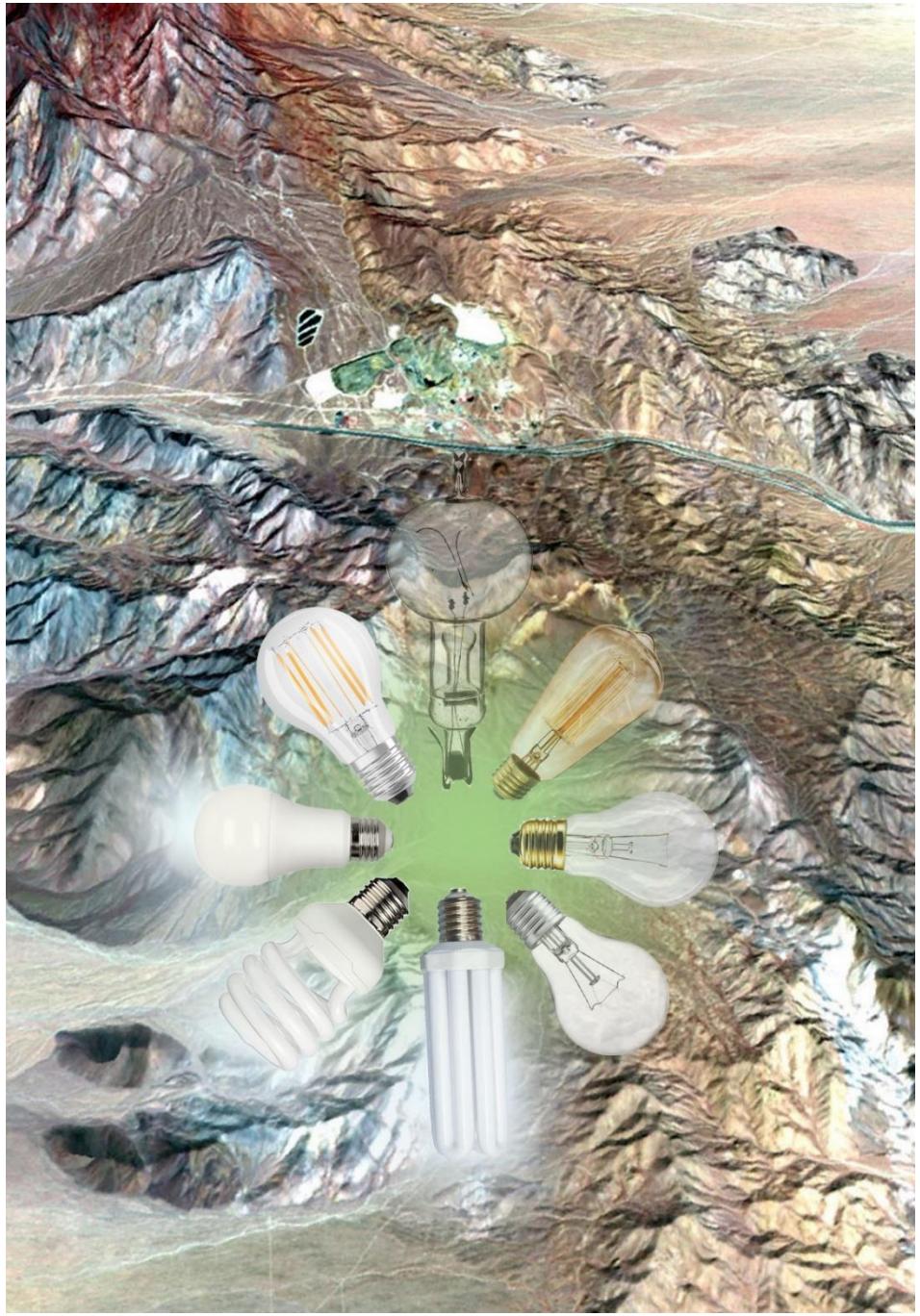

Sustainable Lighting

A LIFE CYCLE PERSPECTIVE WITH GREEN PUBLIC PROCUREMENT

DR. JESSIKA LUTH RICHTER

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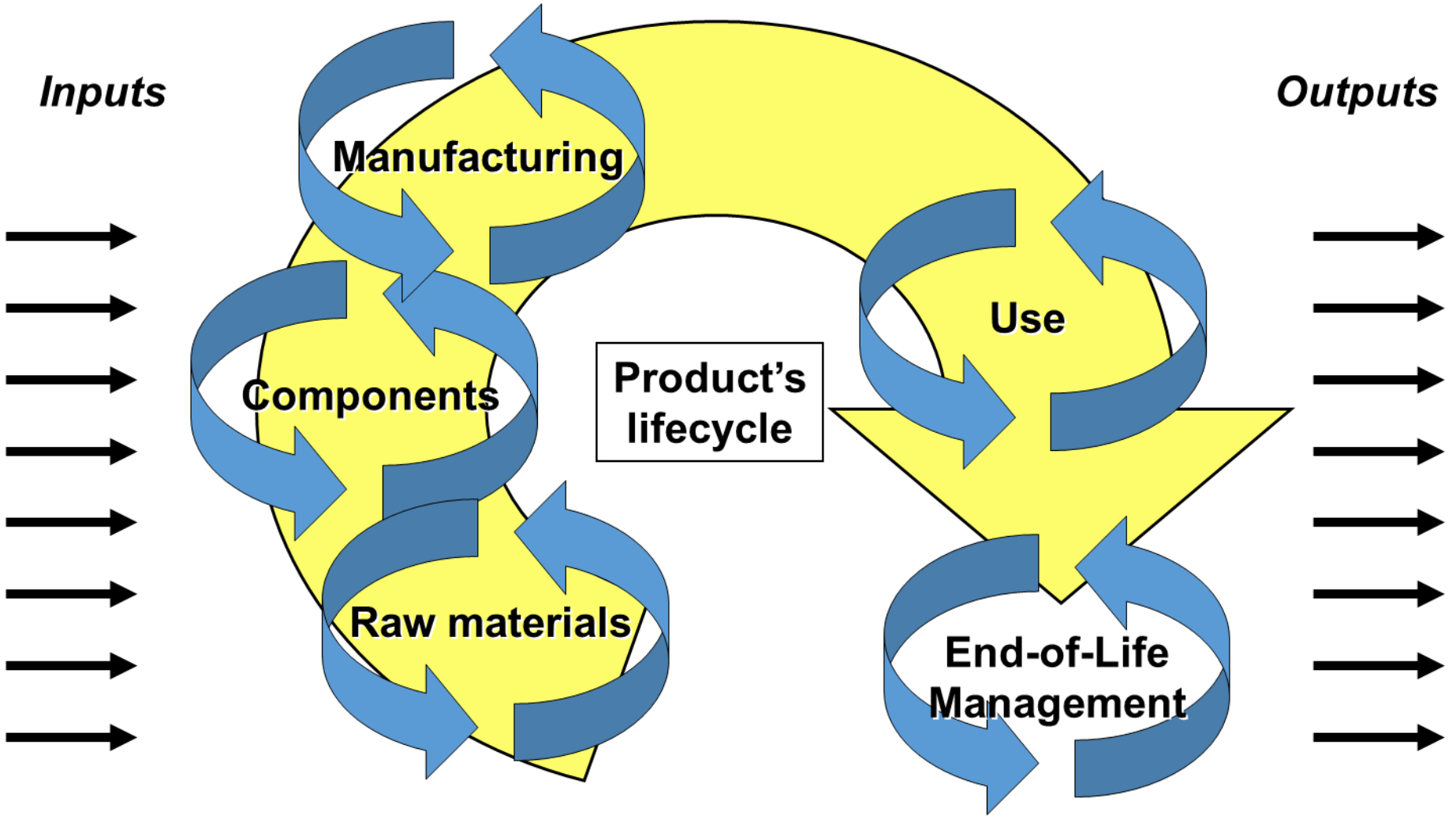
Product lifecycles + environmental impacts



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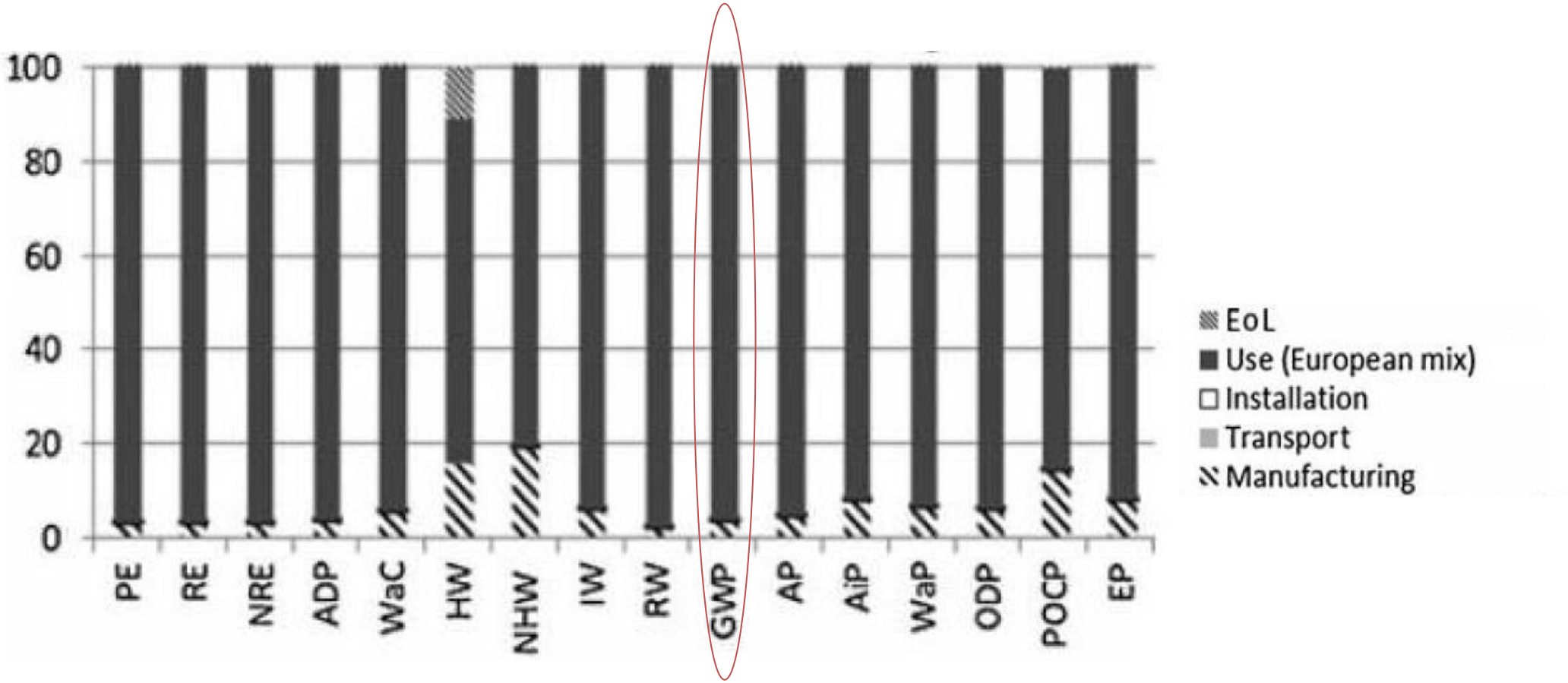
Life cycle assessment of environmental impacts

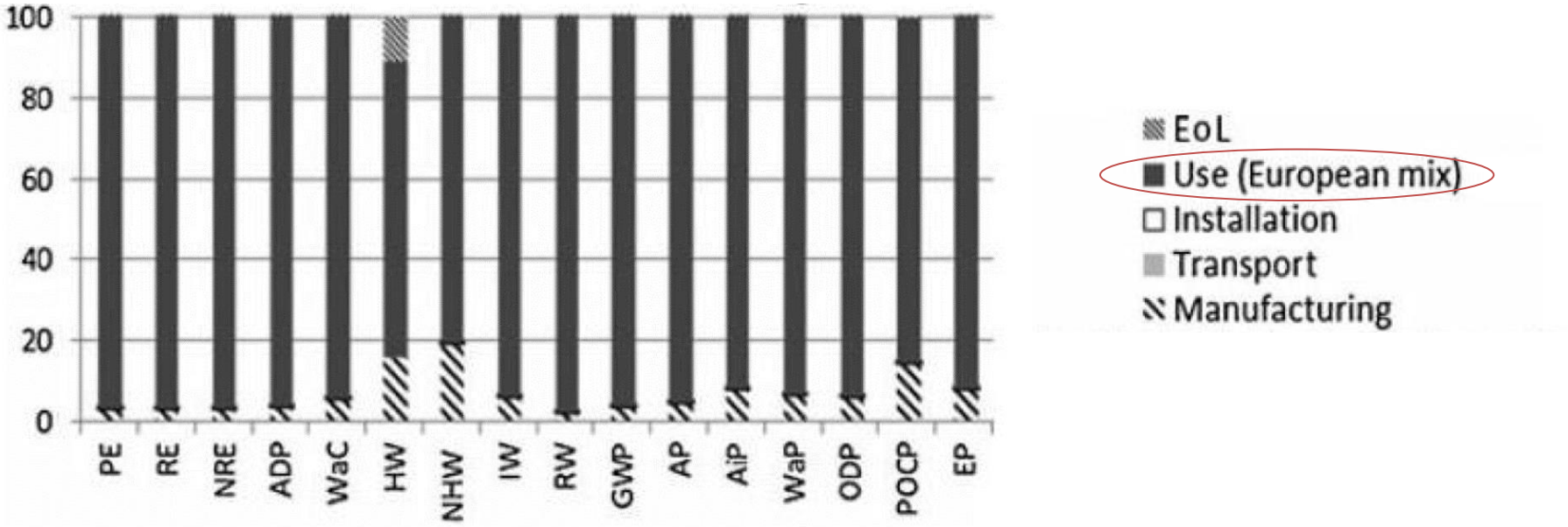


Results of the LCA of an LED luminaire lifecycle in EU

(Tähkämö et al. 2013)

Largest environmental impacts by life cycle stage

- On average, **the largest share** environmental impacts is linked to the use phase



Source: *Solid State Lighting Annex – Life Cycle Assessment of Solid State Lighting Final Report (2014)* Energy Efficient End-Use Equipment (4E), International Energy Agency

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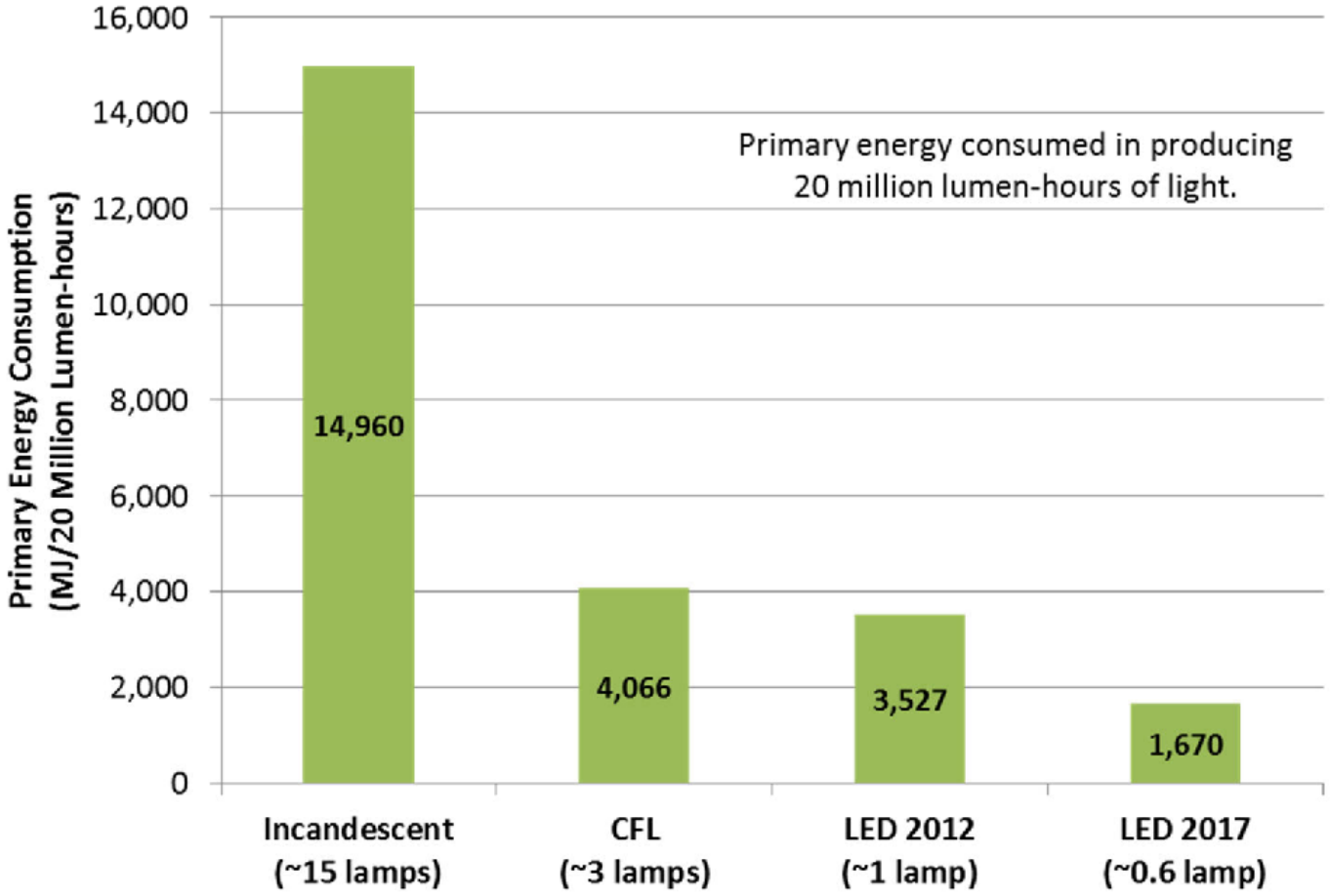
Energy consumption varies by technology



Primary energy consumption over the life cycle of three lamp technologies (US DOE 2012)

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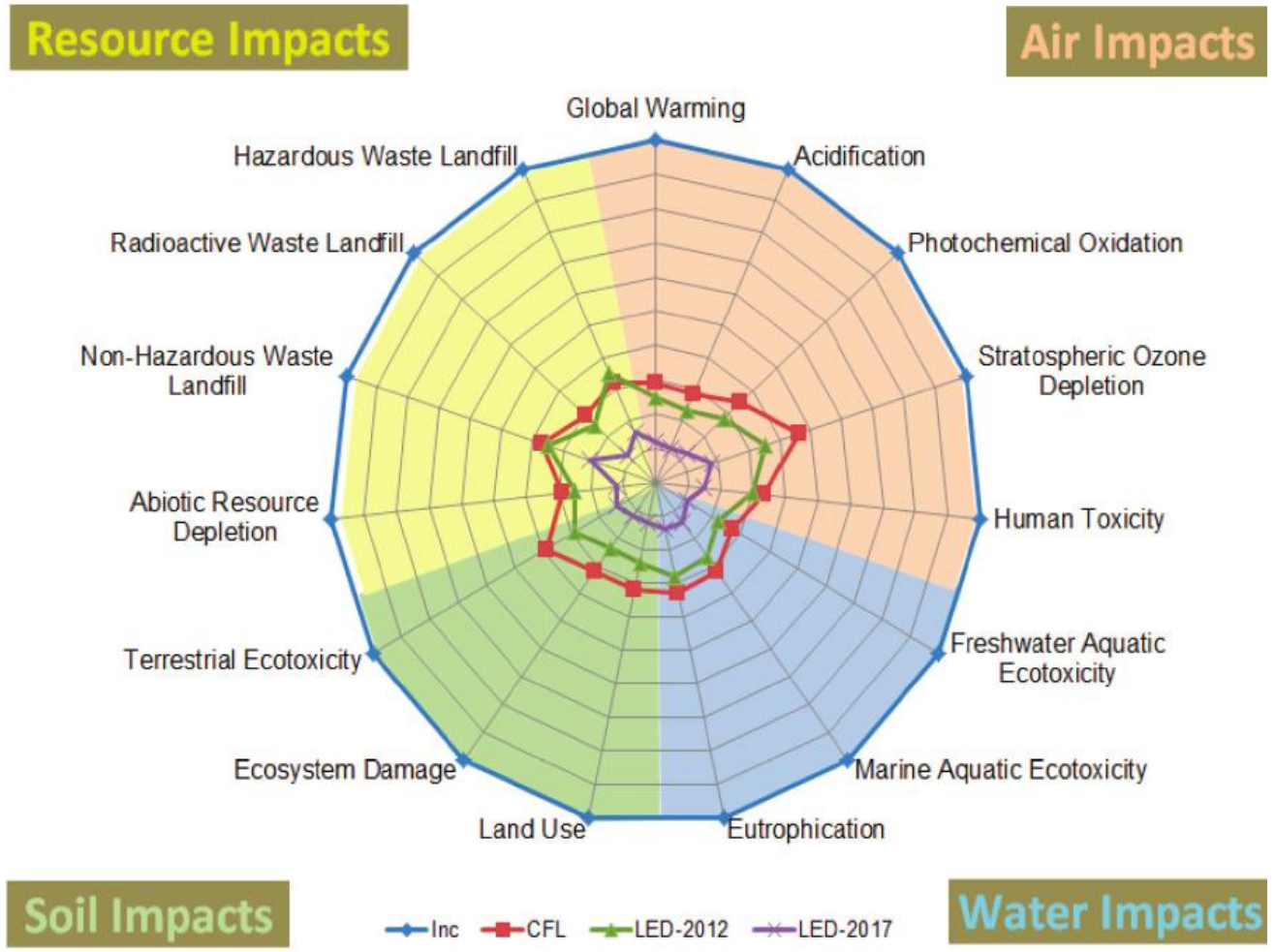
Impacts vary by technology



Source: US Department of Energy, 2012

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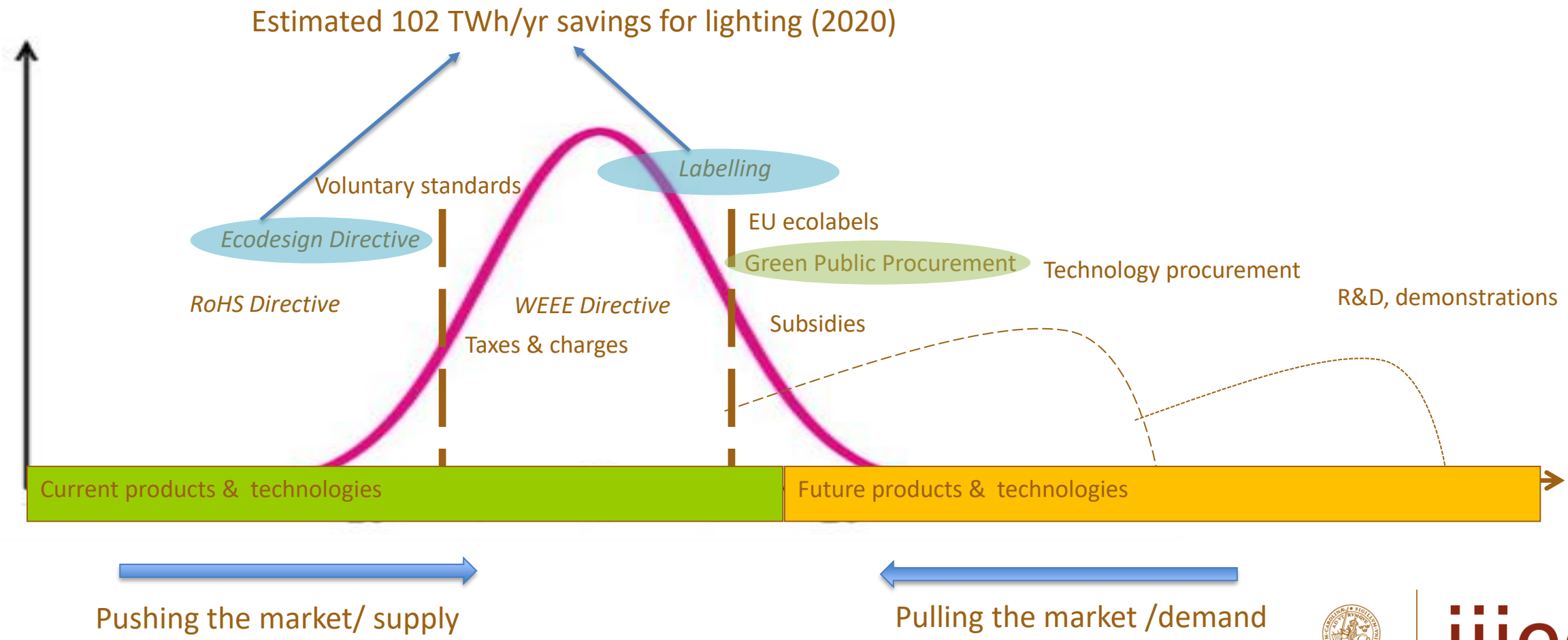
Policies to accelarate product innovation



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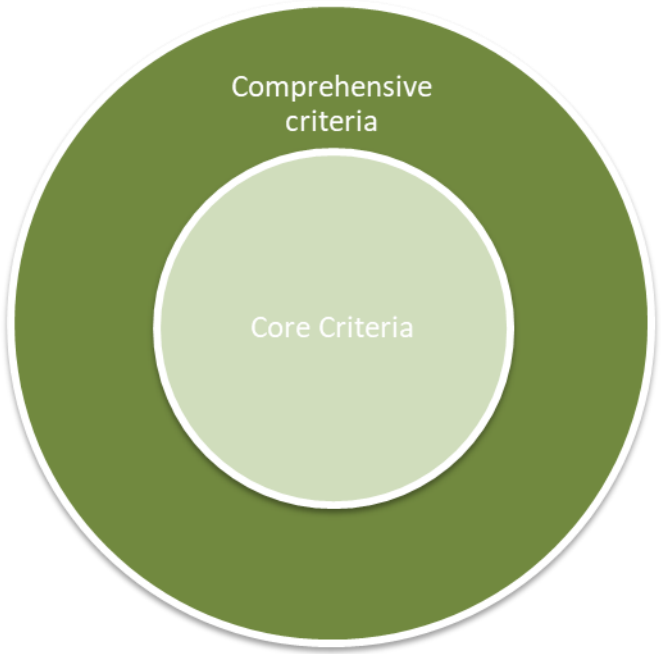
Green public procurement (GPP)

- Public authority expenditures are approximately 14% of the overall gross domestic product (GDP) in Europe = 1.8 trillion Euros annually
- GPP is a voluntary process for procuring goods and services with a reduced environmental impacts throughout their **lifecycle**
- Aim to lead, demonstrate, and incentivise greener products and services



Award criteria

Green Public Procurement (GPP)

- Procurement informed by Life Cycle Costs

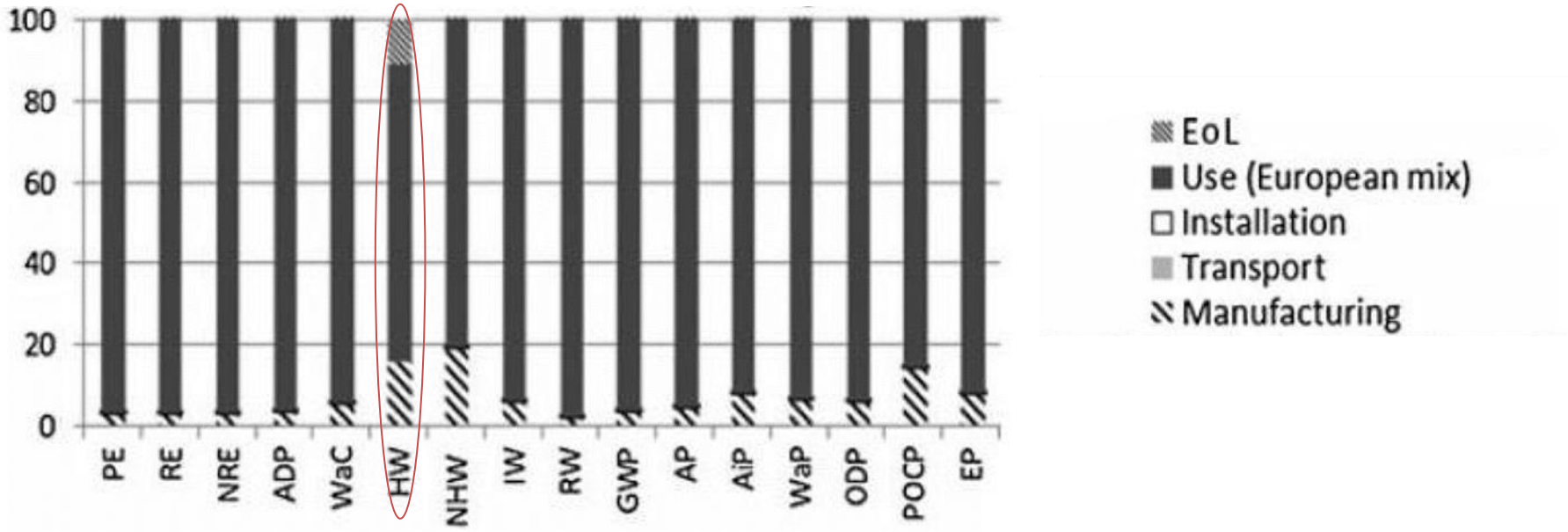
  What is considered in calculations?
  - Time period
  - Real interest /discount rate (%)
  - Electricity price (kr/kWh)
  - Annual electricity price change (apart from inflation) (%)
  - Investment costs (kr)
  - Operational costs (including efficiency, lifetime, automation and dimming settings)
  - Maintenance costs

- Life cycle impacts guide emphasis
  - Focus on energy efficiency and lifetimes

Source: Seattle Municipal Archives.

Environmental impacts by life cycle stage

- The second largest share is in the manufacturing stage
- The environmental impact of the transport only accounts for 1% to 2%.
- Environmental impacts from end-of-life management is generally low



Source: *Solid State Lighting Annex – Life Cycle Assessment of Solid State Lighting Final Report (2014)* Energy Efficient End-Use Equipment (4E), International Energy Agency

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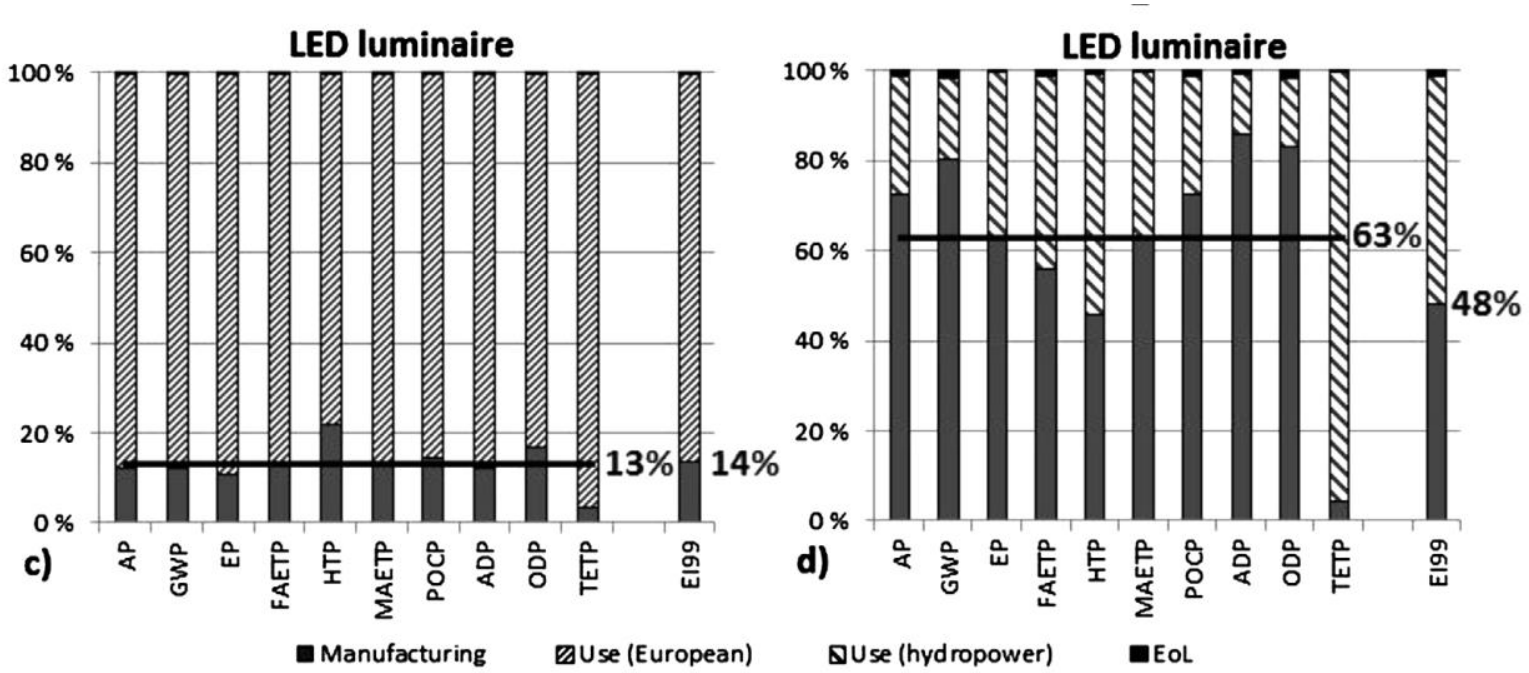
Environmental impacts by life cycle stage

- The manufacturing stage
  - Increases with renewable energy mix
  - Increases with improving energy efficiencies of LED technologies



Source: Tahkämö & Halonen, 2015

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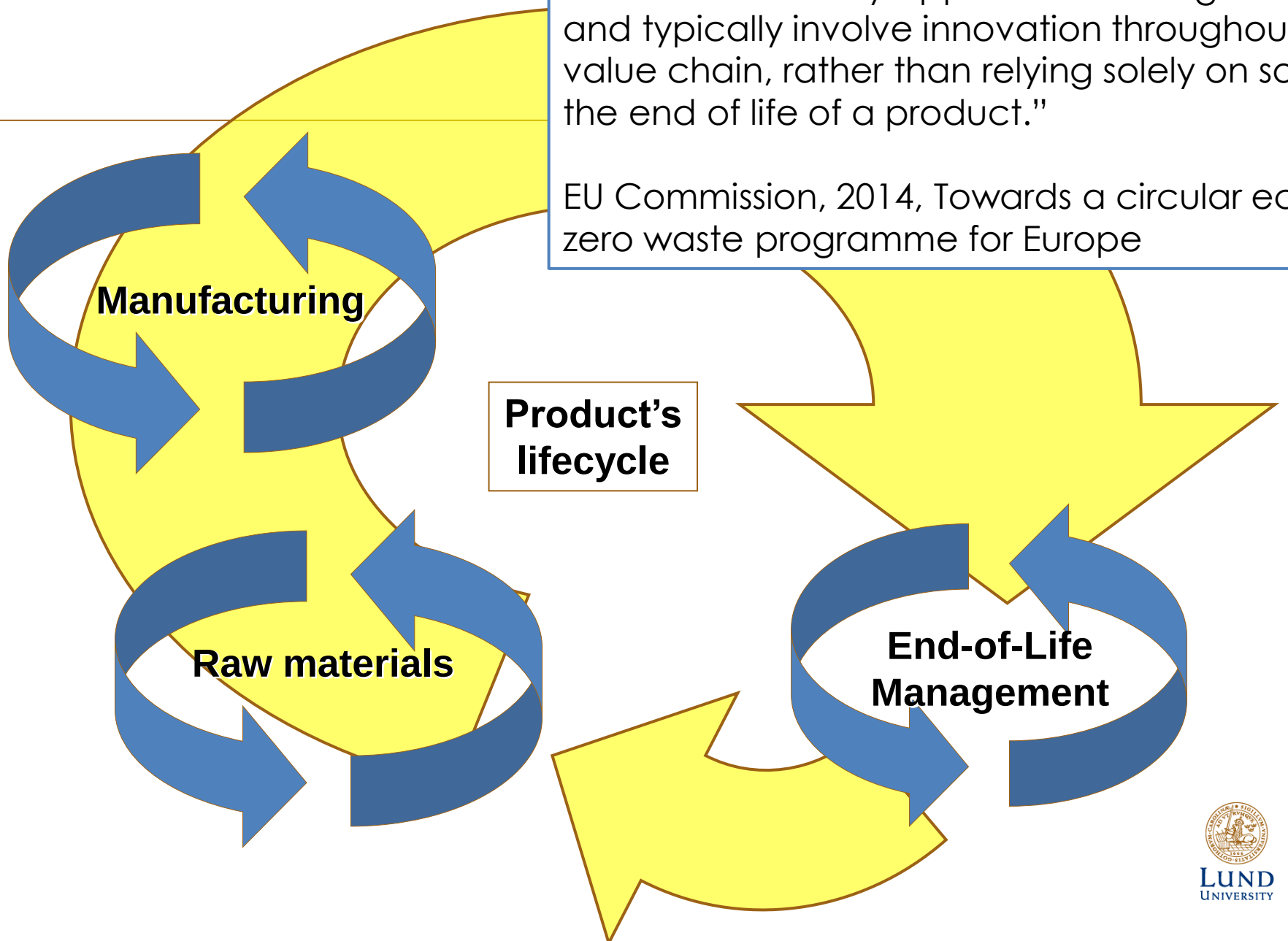
"Circular economy approaches 'design out' waste and typically involve innovation throughout the value chain, rather than relying solely on solutions at the end of life of a product."

EU Commission, 2014, Towards a circular economy: A zero waste programme for Europe



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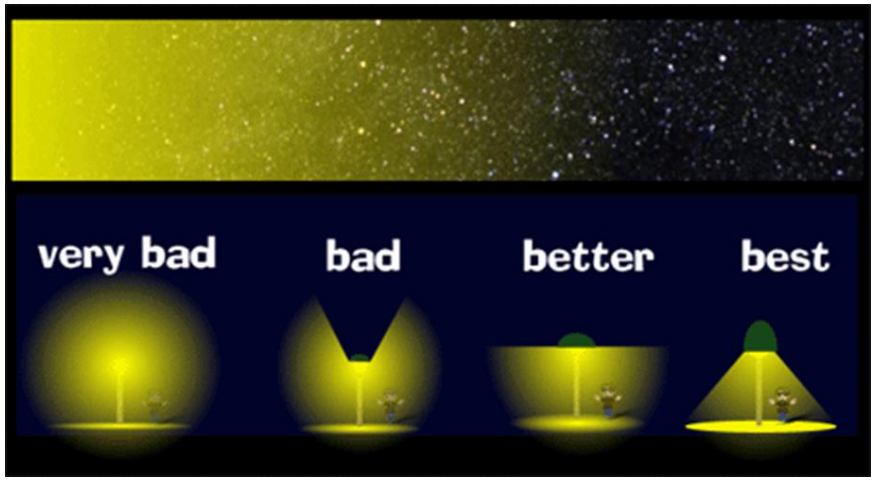
Green Public Procurement (GPP)

- Increasing attention on non-energy criteria in revision in 2019
- Increasing requirements for repairability and maintenance
  - Repair information, available tools, and spare parts
  - Warranties

Source: U.S. Air Force

Other environmental impacts considered in GPP

By NASA - http://spaceflight.nasa.gov/gallery/images/station/crew-35/html/iss035e017335.html, Public Domain, https://commons.wikimedia.org/w/index.php?curid=25992410



Source: U.S. National Park Service

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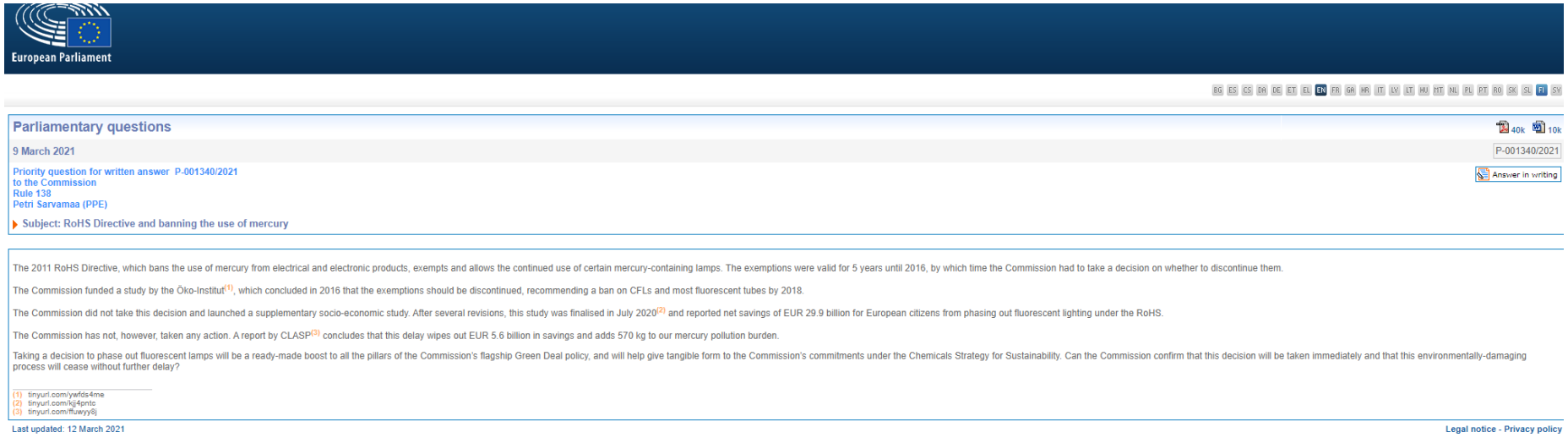
Other environmental impacts: toxic substances

- Mercury for lighting currently exempted under EU restriction on Hazardous Substances and Minamata Convention
  - Exemptions being debated and challenged



European Parliament

BG ES CS DA DE ET EL EN FR GA HR IT LV LT HU MT NL PL PT RO SK SL FI SV

Parliamentary questions

40k 10k

9 March 2021 P-001340/2021

Priority question for written answer P-001340/2021
to the Commission
Rule 138
Petri Sarvamaa (PPE)

Answer in writing

Subject: RoHS Directive and banning the use of mercury

The 2011 RoHS Directive, which bans the use of mercury from electrical and electronic products, exempts and allows the continued use of certain mercury-containing lamps. The exemptions were valid for 5 years until 2016, by which time the Commission had to take a decision on whether to discontinue them.

The Commission funded a study by the Öko-Institut(1), which concluded in 2016 that the exemptions should be discontinued, recommending a ban on CFLs and most fluorescent tubes by 2018.

The Commission did not take this decision and launched a supplementary socio-economic study. After several revisions, this study was finalised in July 2020(2) and reported net savings of EUR 29.9 billion for European citizens from phasing out fluorescent lighting under the RoHS.

The Commission has not, however, taken any action. A report by CLASP(3) concludes that this delay wipes out EUR 5.6 billion in savings and adds 570 kg to our mercury pollution burden.

Taking a decision to phase out fluorescent lamps will be a ready-made boost to all the pillars of the Commission's flagship Green Deal policy, and will help give tangible form to the Commission's commitments under the Chemicals Strategy for Sustainability. Can the Commission confirm that this decision will be taken immediately and that this environmentally-damaging process will cease without further delay?

(1) tinyurl.com/ywfds4me
(2) tinyurl.com/kj4pntc
(3) tinyurl.com/fuwvy6j

Last updated: 12 March 2021

Legal notice - Privacy policy

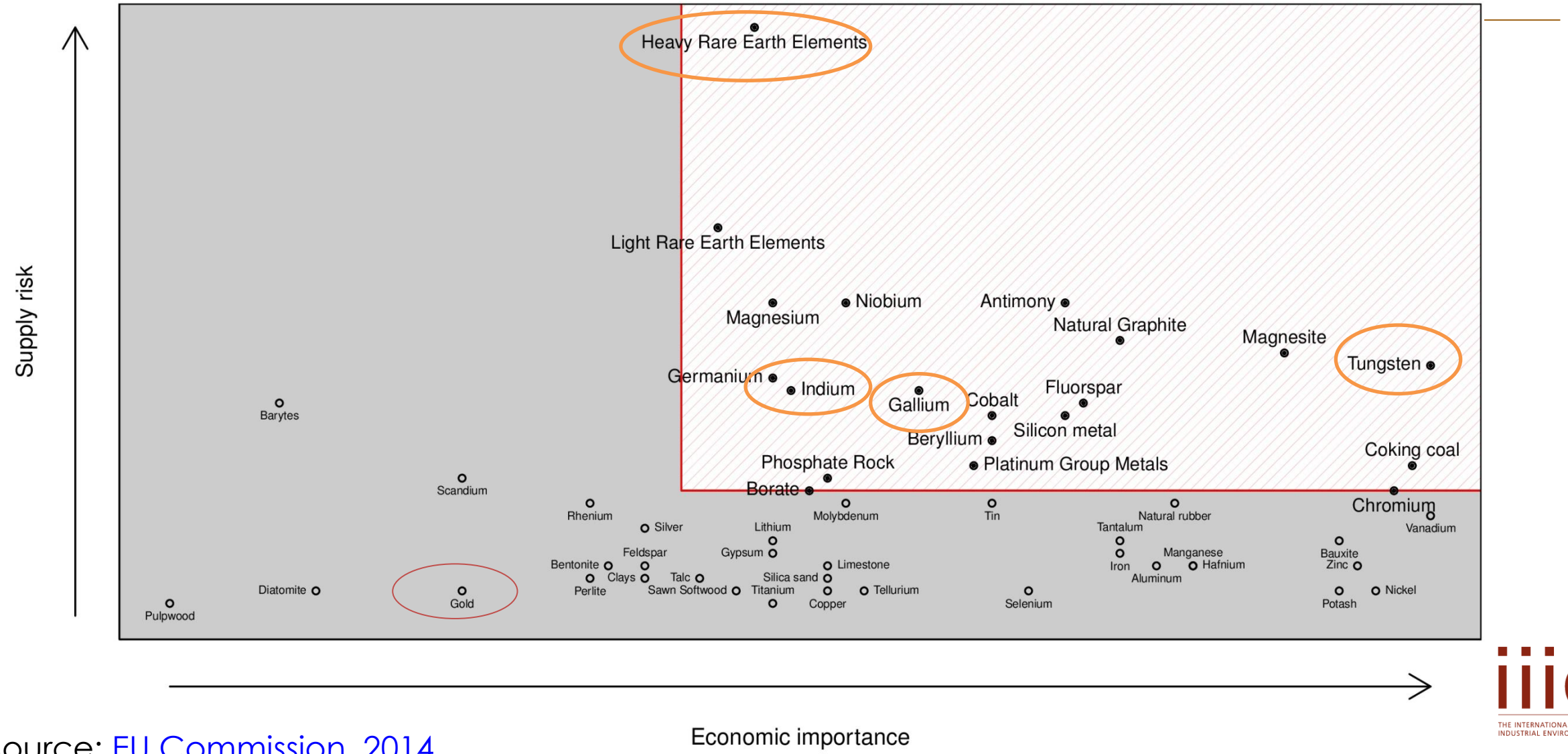
MINAMATA CONVENTION ON MERCURY

Ref: MC/COP4/2021/28

30 April 2021

Subject: Proposal by the Africa region to amend Annex A: Part I, and Annex A: Part II to the Minamata Convention on Mercury to be considered by the Conference of the Parties at its fourth meeting.

Other impacts: conflict and critical raw materials



Source: [EU Commission, 2014]

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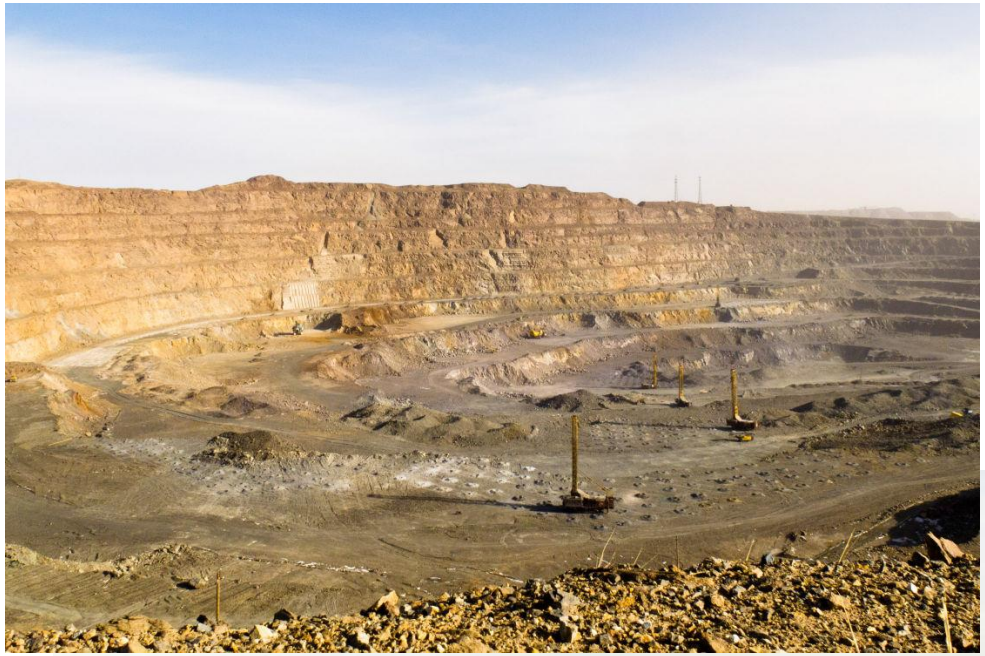
Impacts of mining rare earth elements



Images: Unknown Fields Project

a) Mining & milling

b) Flotation

c) Further Metallurgical Processing

Environmental impacts:

- land use
- leachate into groundwater (e.g. heavy metals, arsenic, fluorides, sulphides, thorium and uranium)
- dusts emissions (with contents of e.g. heavy metals, thorium, uranium)
- Air emission of process chemicals (SO_2, HCl)
- waste water generation
- GHG emissions due to energy use

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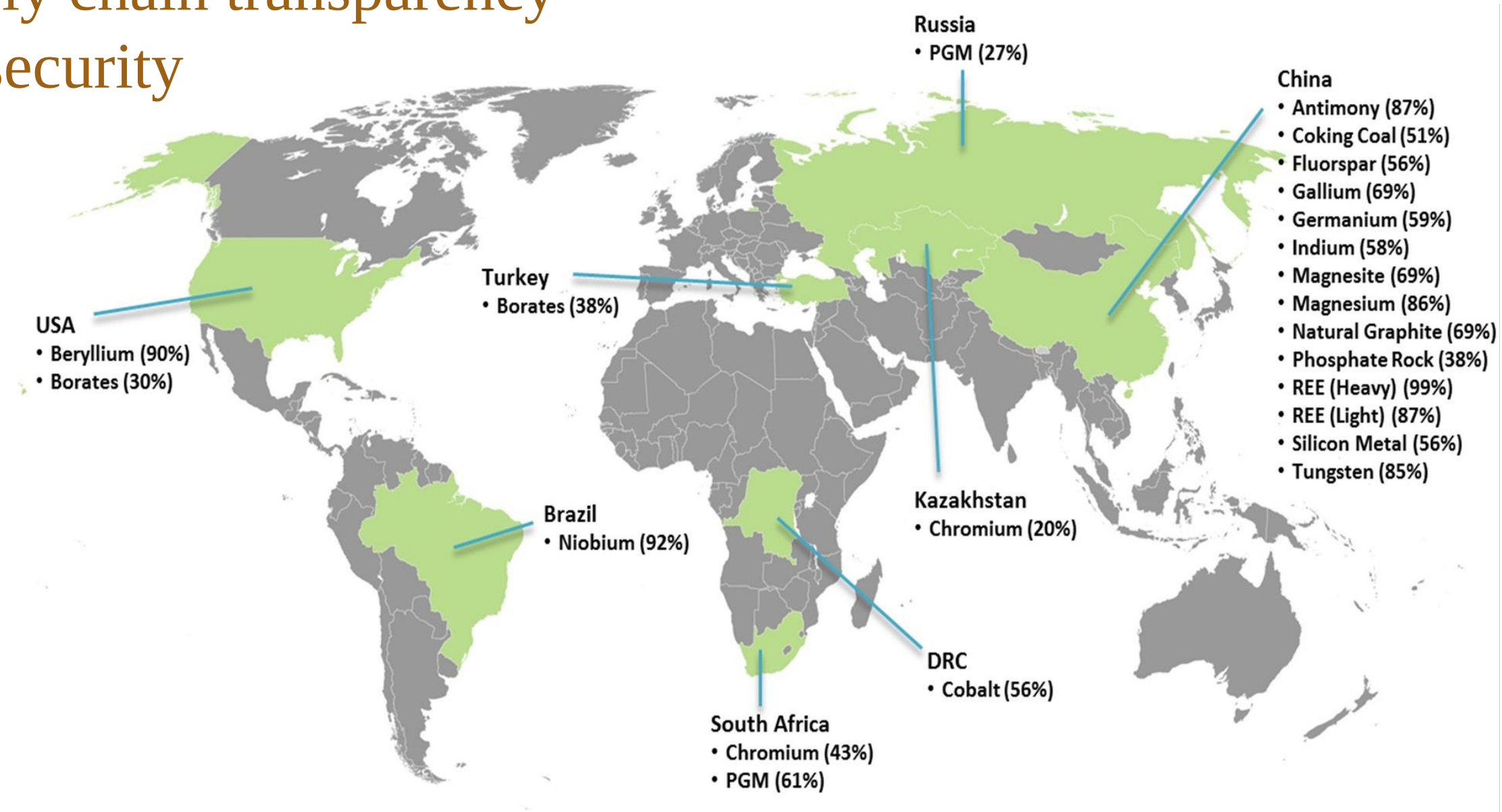
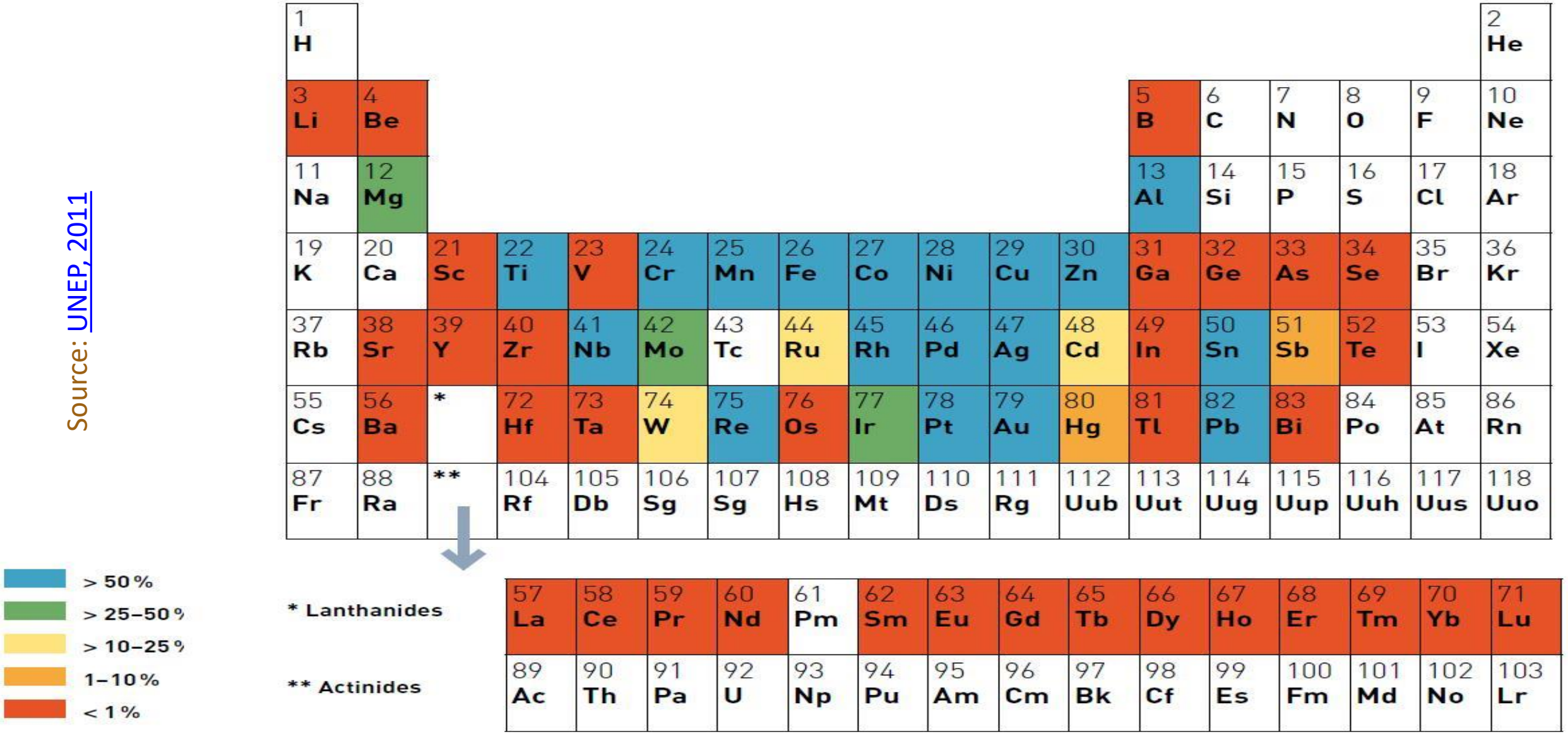
Supply chain transparency and security



Source: [EU Commission, 2014]

Recycling critical materials

Source: UNEP, 2011



More sustainable lighting

- Still focus on energy efficiency, but increasingly on other lifecycle stages
  - » Minimum standards important to push
  - » Green Public Procurement criteria important to pull
- Increasingly other environmental impacts considered
  - » Lighting pollution minimisation
- Circular Economy
  - » Disassembly, modularity, recyclability requirements?
  - » Procurement of refurbished lighting / recycled content requirements?
- Sustainable Production and Consumption
  - » Material passports for more transparent supply chains and better recycling
  - » Procurement of lighting as a service
  - » Ensuring savings ≠ rebound

Thank you!

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Questions?
jessika.richter@iiiee.lu.se