Ecologic Institute

Science and Policy for a Sustainable World

Insights from the scientific debate on the climate-resource-nexus

Overview of findings of ICARE literature review

Umwelt Bundesamt

Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit

ICARE Online Seminar
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Aim of the literature review

- Get an overview of the recent scientific discussion
- How are interactions between climate action & resource conservation described?
  - Synergies?
  - Trade-offs?
- Identify key issues in the scientific debate

→ Findings will support further ICARE project work (particularly qualitative cause-effect model)

Approach

Time restriction:
2010 – mid 2019

Literature search

- ScienceDirect, library portal Primo (FU Berlin), Google Scholar & snowball approach

2 Criteria:

1. Both climate & resource protection described?
2. Relationship between both described?

Long list

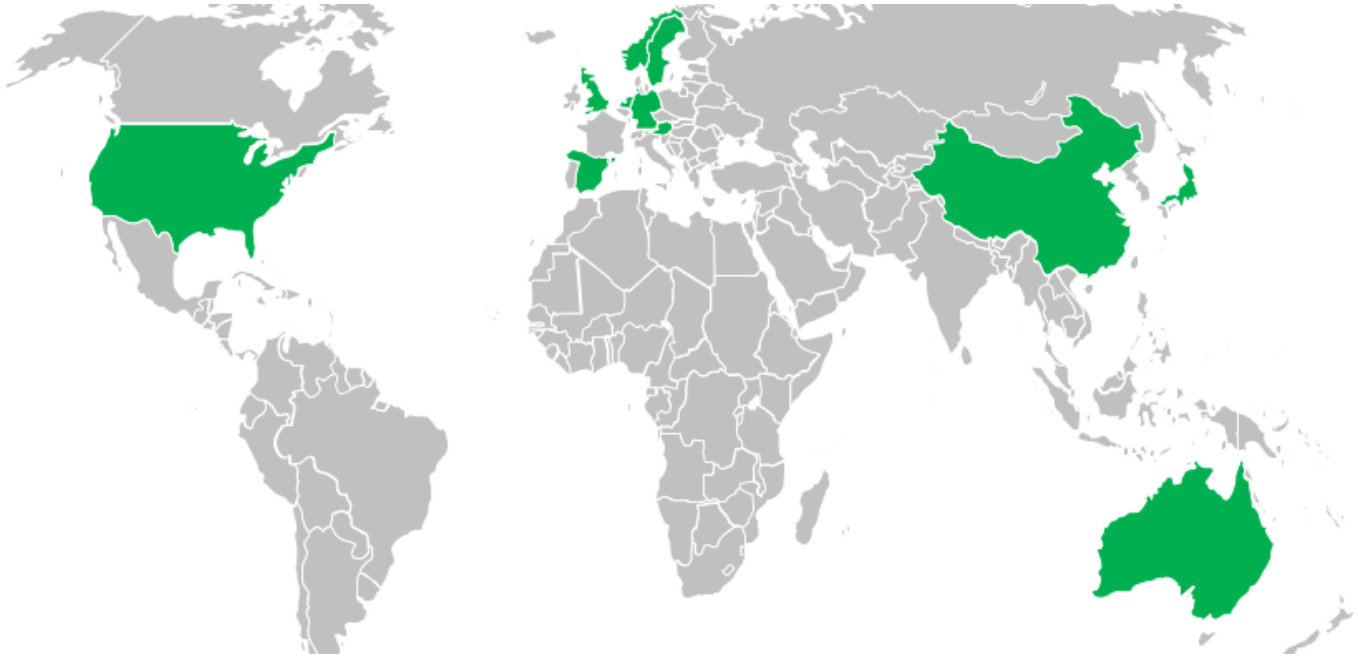
- About 50 publications

wide range of sectors, author teams & geographical regions

Short list

- 32 publications

Who is investigating the resource-climate nexus?



- Mainly authors from industrialised countries
- Relevant supranational institutions: OECD, IRP, JRC

Results: 3 Clusters

a) Resource demand for climate-friendly technologies

- Trade-off between climate and resource policy
- Focus on transforming the energy system

b) Greenhouse gas savings through resource efficiency

- Synergies, untapped potential
- Focus on industrial material efficiency

c) Links between Circular Economy & climate protection

- Synergies, untapped potential
- Focus on the entire life cycle (including waste management)

Cluster a

Resource demand for climate-friendly technologies

- Studies look at the transformation of the energy sector on a large scale (global, EU or country level)
- scenario analysis and modelling
- mostly focus on the electricity & mobility sector

Conflicting goals:

- climate-friendly restructuring of the energy sector leads to increased resource consumption
  - Especially for **metals**
  - This could lead to **raw material shortages**

Cluster a

Central question: Could raw material shortages prevent the transformation of the energy system?

- Disagreement in the literature

Material requirements are "*manageable*" (**Hertwich et al. 2015**); copper supply could become a concern

Special metals will not suffice to realise a global energy transition. (**Grandell et al. 2016**) Most critical: silver, followed by tellurium, indium, dysprosium, lanthanum, cobalt, platinum and ruthenium

Feasible, but: „*Resource supply disruptions could become more likely in the future*" (**Koning et al. 2018**)

"The diffusion of solar power and next-generation vehicles may be hindered by resource depletion" (**Watari et al. 2018**) Critical: indium, tellurium, silver, lithium, nickel, platinum

Cluster a

Possible solutions are discussed

- Recycling
- substitution of materials or technologies
- increasing the efficiency of raw materials
- increase of extraction rates
- exploration of new raw material deposits

Cluster b

Greenhouse gas savings through resource efficiency

- Motivation of the studies: research gap
  - How do resource or material efficiency approaches contribute to reducing GHG emissions?
- scenario analysis and modelling
- Diverse sectors: electricity, construction, mobility, agriculture, electronics

Synergies:

➢ Great potential for resource and GHG savings, if climate & resource policy are linked and integrated
- varies from region to region
- depends on materials & sectors

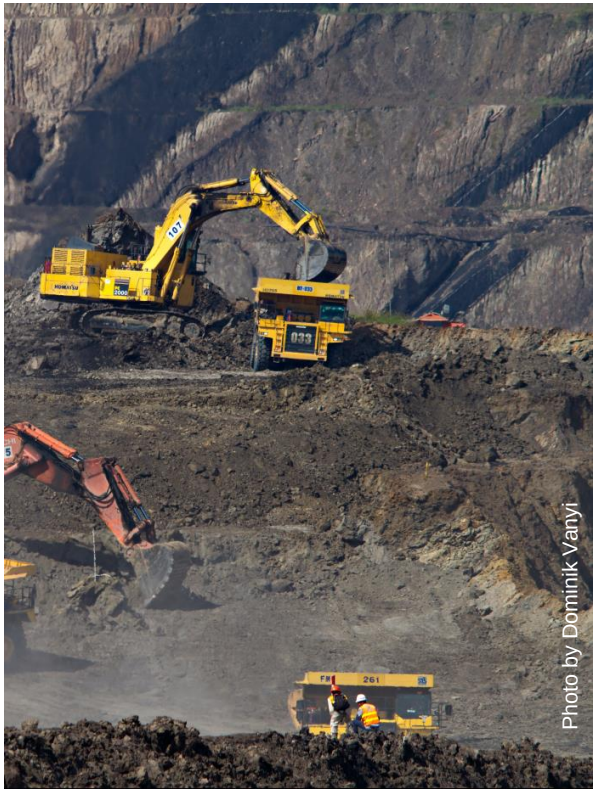
Common messages:

- Business-as-usual would have devastating effects
  - climate targets would not be met
- Key issue: rebound effect
  - increased resource efficiency can affect quantities & prices of resources
- The combination of resource efficiency & climate protection scenarios yields the best results
  - better than climate protection alone

Cluster b

Possible solutions are discussed

- Joint effort of climate & resource policy
  - policy mixes
- Introducing measures to counteract rebound effects
  - Resource extraction taxes
  - Taxation of GHG



Links between Circular Economy & climate protection

- Basic assumption of the studies: Circular Economy strategies do not only conserve resources, but also have the potential to reduce GHG emissions
- focus on specific economic sectors (e.g. the building sector), materials (e.g. metals) or strategies (e.g. re-use)

Synergies:

- Overall large untapped potential seen
  - savings of resources and GHG along the entire value chain
  - varies from material to material

Cluster c

Links between Circular Economy & climate protection

- Limitations of CE approaches:
  - Technical limits on re-use and recycling
  - Trade-Offs between material input in the production & energy consumption in the use phase
- Areas with particularly high potential:
  - use of secondary materials in the construction sector
  - more widespread use of recycling (better separation of waste streams as a basic requirement)

Summary of key findings

- Overall little research has been conducted to illuminate the interactions between resource conservation & climate protection
  - Various uncertainties remain
- Broad topic; can be investigated from many angles
- Overall, the selected publications give strong support for
  - policy mixes addressing both climate & resource protection
  - Re-use, recycling & the use of secondary materials as a way to save both resources & GHG emissions
- There are trade-offs which require political attention

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Thanks! Any more Questions?

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