Industrial policy respecting the necessity of zero emissions

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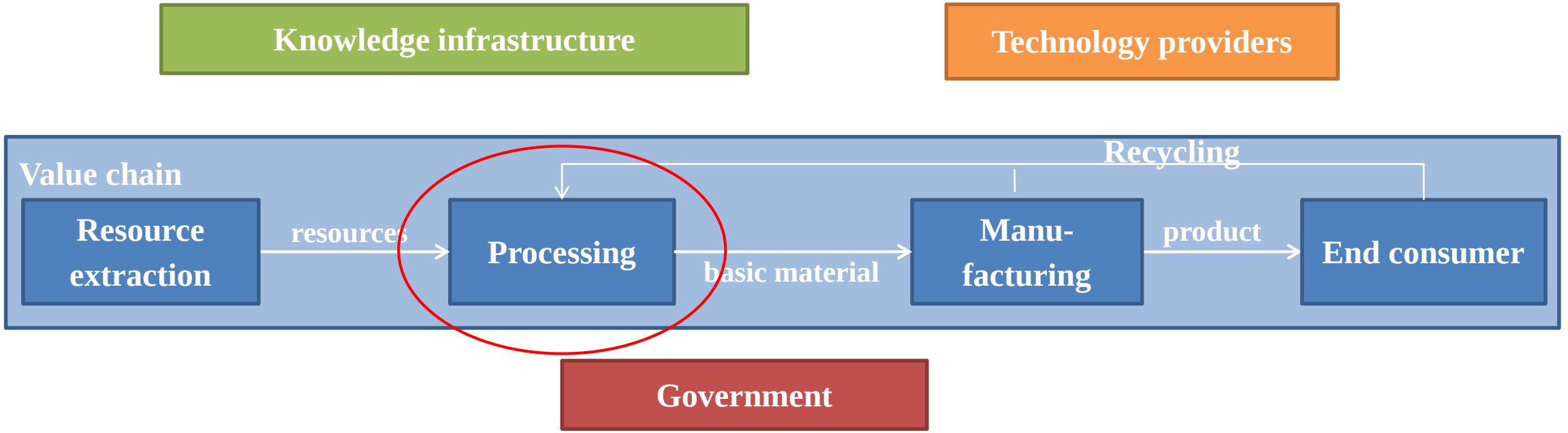
Industry characteristics and innovation systems



- **Industry structure**: capital intensive, investment cycles, scale economies
- **Innovation strategies**: incremental process improvements, some products
- **Markets**: bulk commodities, cyclic, small margins (but some nichés)
- **Public policy**: safety, pollution, energy efficiency and ***sheltered against disadvantages***
- **Systemic lock-in**: incumbents, no markets, no push-pull, CO_2-leakage

Source: Wesseling, et al (2017) The transition of energy intensive processing industries towards deep decarbonization: Characteristics and implications for future research, *Renewable and Sustainable Energy Reviews*

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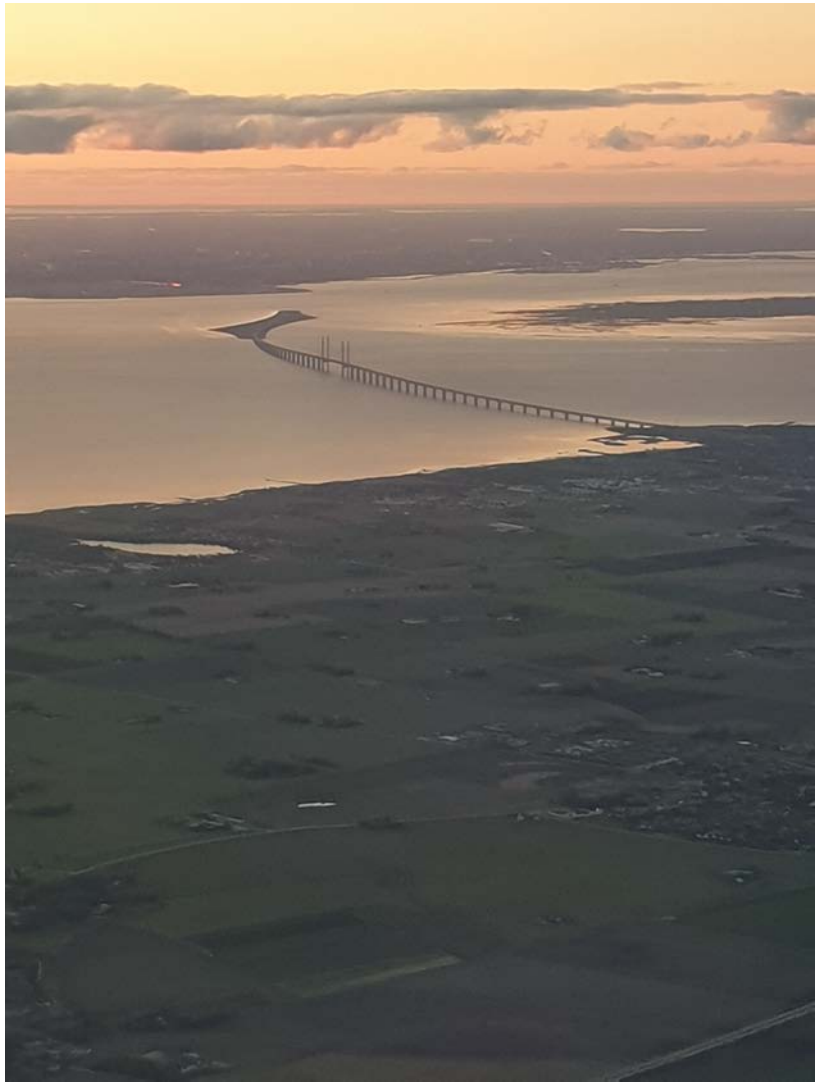
Insights on emissions intensive industry.
- Formerly known as the ‘hard to abate sectors’

- Industrial decarbonisation is more than “putting a price on carbon” and requires a new industrial policy (not climate policy alone)
- Decarbonizing primary production requires “breakthrough” technologies
- Industrial decarbonisation involves new sectoral couplings, new value chains and new business models.
- Incumbents are strong and change will also have to come from “inside”
- Global competitiveness and “an uneven playing field” are issues that needs to be dealt with

Decarbonisation option categories

- Demand reduction, e.g., service efficiency
- Materials efficiency, e.g., light-weighting and lifetimes
- Energy efficiency. This is always important, also in a fossil-free industry
- Circular economy, e.g., micro, meso and macro recycling and symbiosis
- Zero emissions primary production:
  - Electrification (hydrogen), biomass, CCS/U



Current use in the EU

- **PLASTICS**
  - Around 100 kg per person
  - Packaging, buildings, cars, electronics
  - Low recycling
- **PAPER**
  - Around 150 kg per person
  - Packaging, printing paper, hygiene
  - High recycling
- **STEEL**
  - Over 300 kg per person
  - Construction, cars, machinery
  - Around 12 ton per person in stock
  - Very high recycling

Sector highlights from **REINVENT** research

- **PLASTICS**
  - No vision among “molecular managers”
  - Several (partly conflicting) pathways
  - Incumbents taking more control of VCs
- **PAPER**
  - Decarbonisation relatively easy
  - Next biorefineries and closed loop biogenic carbon economy
  - Ambivalent about decarbonisation (e.g., CCU/S)
- **STEEL**
  - Visions are forming (from CCS to H2)
  - Lean circular economy important
  - Mature sector, incumbent change agents

reINVENT decarbonisation

Industrial policy for EII : Paris compliant

Ideas are starting to form among businesses and governments

- **EU draft Master Plan for EII:s** (2019)
  - Markets (create demand, carbon price), Solutions (RD&I), Resources (energy and feedstock)
- **European Environment Agency** (2019, all sectors)
  - Experimentation, diffusion, reconfiguration, finance, direction, policy coherence, monitor risks, build capacity
- **CEPS** (2018)
  - Create markets, handle competition, support MS and industry partnerships
- **Corporate Leaders Group Europe** (2019)
  - Direction, innovation, investment, market demand, circularity, other infrastructure (energy/CCUS)

What is needed in a new industrial policy driving innovation in “hard to abate” sectors ?

- **Direction**
  - Visions, roadmaps, pathways and strategies for zero emissions. Whole economy and value chain approaches. Pick potentially winning approaches
- **Devlopment and system innovation**
  - Experimentation. Co-evolution with other systems, new value chains and sectoral couplings, markets, norms, regulations and business models.
- **Diffusion and upscaling**
  - Demand articulation. Risk sharing, de-risking and financing (political, market and technical risks). Market demand pull policy. Institutions including permit procedures.
- **Institutional capacity**
  - Government expertise and ability to manage policies, including phase-outs and sunset clauses. Including social dimensions. Methods for evaluating transition policy. Permit procedures.
- **International policy coherence**
  - Carbon leakage, UNFCCC (NDCs), sectoral leadership approaches, free trade, Leadership Group on Heavy Industry, Mission Innovation?

Partly based on Grillitch, Hansen et al (2019), Innovation policy for system-wide transformation: The case of strategic innovation programmes (SIPs) in Sweden


Thanks !