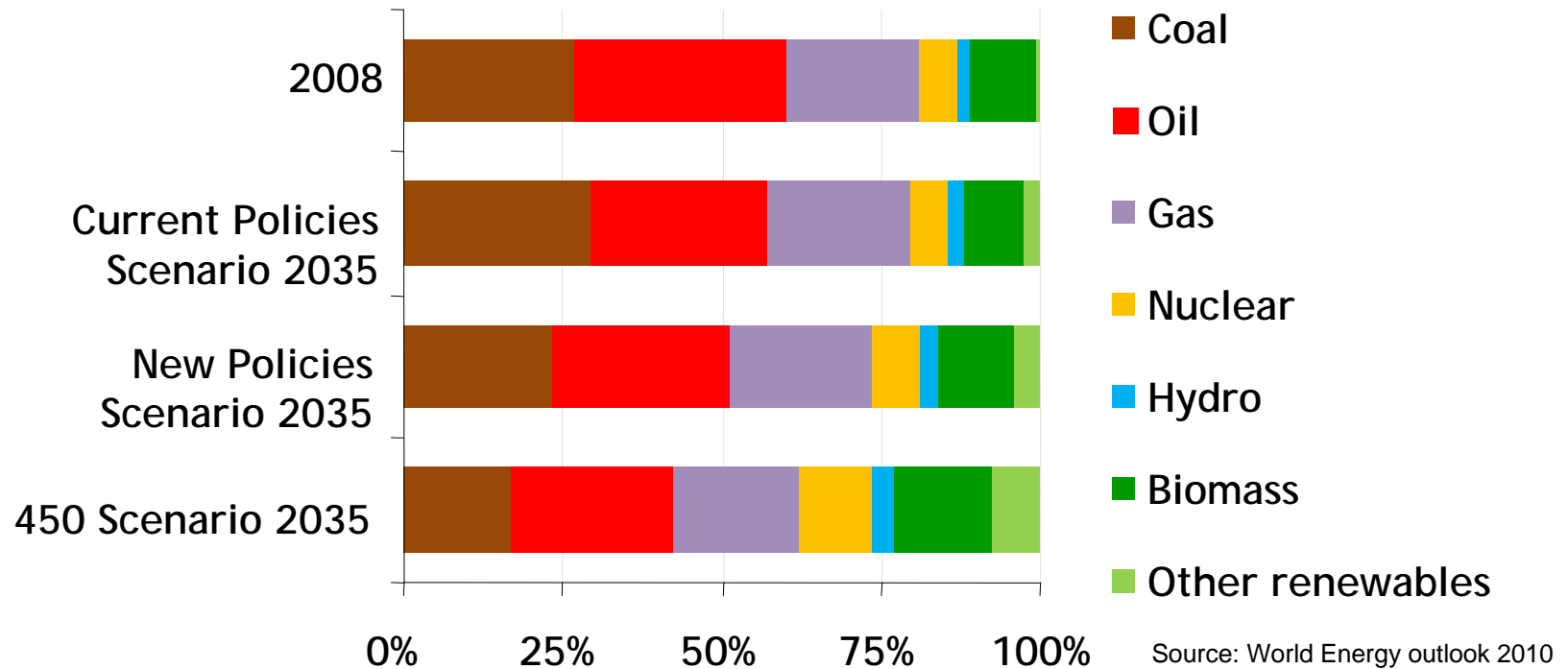


Constructed using Hans Rosling's Gapminder software & open databases, <http://graphs.gapminder.org>

Our energy comes from dead things

More than $\frac{3}{4}$ fossil fuels – for a long time ahead

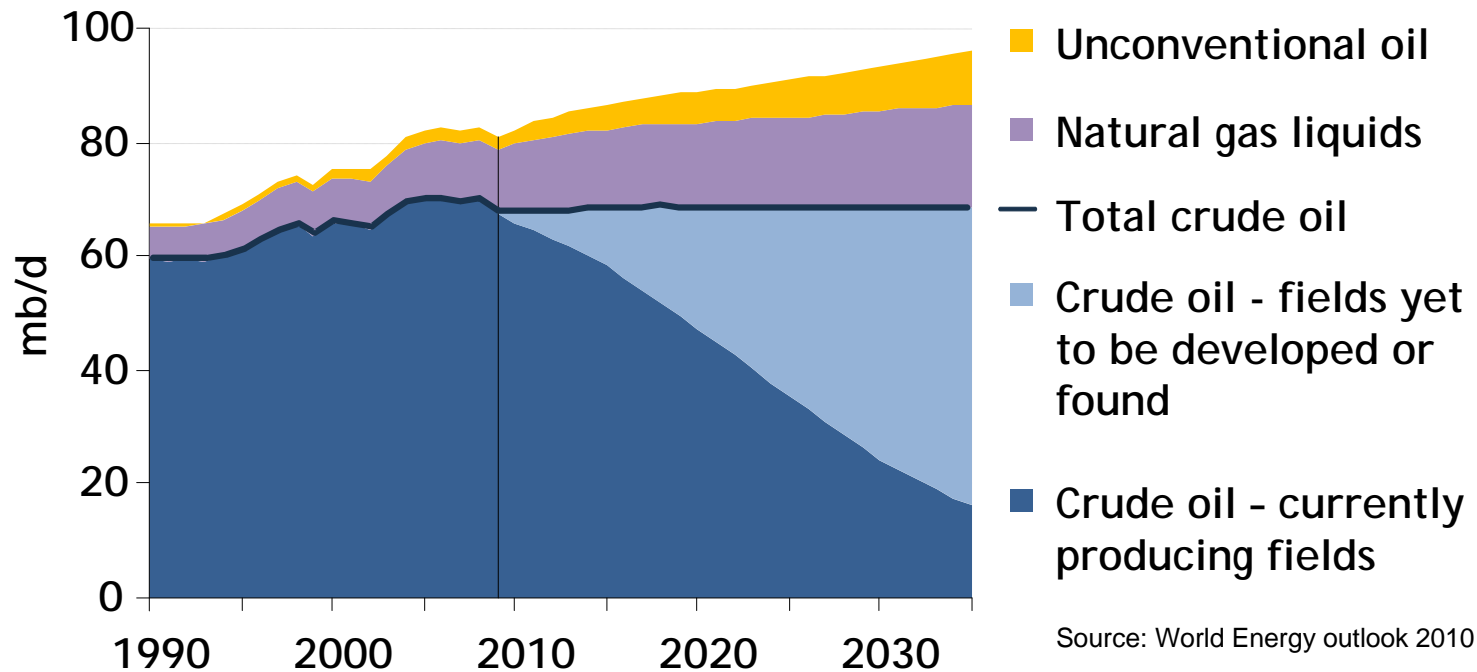
Shares of energy sources in world primary demand by scenario



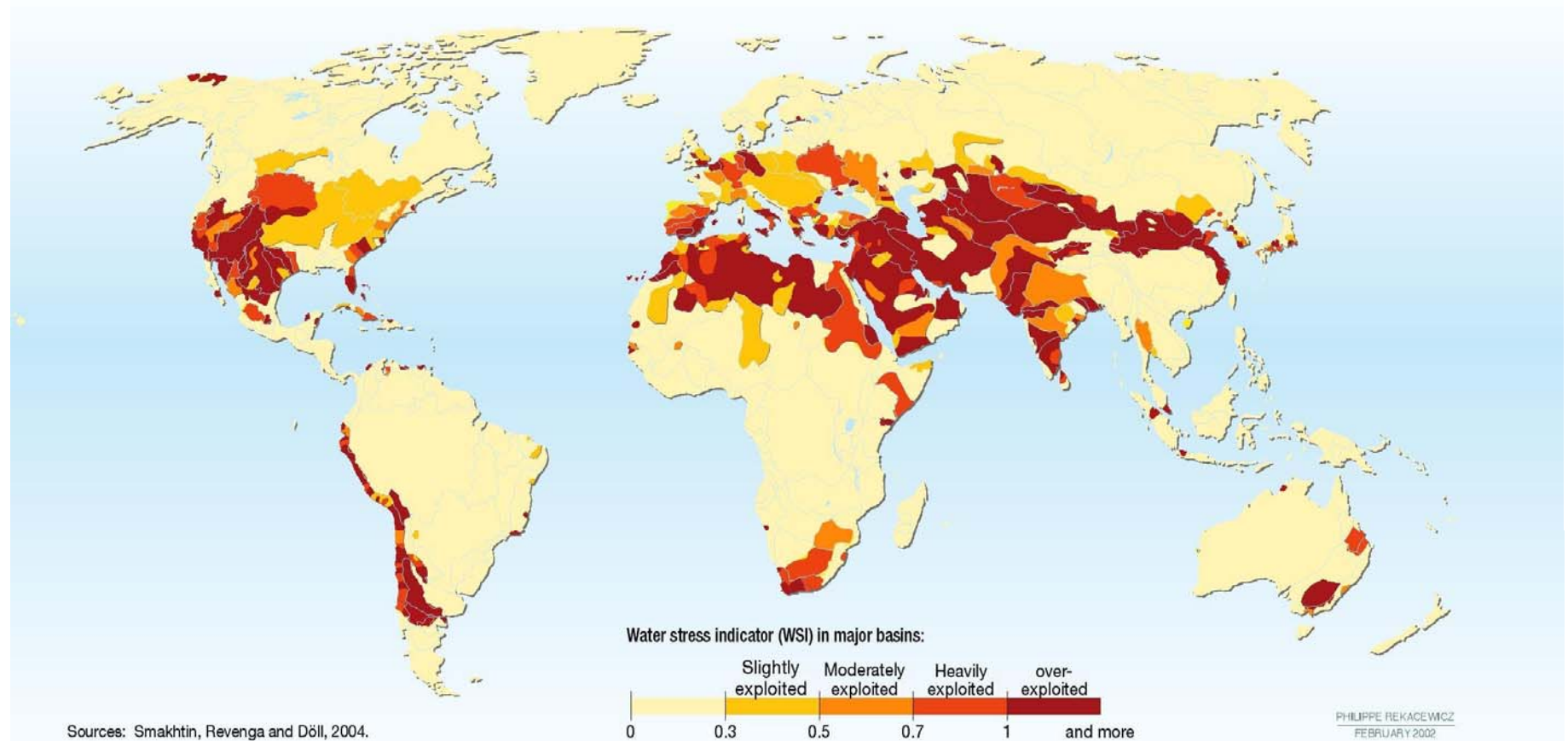
Major fossil fuel sources are under scrutiny

Peak oil will lead to peak-everything-else

World oil production by type in the New Policies Scenario



Water stress is already a reality



02



Evaluate the risk

Establish a criticality matrix to know your exposure

Economic impact of CO₂, energy, water in raw materials will drastically increase by 2020

1 car 

2020 Expected change (upper/lower)

3 tons CO₂ x

100 € = 606 M€
/ ton CO₂
32 € = 194 M€



300 m³
H₂O x

+50% = 172 M€
/ m³ H₂O
+20% = 69 M€



12,5 MWh
energy x

+50% = 292 M€
/ MWh energy
+20% = 118 M€



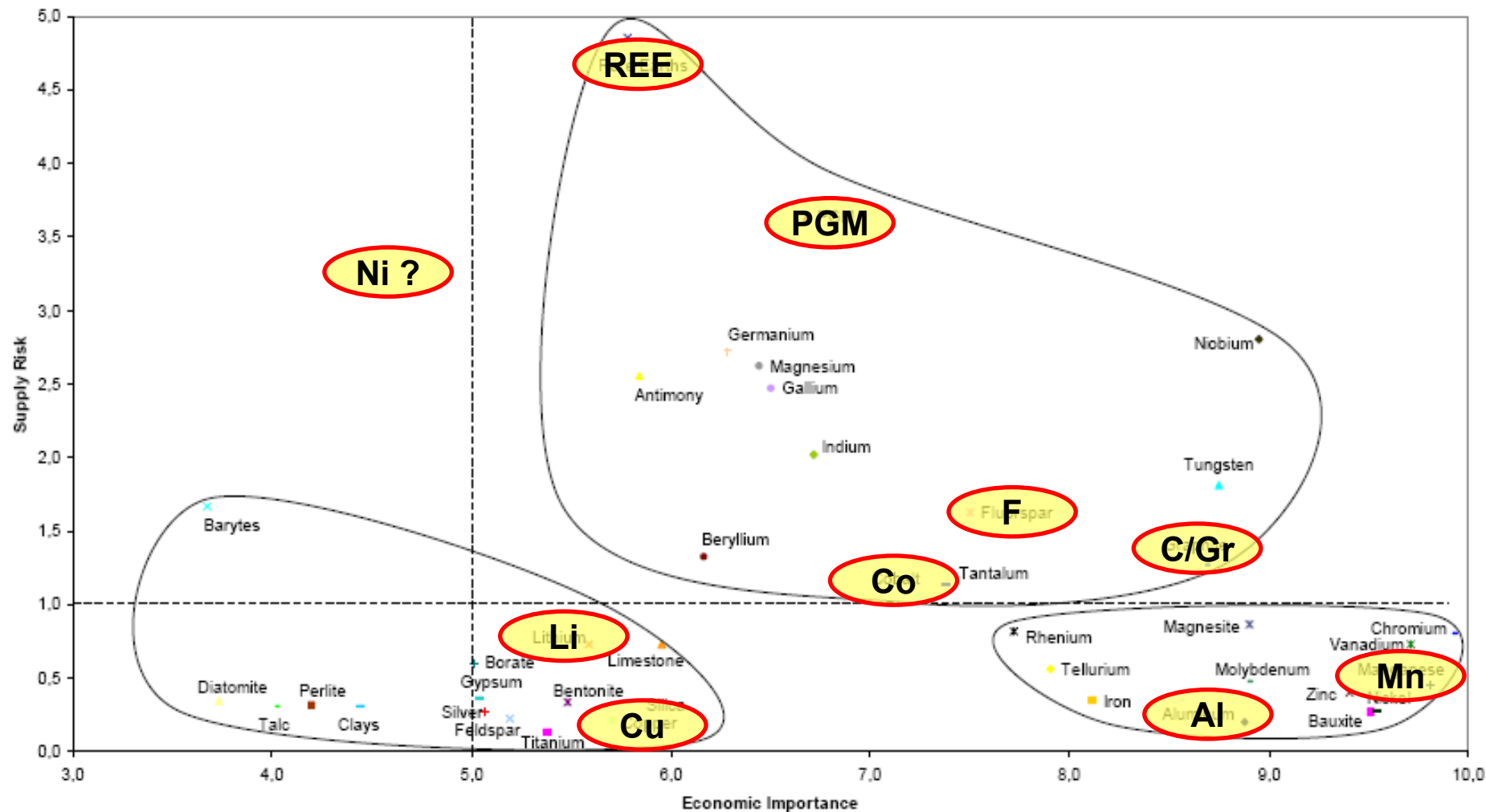
WE energy mix

For R sales of 2.3 Mveh

380 M€
to
1070 M€
total impact
on materials
cost
*throughout
our supply
chain*

Critical elements for the EU

(EC RM Initiative macro-economical approach, multi/megasectors, July 2010)



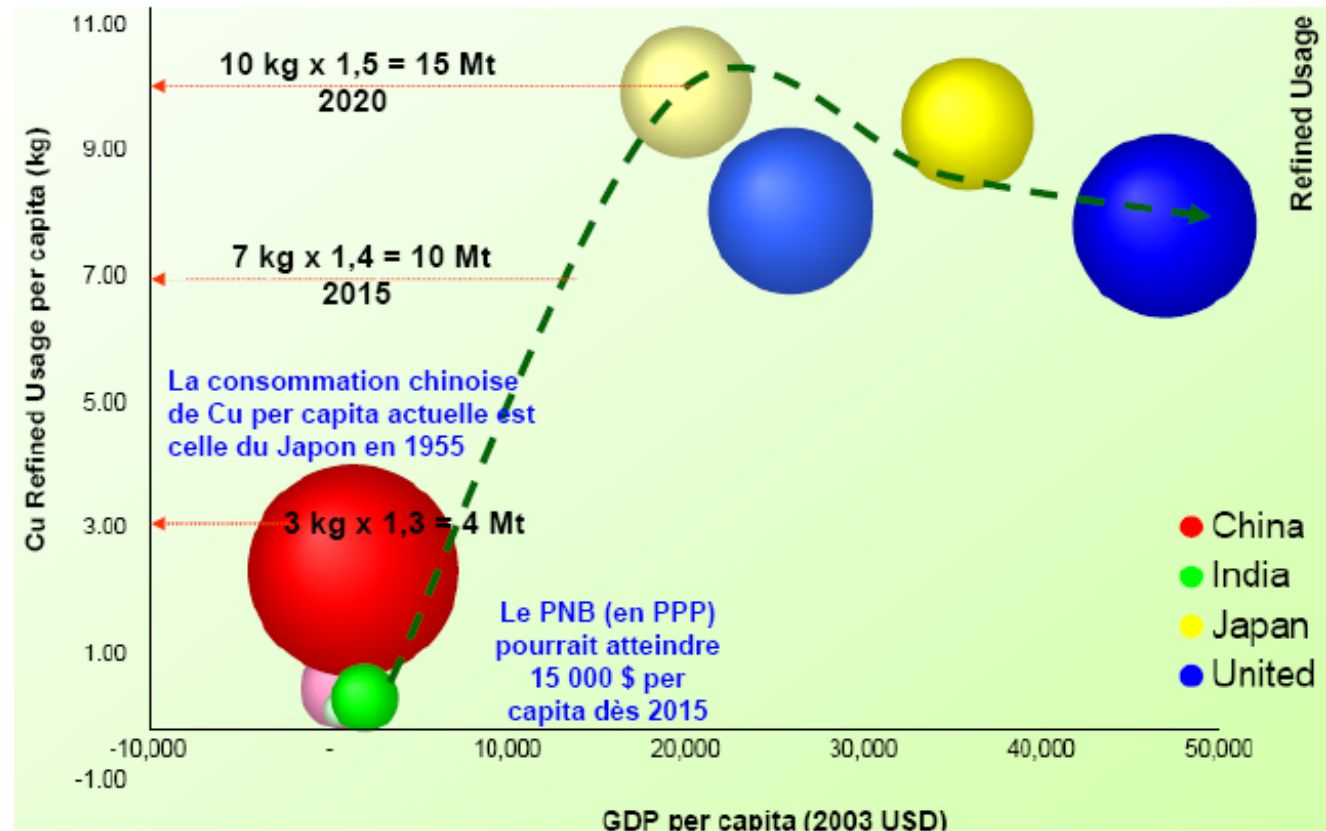
China & India will change the balance

Since the early 2000s China has driven a **policy** to promote OFDI flows under the title of □□□ “go global” (zou-chu-qu – literally “go out”)

OFDI = outward foreign direct investment

Source: OECD Investment Policy

Reviews: China 2008



Source: C. Hocquard, BRGM

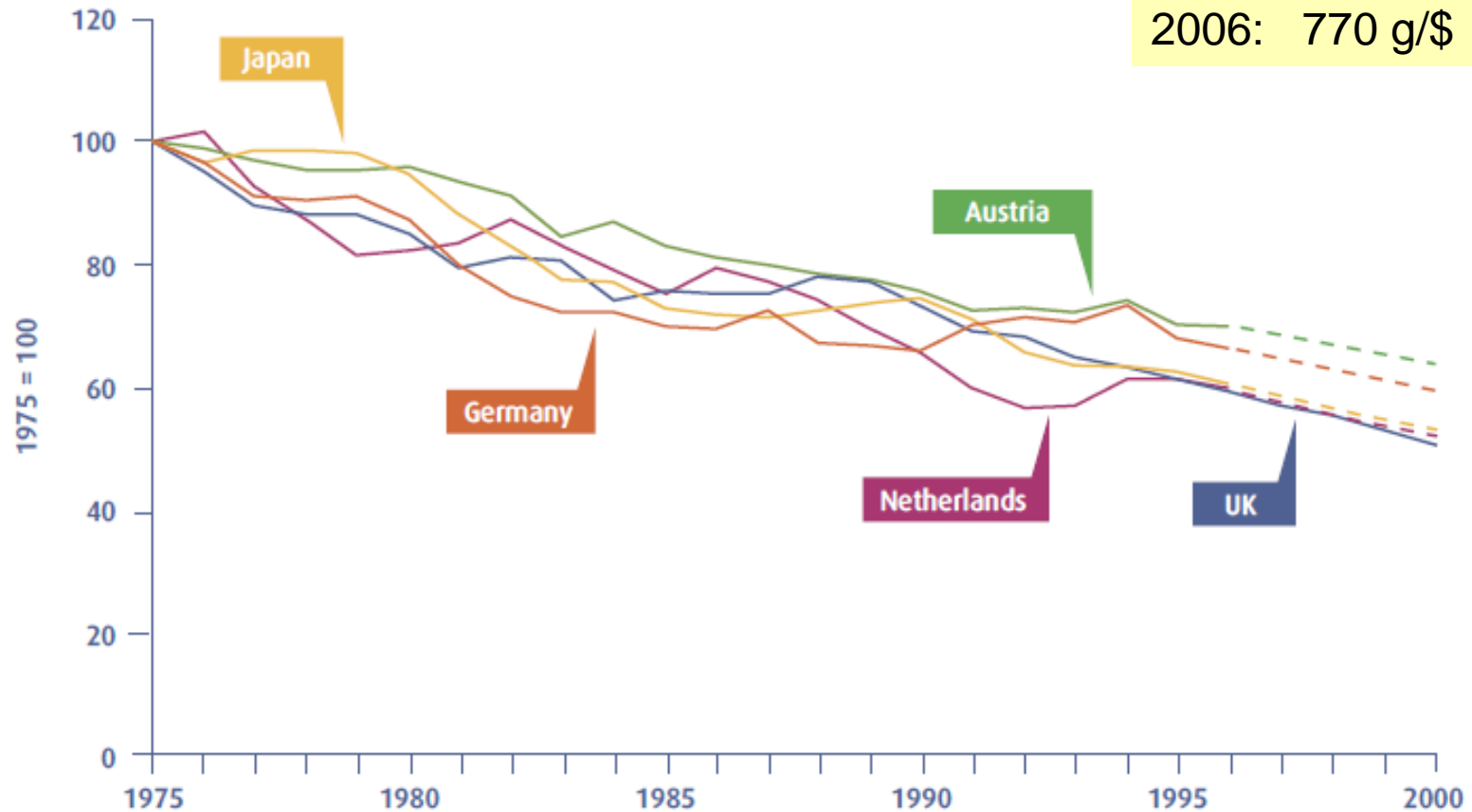
03



Develop a materials security strategy
Ensure the robustness of your supply chain

Dematerialization: is it a reality...

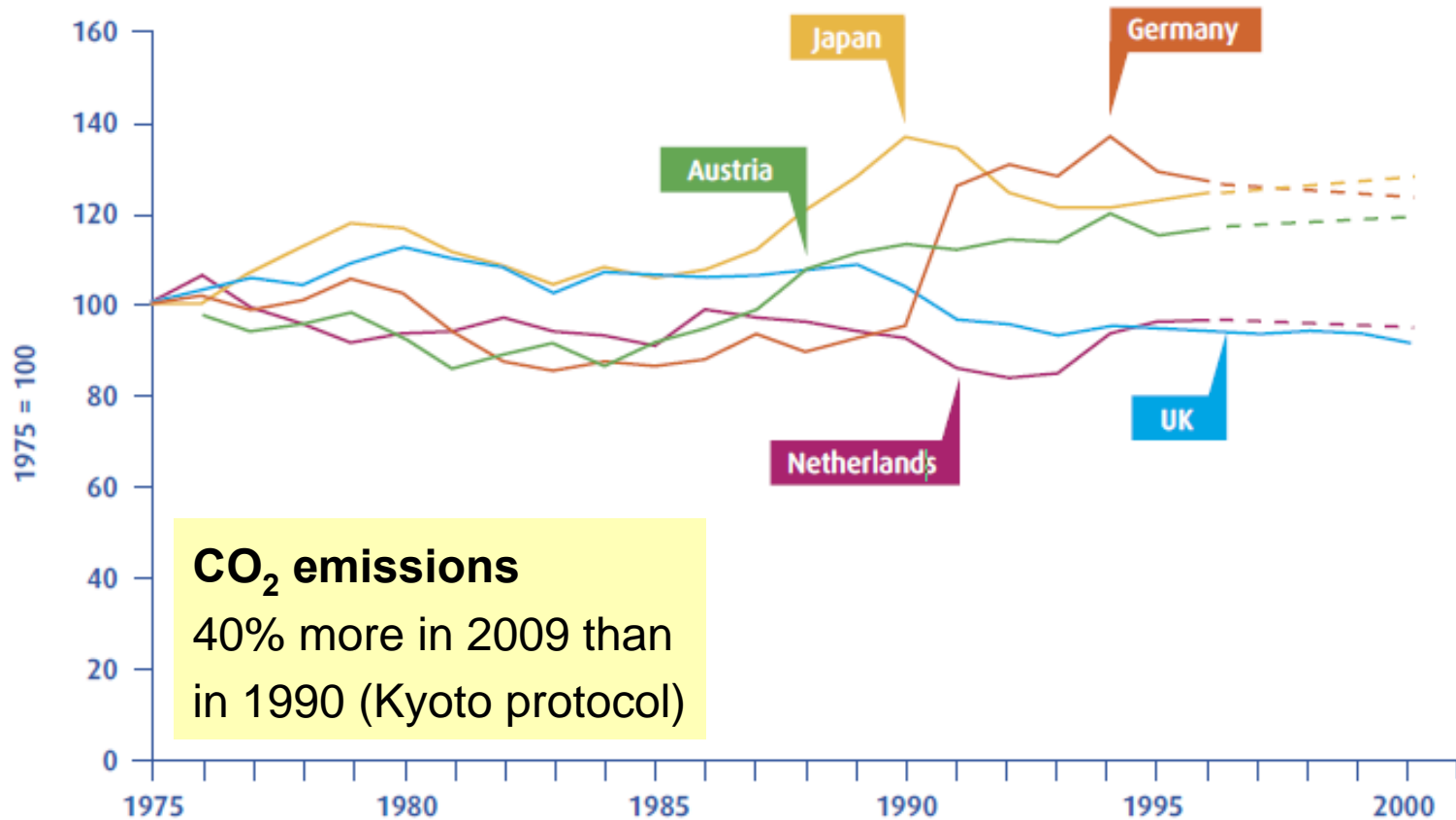
Figure 12 Relative Decoupling in OECD countries 1975-2000⁷



Source: Prosperity without growth, a report by T. Jackson, UK Sustainable Development Commission, 2009

... or a myth that we need to turn into reality

Figure 15 Direct Material Consumption in OECD Countries: 1975–2000¹⁰

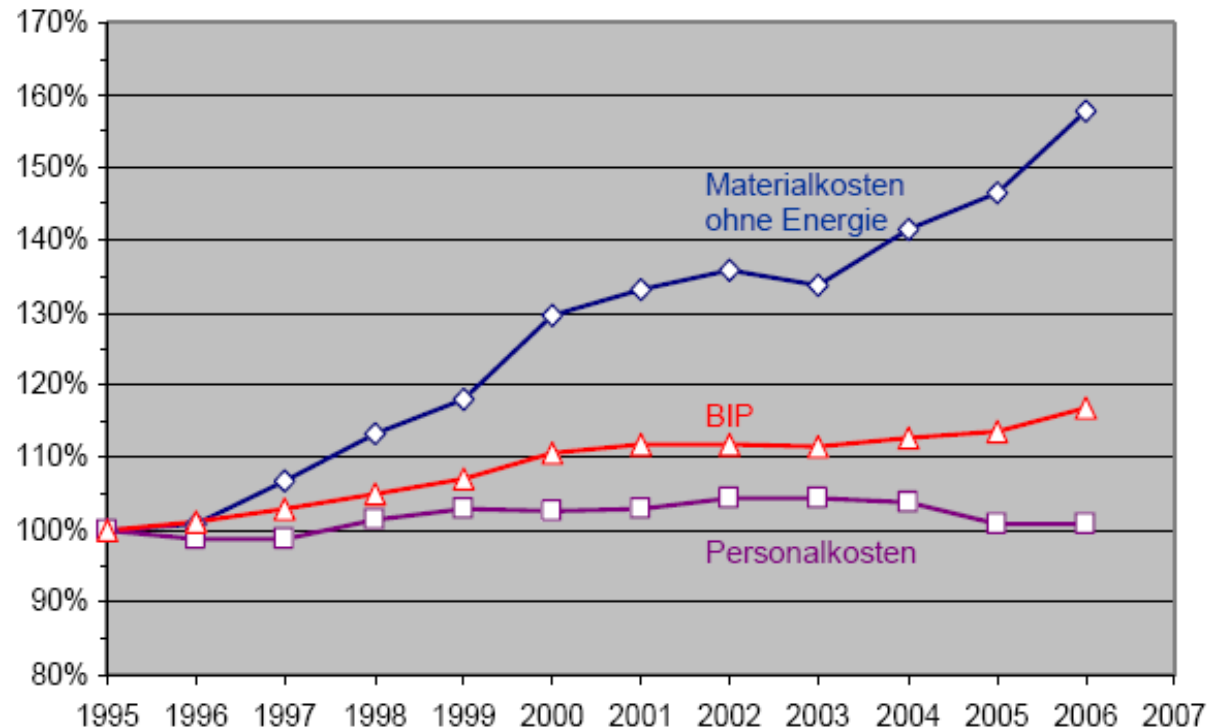


Source: Prosperity without growth, a report by T. Jackson, UK Sustainable Development Commission, 2009

Our industries are at a turning point

This will require new business creativity

Material costs:
43% of total
production costs,
cf. 1.8% energy
(Germany, 2006)



Source: G. Angerer et al., Rohstoffe für Zukunftstechnologien", Fraunhofer ISI, 2009

Criticality analysis & consequences

- Speculative price impacts
 - Production bottlenecks
 - Trade restrictions
 - Externalities (resources, emissions)
 - Limits of availability
 - ELV materials flows
- Cost of business, COP
 - Production continuity
 - Geographic availability
 - Reduce the footprints
 - Need for substitution
 - Involvement in **3R** loops

3R must be at the base of our engineering design practices



34 kg of plastics in the latest Renault models are recycled.

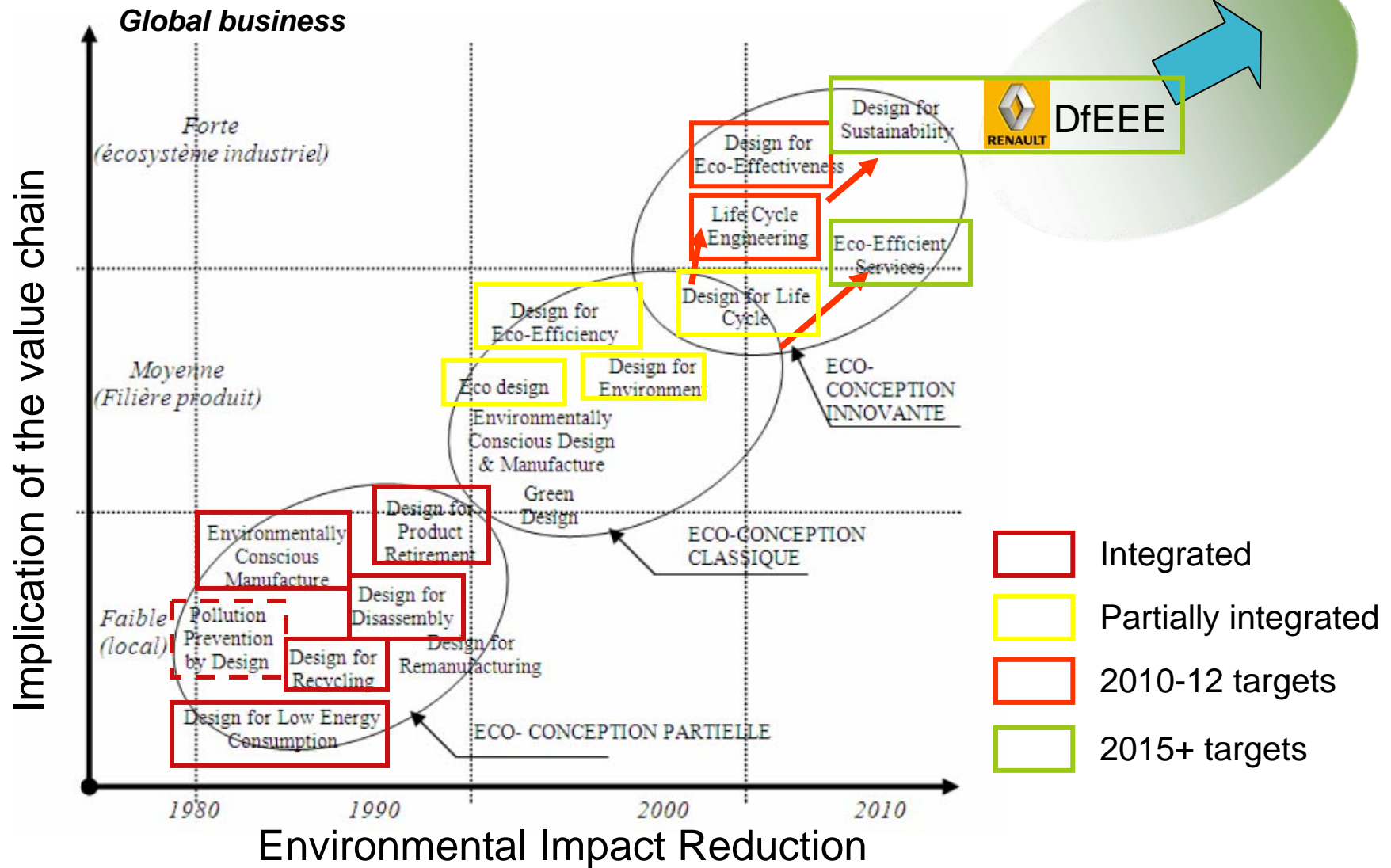
- How far can we go?
- What if everybody does it?

Raw materials risks :

multi-dimensional problems require multi-modal action

- Any weak link in your supply chain constitutes a risk
ensure that your suppliers have sustainable practices
- Implement resource strategies at technical, purchasing, management and public action levels
coordinated mobilization is the key
- Recycling will not be sufficient to meet demand
develop a range of measures
- Our action must radiate up & downstream, worldwide
coordinate regional action with main industry sectors,
take good measure of the R/O global sourcing & production,
develop life-cycle schemes and green CAPEX

Corporate design for sustainability: beyond eco-design



Corporate security calls us to design for sustainability

Know & master **stocks & flows**

- **Find more**
- **Substitute**
- **Recycle**
- **Reduce**
- **Do without**



Aim for a closed system → “**3R** loops”

Design for materials efficiency

04



Take action

Join forces to increase your leverage

Orientations for solutions

Technical

- Technology choices based on stronger resource intelligence
- LCA-based technical strategies for improved materials efficiency
- R&D to promote substitution and recycling
- Green CAPEX



Others

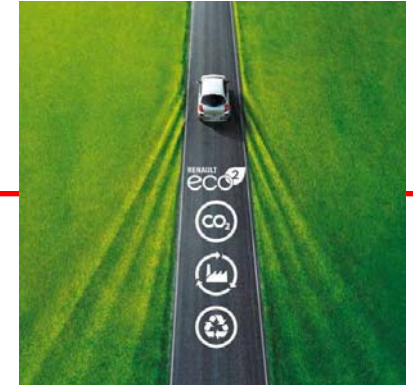
- Mobilize your community
 - Long-term contracts and sustainability pacts
 - Global design of our sourcing / supply chain
- Partnerships and leverage through associations

Consequences on R&D management

- Build a more integrated picture to model the future with **scenarios** for the mid & long term
- Step up **corporate** implication in the public domain, to solve “big” problems
- Re-define **Design for Sustainability** to include long-term business continuity



Our product strategy – such as **Renault EV** – can not be dissociated from a resource security strategy



**Renault, a people-centric and innovative
Company, offering sustainable mobility for all**

05



Conclusions

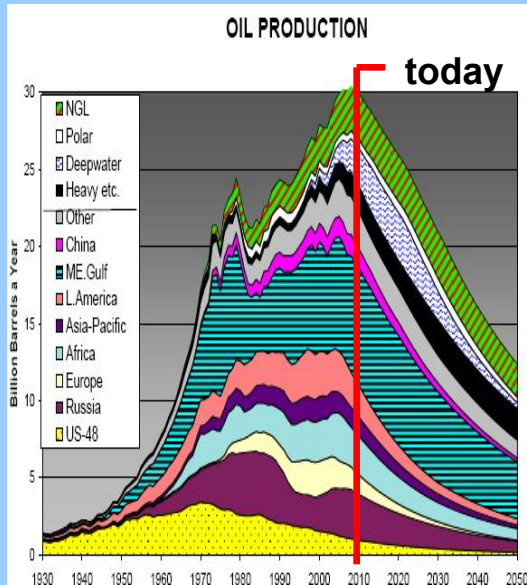
... and recommendations

Conclusions & recommendations

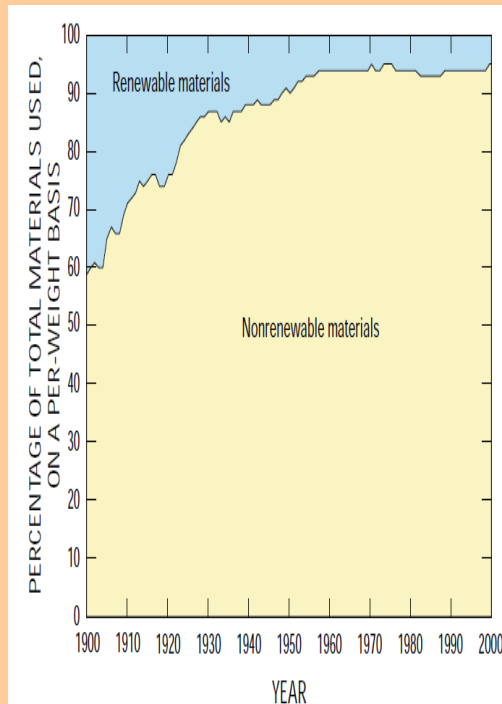
- Recycling schemes must be considered in the framework of LCA and stocks & flows— but **recycling will not be sufficient to meet demand**
- Know & control materials costs & **risks** (3 Rs, substitution & diversification) within a context of competition on the materials market
- Know the environmental impacts and factor **externalities** into the evaluation of future cost evolutions
- Reinforce corporate as well as government **R&D** to improve performance **for materials efficiency**
- Develop integrated downstream business concepts, and launch stronger **industry partnerships with a more pronounced long-term component**

The future of our business is linked to resources

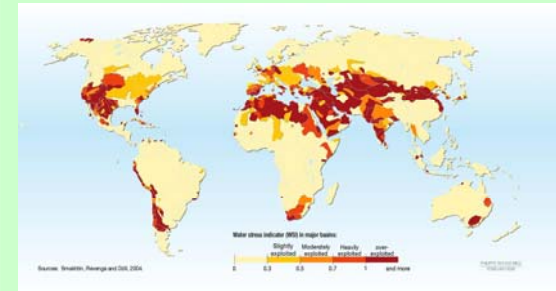
Energy



Minerals



Water



Source: Petroconsultats, Materials in the economy, USGS 1221-508 (2002), & UNEP

Thank you for your attention



Recommended readings

- L. Brown, Plan B 4.0, 2009
- T. Graedel & E. van der Voet, eds., Linkages of Sustainability, MIT Press, 2010
- T. Jackson, Prosperity without Growth, UK Sustainable Development Commission, 2009
http://www.sd-commission.org.uk/file_download.php?target=/publications/downloads/prosperity_without_growth_report.pdf
- J. Krones, A Beginner's Guide to Industrial Ecology, MURJ, Vol. 15, 2007
- C. Hall, Revisiting the Limits to Growth After Peak Oil, American Scientist Vol. 97, 2009
<http://www.esf.edu/efb/hall/2009-05Hall0327.pdf>
- D. Korowicz, Tipping Point: Near-Term Systemic Implications of a Peak in Global Oil Production An Outline Review, The Foundation for the Economics of Sustainability, 2010
<http://www.feasta.org>
- Angerer et al., Rohstoffe für Zukunftstechnologien, Fraunhofer, 2009
<http://www.verlag.fraunhofer.de/bookshop/artikel.jsp?v=229184>
- J. Morrison et al., Water Scarcity & Climate Change: Growing Risks for Businesses & Investors, the Pacific Institute, A Ceres Report, 2009
- World Economic Forum Water Initiative, 2009 <http://www.weforum.org/en/initiatives/water/index.htm>
- A.Y. Hoekstra, Human appropriation of natural capital: A comparison of ecological footprint and water footprint analysis, Ecological Economics, Vol. 68, 2009