The German Low-Carbon Industry Transition from a Sectoral Innovation and System Failures Perspective

DEMAND

Construction
Iron & steel and cement are the basic components in most buildings

Automotive
Iron & steel are fundamental for car manufacturing. Many companies such as Volkswagen, Opel, BMW, Mercedes, Audi, Porsche

Mechanical
Major companies such as ThyssenKrupp and Schaeffler Group that produce important industrial components

Other
Fear of demand shifting towards other industrial powerhouses (e.g. China)

Legislation affecting the regulatory framework

ACTORS & NETWORKS

Stahl, VDZ, VCI, BDI

Large Companies and SMEs
Steel manufacturers such as ThyssenKrupp
Steel-using companies such as Volkswagen, Mercedes, BMW etc

Universities & Research Institutions
Max Planck Society
Fraunhofer-Gesellschaft
Helmholtz Association
Leibniz Association

Network Failure: Strong Network

Federations & Institutions

Network Failure

Knowledge Flow: The processes are enhanced and improved and then used by the actors of the industry

INFRASTRUCTURAL FAILURE & CAPABILITIES

• Failure on the demand side: Dependency on the automotive industry

• Infrastructural Failure & Capabilities

Capabilities Failure on the demand side: Dependency on the automotive industry

Fear of demand shifting towards other industrial powerhouses (e.g. China)

Legislation affecting the regulatory framework

Environmental legislation affecting the penetration of innovative technologies and the use of the existing ones

INSTITUTIONS

National Legislation

Climate Policies
• Energy Concept (80-95% emissions reduction by 2050 - 2000, revisions in 2014 and 2017)
• Energy Strategy (Nuclear phasing out and fossil fuel reduction - 2010)

Emission Regulation
• TA Luft (Air quality control - 1964)
• Federal Immissions Control Act (Principles on harmful environmental practices - 1994)

National Industry Strategy
Drafted in 2019 in order to strengthen German Industry by 2030

European Legislation

Climate Policies
Various targets for CO2 emissions and RES penetration by 2030, 2040 and 2050.

Industrial Emissions Directive
Obligatory use of BAT practices - 2014.

EU ETS
Prices for CO2 and other emissions.

KNOWLEDGE, LEARNING PROCESSES AND TECHNOLOGIES

Dominant Processes in iron & steel, cement and chemicals industries

IRON & STEEL: BF/BOF (70%), EAF (approx. 30%), DRI (only a pilot)
CEMENT: Clinker-based production
CHEMICALS: Haber-Bosch / Naphtha-Cracking

Innovations: Hydrogen, CCS, BAT

Arcelor Mittal experimental hydrogen project
CCS installation in clusters
The majority of installation already apply BAT

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