Roadmaps for a just and deep decarbonisation of the Energy Intensive Industries

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Long-term objectives

- **Paris Agreement**: carbon-neutrality in second half of the century
- EU: CO2-emissions to be cut by **80%-95% by 2050** (compared to 1990 levels)
- Idea: turn these LT plans into achievable **5-year decarbonisation plans for industry** and complement with corporate sustainability targets
- **60-80% of industrial emissions** originating from EII's (steel 31%)
- Technological challenges are enormous
- A myriad of low carbon technologies/production processes exist
- But **a silver bullet doesn't**
- Not only **process innovation**, also **product innovation** and **new business models** needed
- Not only a technological, also an **economic challenge**:
  - Zero-emission solutions will result in substantially **higher costs** without no increase of value added
  - **Long investment cycles** (typically 20-40 years)

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Employment Energy Intensive Industries

Energy intensive industries	2000	2005	2008	2010	2013	2014	2015	diff. Abs	diff %
Basic metals	1297,75	1213,01	1252,93	1131,77	1063,33	1055,59	1039,99	257,76	24,8%
Mining and quarrying	881,36	796,26	783,29	717,6	719,8	707,8	670,19	211,17	31,5%
Coke and refined petroleur	196,02	183,25	181,61	144,51	145,19	134,22	138,11	57,91	41,9%
Paper and paper products	795,23	738,8	719,55	649,59	637,38	640,41	638,09	157,14	24,6%
Chemicals	1402,39	1282,69	1280,74	1228,29	1175,84	1182,93	1178,15	224,24	19,0%
Rubber and plastics	1805,83	1741,82	1781,04	1602,84	1638,86	1657,89	1683,08	122,75	7,3%
Other non-metallic minera	1808,91	1675,18	1677,89	1419,04	1303,49	1278,56	1267,93	540,98	42,7%
Total	**8187,49**	**7631,01**	**7677,05**	**6893,64**	**6683,89**	**6657,4**	**6615,54**	**1571,95**	**23,8%**

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Green jobs in the EU

CEPAREMA	2006	2007	2010	2014
Total environmental protection and resourc	**3.276.000**	**3.376.000**	**3.938.000**	**4.164.000**
Total environmental protection activities	*2.181.000*	*2.215.000*	*2.378.000*	*2.471.000*
Protection of ambient air and climate	112.000	110.000	102.000	104.000
Wastewater management	543.000	574.000	582.000	586.000
Waste management	965.000	951.000	1.084.000	1.125.000
Protection and remediation of soil, groundwater	236.000	243.000	275.000	319.000
Noise and vibration abatement (excluding workp	27.000	26.000	24.000	23.000
Protection of biodiversity and landscapes	127.000	128.000	129.000	128.000
Protection against radiation; environmental rese	172.000	182.000	182.000	186.000
Total resource management activities	*1.095.000*	*1.161.000*	*1.560.000*	*1.694.000*
Management of waters	143.000	143.000	144.000	146.000
Production of energy from renewable sources	351.000	346.000	679.000	645.000
Heat/energy saving and management	601.000	672.000	736.000	902.000

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Just Transition

Fundamental principles: anticipating change, maintaining jobs, creating new sustainable employment, education/training, social dialogue and social protection.

Must avoid carbon leakage!

Regional aspect- no worker should be left behind.

New *"green jobs"* **But…. WHERE? WHEN? TYPE?**

Create new sustainable economic activities in affected regions!

JT Fund in *ETS Modernisation Fund.*

Skills/training isn't enough- **need social protection**.

Policy coherence: Energy & climate change VS industrial & employment

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Coal Regions in Transition Platform

Launched on 11 December 2017.

Kicked off working with 3 pilot regions: PL, SK, EL (country teams)

2 Working Groups: 1) structural change, 2) Eco-innovation, advanced coal technologies.

ETUC and industriAll participated, but need to strengthen social dimension and TU participation in panels.

Strengthen the Just Transition Agenda!

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Coal Regions Roundtables

CCMI initiative complementing Coal Regions Platform.

2018 – Roundtables in BG (29 May), CZ and D (2nd half 2018).

Focus on economic and social aspects:

- ✓Regional context: structure of the economy, employment, migration trends, structure of the population, etc.
- ✓Current education & training programmes with a view of updating them
- ✓Restructuring strategies

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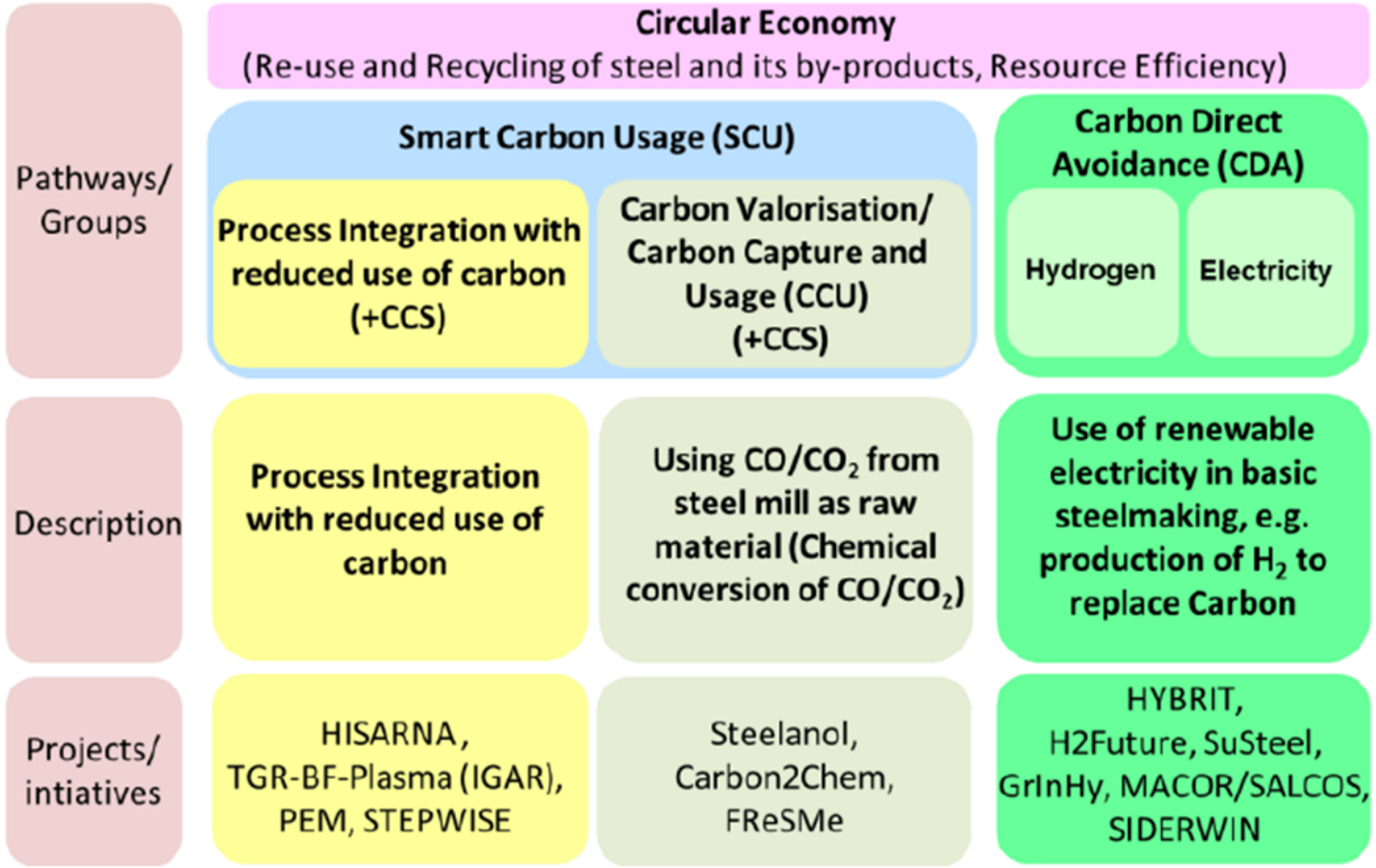
New production technologies

- Steel



- **Cement/ceramics**
  - Reduction of the clinker content is an important measure to reduce CO2
    - But substitution of limestone clinker by other material will alter the properties – depending on the use of the cement (e.g. geopolymers)
  - Electric kilns,
    - use of hydrogen/biomass to fuel kilns
  - Lower temperature processes in ceramics
- **Chemicals**
  - Transition from petrochemicals to bio-based chemicals: ethanol from sugars, cellulose, protein
  - Hydrogen
  - Membrane separation technology
  - Fertilisers: ‘solid state synthesis’ process: no need for separate production of ammonia/hydrogen

- **Glass**
  - Electric furnace technology
  - Use of hydrogen fuel
- **Biomass**
  - are renewable resources (e.g. wood waste, sewage, slurry, organic household waste, energy crops, etc.) that can be used to produce energy
  - to replace fossil fuel electricity or in biorefining to replace conventional feedstock in chemicals, cement, paper
  - Problem: affordable and reliable access to biomass in light of the increasing and competing demands
  - Problem: respect of the waste hierarchy

- **Carbon valorisation**: bring CCS/CCU to a commercial stage
  - Use of CO2 in industrial processes (cement, chemicals, power sector)
  - Has a huge potential (cement sector, demonstration scale in the power sector reached) but not commercially viable yet (2025?)
  - Requires
    - Compressing/liquefying CO2
    - Transporting it by pipelines/ships
    - Storing in geological formations
    - Re-use as feedstock for other energy-intensive industries (hydrogen)
    - Clustering of industries

New products

- New high strength lightweight steel products
- Nanosteel, nano-silica (for cement)
- Bio-chemicals (biodegradable plastics)
- Fuel: synthetic fuels, bio-fuels, liquid hydrogen
- Reduced use:
  - Lower product weight (ceramics),
  - Reduced use of fertilisers
  - 3D-printing in construction to reduce use of mortar/concrete

New business models

- **Clustering of industrial activities** could optimise the use of waste and by-products from one process to be used beneficially by another process
  - But: reliance on external partners which may not be present in the long term
  - But: organize the collaboration, define the responsibilities/liabilities
- **EII's acting as a battery** which consumes more electricity when plenty of renewables feed into the grid and reduces consumption at times at high demand and low renewable energy generation
- **Combined production of energy and products:** : combination of production of fertilizers with the production of electricity as ammonia is an excellent storage medium for hydrogen

Circular economy (cradle-to-cradle principle)

- Organize the circular economy: re-cycling, re-use, re-manufacturing of steel, chemicals, plastics
- Mandates and incentives
- Address the issue of scrap exports (steel)

Energy supply

- Need **to strongly increase** the supply of electricity
  - Chemicals:+50%
  - Steel: +18%
  - Idem for electrification passenger cars
- Establish smart grids to ensure energy security
- Decarbonisation electricity supply - **On-site production of renewables**
- **Energy efficiency**
  - Improved process control, monitoring, planning, maintenance
  - Including recovery industrial heat (district heating)
- **Sufficient supply of hydrogen**:
  - Electrolysis of water with renewable electricity
  - Natural gas (methane) reforming (with addition of CO2 capture)
  - Not only for de-carbonising EII's but also to replace fossil fuels in transport
- Develop modes of **energy storage**
- Keep prices **affordable**

Developing an industrial policy

- **Investment support needed**:
  - Funding needed at all stages of development: R&D, early-stage pilots in labs, demonstration projects, upscaling to commercial projects
  - very capital intensive sectors,
  - risk intensive projects,
  - long-term pay back periods,
  - impact on solvency of companies
  - Smart combinations of grants, equity financing, loans and loan guarantees, tax breaks
  - Need for de-risking strategies: intermediate objectives,
  - Third-party financing (e.g. energy companies)
- **Demand creation**:
  - product standards,
  - eco-design,
  - steer consumer/producer behaviour to low-carbon products/services (life cycle accounting of products)
  - public procurement

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- **Organize** platforms for cooperation
  - Clustering: waste, resource and energy sharing
  - R&D PPP's: SPIRE, hydrogen, bio-based chemicals
  - Important Projects of Common European Interest
- **Innovation and Modernisation Fund**
- **Skills in low-carbon technologies**
- **Fair trade**
  - Border adjustment measures
- **Regulation**
  - Spreading costs all over the supply chain
  - State aid rules (cooperation in demonstration projects)