Industrial policy respecting the necessity of zero emissions
Max Åhman and Lars J. Nilsson
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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, CO₂-leakage

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
• 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
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

- **Development 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!