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9. Technological Innovations for the Sustainability Transitions from COP26 Perspective

Darja Piciga, *Independent Expert in Sustainable Development, Slovenia*

&

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si2021.eu

Policy mixes for systemic change

Directionality, credibility
- Visions and pathways
- Long-term targets
- Scale and speed
- Foresight

Environment and sectoral policies, e.g.
- Carbon pricing
- Strict regulation
- Removing barriers (e.g. subsidies)

Coordination across sectors, scales
- Policy coherence and consistency
- **Mission-oriented innovation**
- Polycentric governance
- Stakeholder platforms, networks

Welfare, education policies
- Compensating losers
- Offsetting inequities
- Retraining

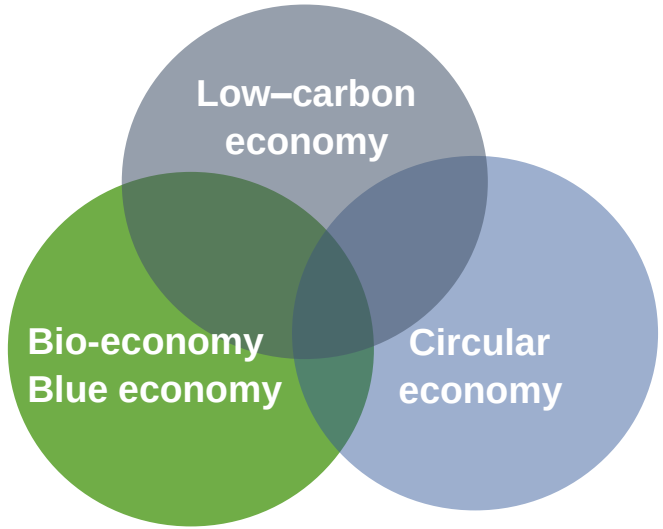
Innovation policies, e.g.
- **R&D**
- **Experiments**
- **Network building**
- **New entrant support**

Industrial policy, e.g.
- Specific visions
- Market creation
- Adoption subsidies
- Backing winners

EUROPEAN RECOVERY AND RESILIENCE MECHANISMS - CHALLENGES IN SYSTEMIC APPROACHES IN SD

SUSTAINABILITY TRANSITIONS AND SYSTEMS CHANGE

Discussion Paper



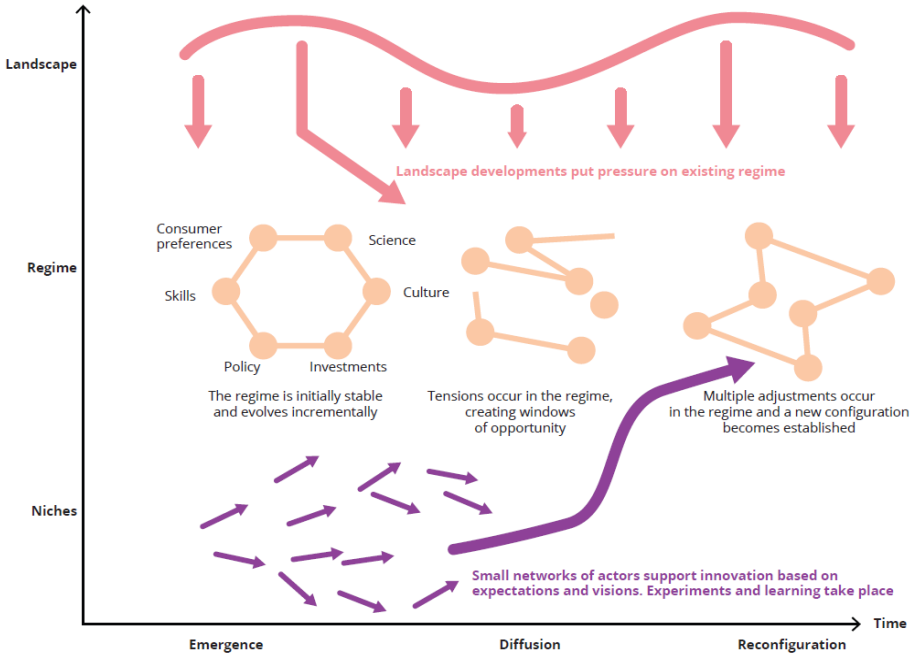
European Environment Agency

EUROPEAN RECOVERY AND RESILIENCE MECHANISMS - CHALLENGES IN SYSTEMIC APPROACHES IN SD

SUSTAINABILITY TRANSITIONS AND SYSTEMS CHANGE

Discussion Paper

FIGURE 17.1 The multilevel perspective on sustainability transitions



Source: Based on Geels (2002).

COMMENT: We can't make Europe's systems of production and consumption sustainable by optimising existing systems. We need huge improvements in environmental efficiency. That means fundamental change in energy, food and so on.

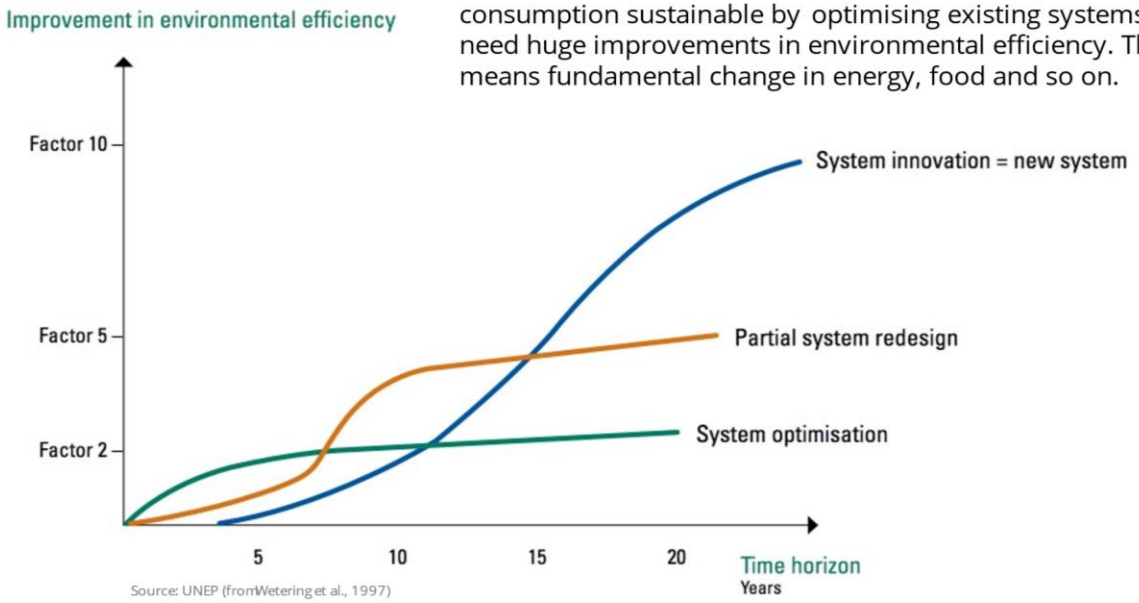
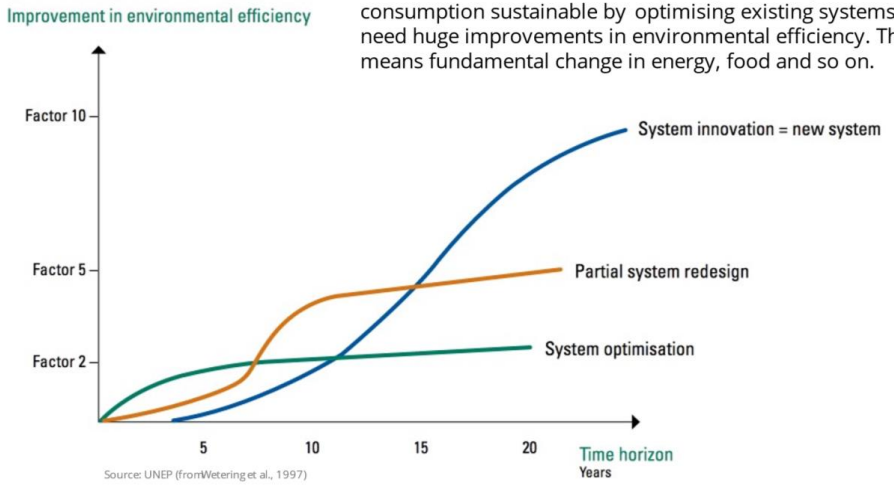


TABLE 17.1 Examples of sustainability innovations in the mobility, food and energy domains

	Mobility	Food	Energy
Incremental technical innovation	Fuel-efficient petrol or diesel cars	Precision farming, food waste valorisation, integrated pest management	Insulation, energy-efficient appliances, efficient gas or coal-fired power plants
Radical technical innovation	Battery electric vehicles, electric bikes, alternative fuels, autonomous vehicles	Permaculture, no-tillage farming, plant-based meat and dairy products, genetic modification	Renewable electricity, heat pumps, passive houses, whole-house retrofitting, smart meters
Social or behavioural innovation	Car sharing, modal shift, teleconferencing, teleworking, internet retail	Alternative food networks, organic food, dietary change, urban farming, food councils	Decentralised energy production ('prosumers'), community energy, energy cafes
Business model innovation	Mobility services, car sharing, remanufacturing vehicles, bike sharing	Alternative food networks, organic food	Energy service companies, back-up capacity, vehicle-to-grid electricity provision
Infrastructural innovation	Intermodal transport systems, compact cities, integrated transport and land use planning	Reforms to distribution systems, storage provision and better food waste management	District heating systems, smart grids, bio-methane in reconfigured gas grid



COMMENT: We can't make Europe's systems of production and consumption sustainable by optimising existing systems. We need huge improvements in environmental efficiency. That means fundamental change in energy, food and so on.

Discussion Paper

The European environment — state and outlook 2020
Knowledge for transition to a sustainable Europe

	Mobility	Energy
Incremental technical innovation	Fuel-efficient petrol or diesel cars	Insulation, energy-efficient appliances, efficient gas or coal-fired power plants
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European Union side events | COP 26 1-12.11.2021 GLASGOW, UK

NET ZERO

Sensitive Intervention Points for Achieving Climate Neutrality

Summary Report of the Climate Neutrality Forum

Supported by JPI Climate, and the Climate Works Foundation

September to November 2021 to be presented at COP 26

Find the report online at http://www.ClimateNeutralityForum.org

https://netzeroclimate.org/climateneutralityforum-2/

Discussion	Sensitive Intervention Points for Climate Neutral Strategies Detailed in this Report
Equity and Just Transition	Climate and Nature Aligned Debt Restructuring (debt for nature swaps and debt for efficiency swaps) paired with international climate finance efforts through the IMF and the World Bank
Rapid Emissions Reduction	Policy instruments to incentivise investment in clean energy technology with declining costs AND Ambitious Carbon (& Deforestation) Border Adjustment Mechanism, with ambition and equity measures such as international funding and new timelines
Final 20% Hard to Abate Sectors	Public interventions for targeted investment in clean energy and green (rather than blue) hydrogen infrastructure paired e.g. Contracts for Differences (CfDs)
Nature, Land-use, Agriculture	Redistribution of agricultural subsidies for climate, biodiversity and health aims AND Scaled up Monitoring Verification and Reporting (MRV) for soil carbon sequestration
Greenhouse Gas Removal	Standardized accounting for GHG Removals AND Carbon Take Back Obligation, with improved standards and separate measurement of removals
Climate Finance and Policy	Green Loan Guarantee Programmes

Sensitive Intervention Points

for Achieving Climate Neutrality

Summary Report of the Climate Neutrality Forum

RAPID EMISSIONS REDUCTION

Policy instruments to incentivise investment in clean energy technology with consistently declining costs

Recommendations - To primarily focus on four key technologies:

1. solar PV 2. wind 3. batteries 4. hydrogen electrolysers

FINAL 20%, CLIMATE NEUTRAL STRATEGIES FOR HARD-TO-ABATE SECTORS (CEMENT, STEEL, PLASTICS, TRUCKING, SHIPPING AND AVIATION)

Recommendations for Policymakers

……

- Supporting hydrogen technologies - targeted investment:

As a clean energy carrier hydrogen offers a range of benefits for simultaneously decarbonizing the **transport**, **residential**, **commercial**, and **industrial sectors**.

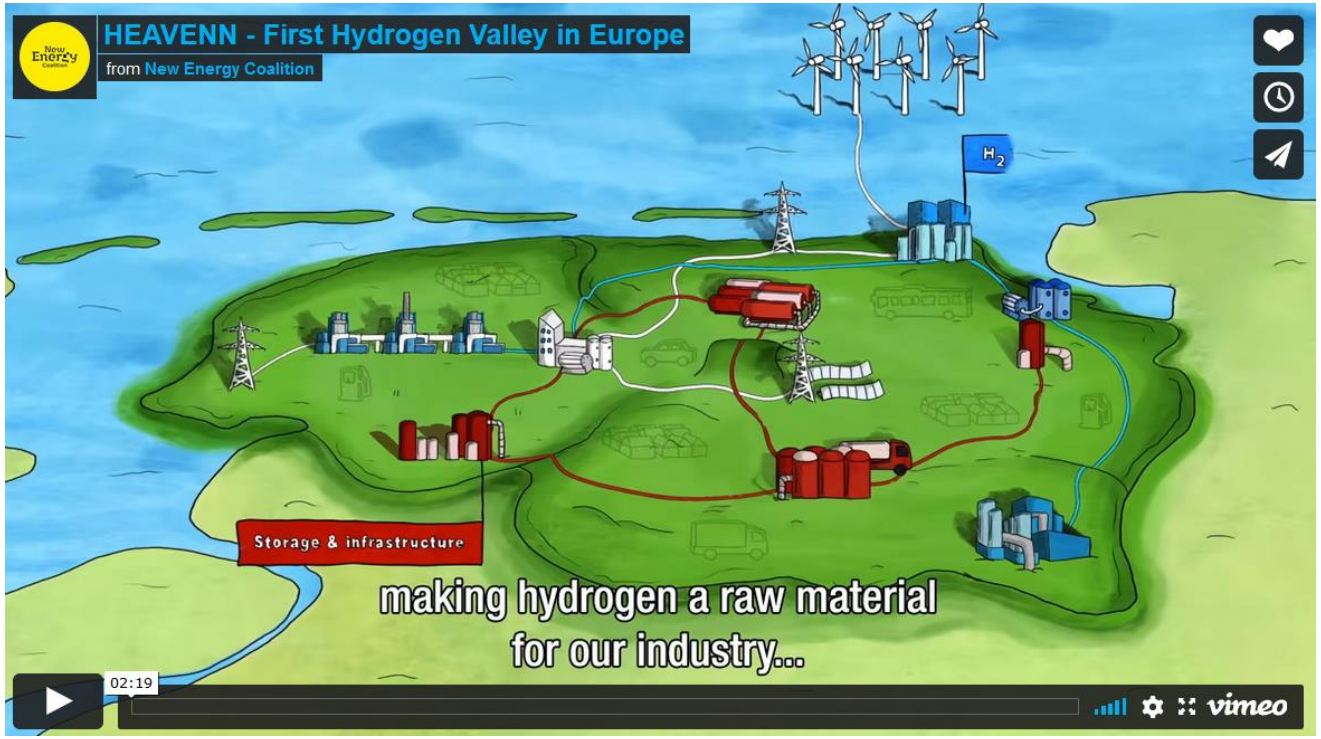
While **industry players** have already started the market introduction of **hydrogen fuel cell systems**, including fuel cell electric vehicles and micro-combined heat and power devices, the use of hydrogen **at grid scale requires** the **challenges** of **clean hydrogen production**, **bulk storage** and **distribution** to be resolved.

……

- Investment in research into design efficiency to reduce material intensity of production.

Hydrogen Valley - The Northern Netherlands

https://www.newenergycoalition.org/en/hydrogen-valley/



European Hydrogen Week 2021, 29 November – 3 December 2021.
https://www.fch.europa.eu/event/european-hydrogen-week-2021

Sensitive Intervention Points

for Achieving Climate Neutrality

Summary Report of the Climate Neutrality Forum

NATURE, LAND USE AND AGRICULTURE FOR CLIMATE NEUTRALITY:

➡ **Jernej Stritih (last slide)**

GREENHOUSE GAS REMOVAL (GGR) FOR CLIMATE NEUTRALITY

! An urgent need to invest in R&D to scale GGR in order for it to be available when it is needed !

The range of proposed GGR techniques: biological approaches, such as afforestation, investment in marine ecosystems or soil sequestration, and **engineered approaches,** such as enhancing the rate at which certain minerals weather and devices that directly capture CO2 from the air.

Carbon Takeback Obligation (additional slide)

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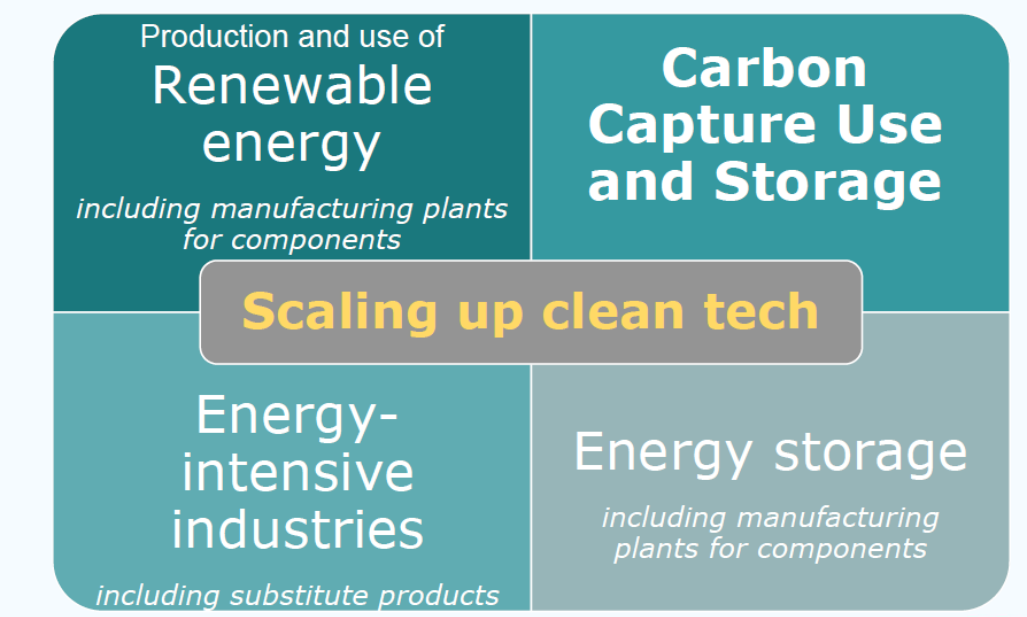
INNOVATION FUND



https://ec.europa.eu/clima/eu-action/funding-climate-action/innovation-fund_en

LARGE SCALE CALL

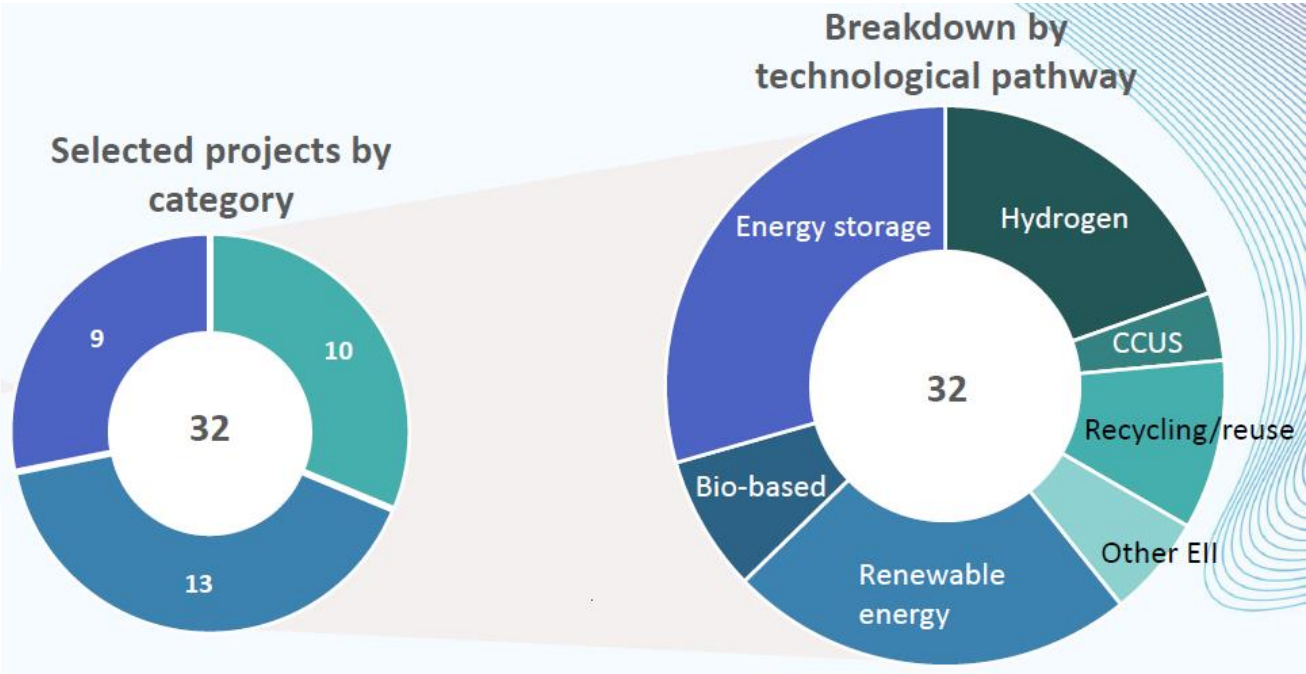
7 projects aiming to bring breakthrough technologies to the market in **energy-intensive industries**, **hydrogen**, **carbon capture, use and storage** and **renewable energy** were pre-selected for grant agreement preparations. (NOV 2021)

SMALL SCALE CALL 2020

OCTOBER 2021

- Renewable Energy
- Energy Intensive Industry
- Energy Storage

https://cinea.ec.europa.eu/document/download/2c19b1c3-7787-4d82-8f0e-0a016081b90b_en



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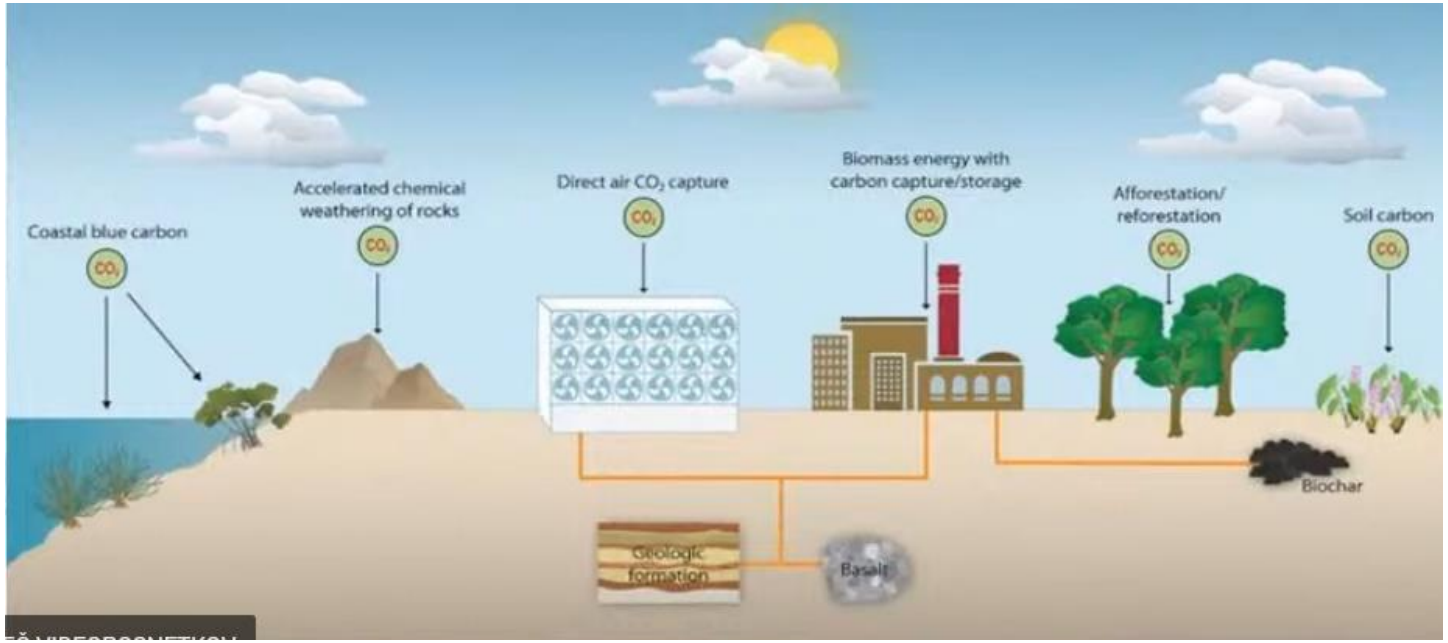
Blindspots of net-zero strategies and how to address them

- CIRCULAR ECONOMY

- NEGATIVE EMISSIONS TEHNOLOGIES (NET):

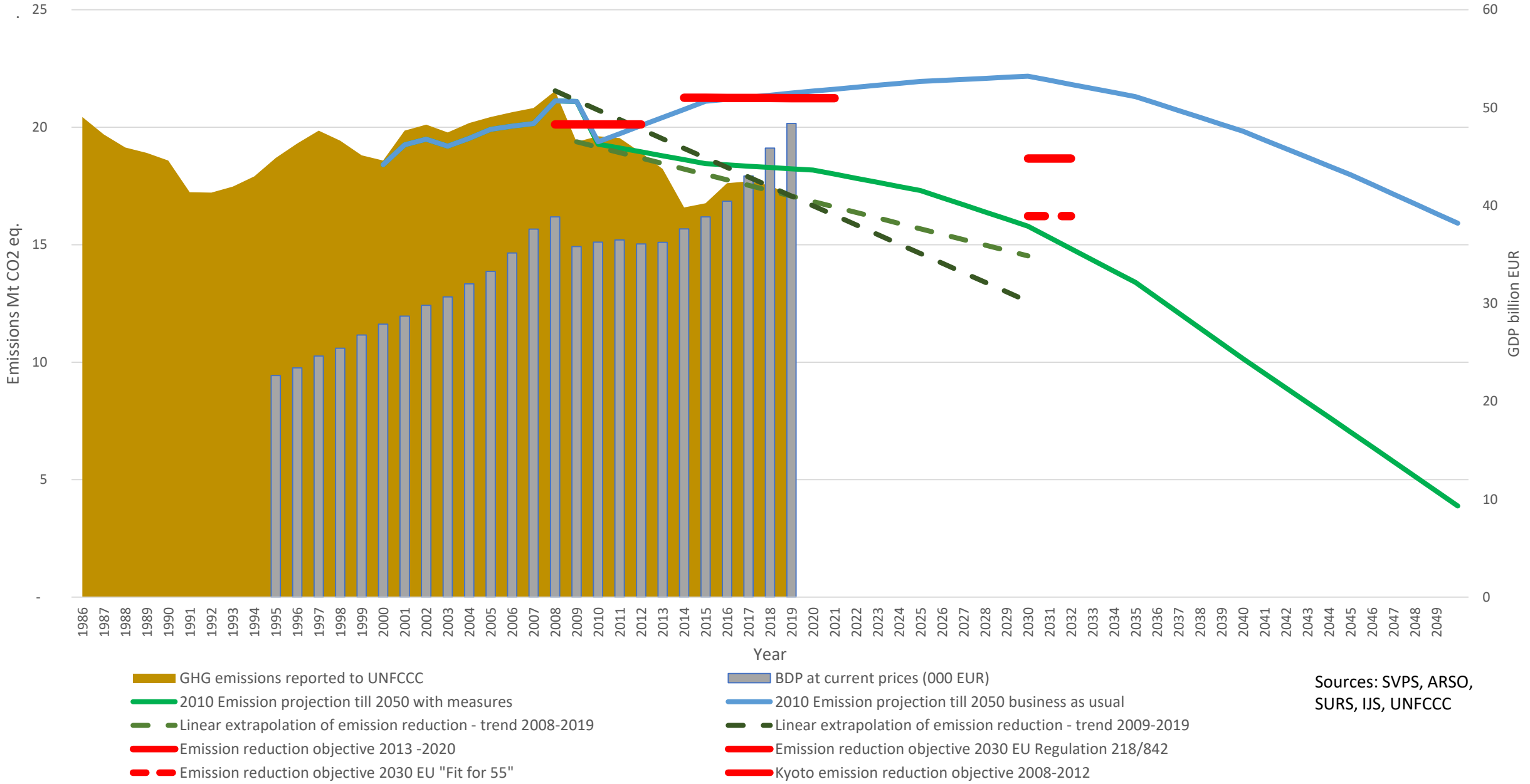


https://cop26eusideevents.app.swapcard.com/event/eu-side-events-cop26/planning/UGxhbm5pbmdfNzI1Mzk2

New European Bauhaus

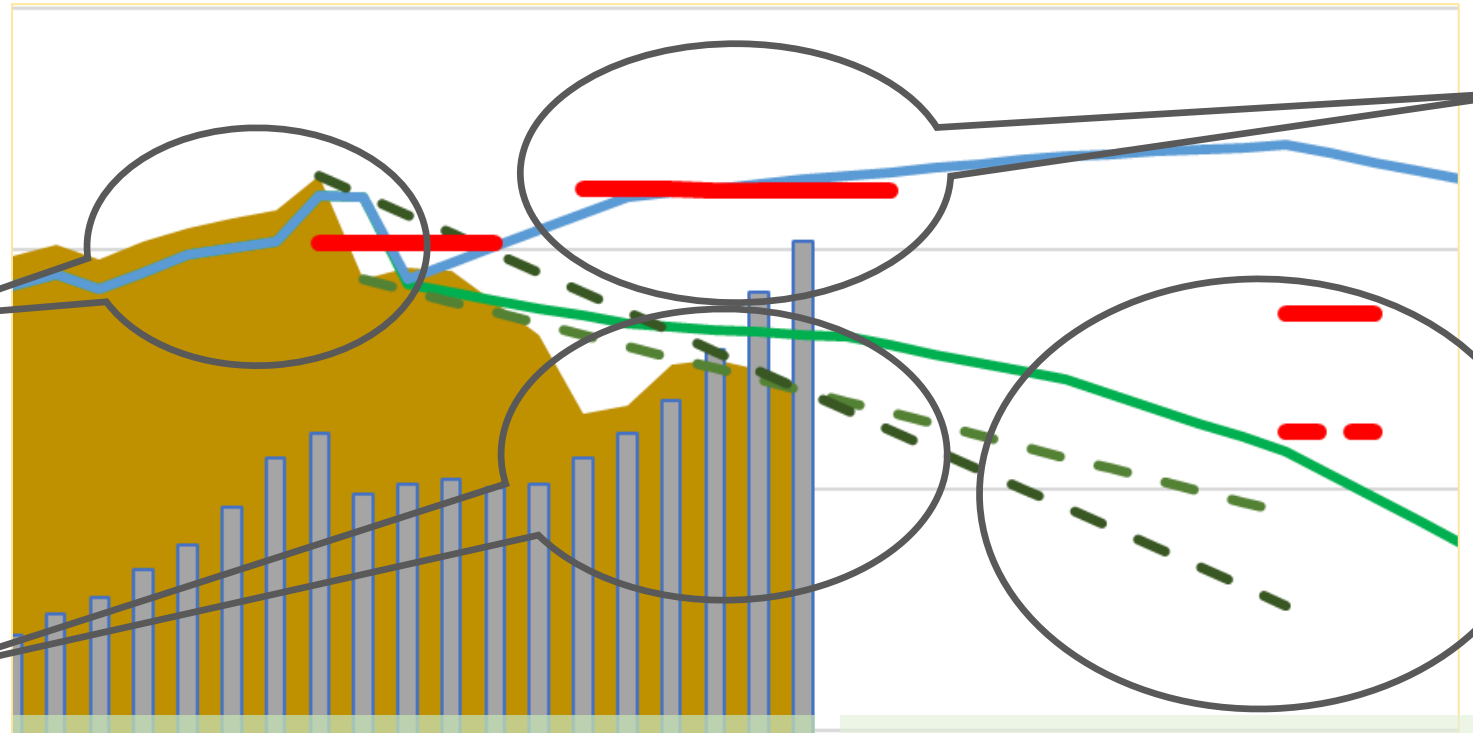
https://europa.eu/new-european-bauhaus/index_en

Emissions reduction in Slovenia



Sources: SVPS, ARSO, SURS, IJS, UNFCCC

What has happened?



Peak emissions masked by construction boom 2004 - 2008

Decoupling of GDP growth and emissions

Unambitious 2013 - 2020 target based on incumbent technologies and trends

Rapid emission reduction by upscaling already available technologies

Main technologies driving the reduction 2008 - 2020:

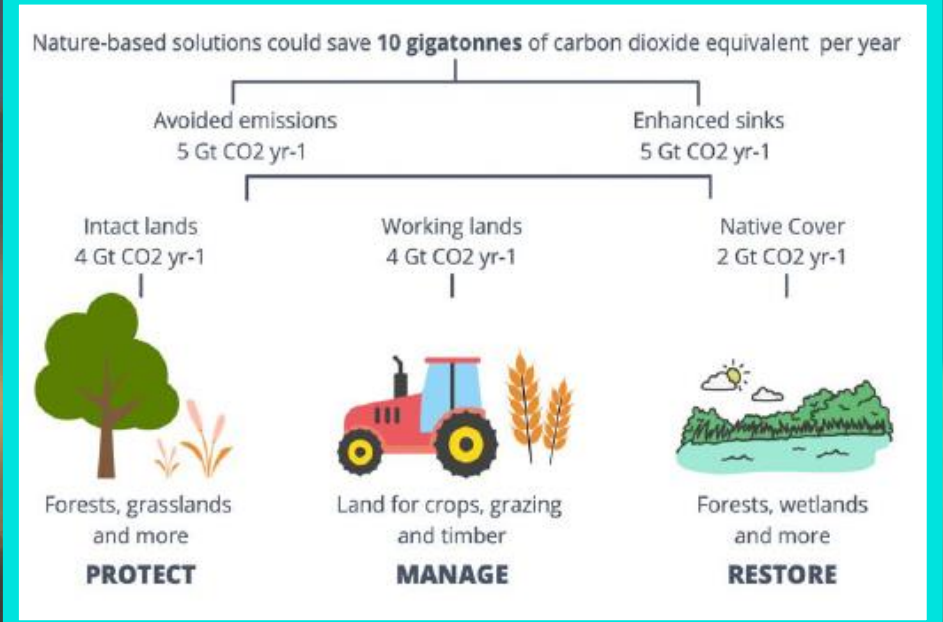
- Energy efficiency and renewable energy in buildings
- Efficient coal in TPP Šoštanj
- Carbon sequestration in forests
- Solar power
- ETS

Main technologies driving the reduction 2020 - 2030:

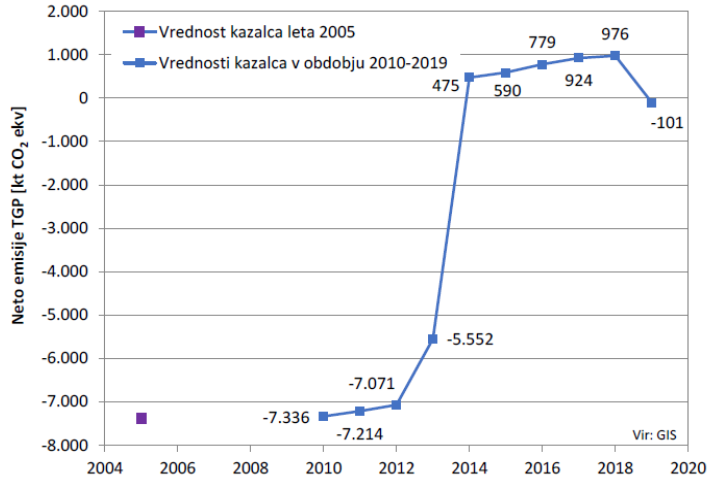
- Solar power
- Electric vehicles
- Energy efficiency and renewable energy in buildings
- Coal phaseout
- Adaptation in forests

Final hard to achieve 20% ?

Nature, land use and agriculture for climate neutrality



Net GHG emissions from LULUCF in Slovenia 2008-2019 – impact of climate change



Key concerns:

- Rediscover traditional technologies (sustainable forestry, organic farming) and lessons learnt
- New approaches (e.g. ecosystem services, remote sensing)
- Mitigation effect at risk without vigorous adaptation
- Precondition: sustainable land tenure, addressing the rights of local and indigenous people

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9. **Technological Innovations for the Sustainability Transitions from COP26 Perspective**

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ADDITIONAL SLIDES

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Sensitive Intervention Points

for Achieving Climate Neutrality

Summary Report of the Climate Neutrality Forum

Criterion for discussing Sensitive Intervention Points

Timing 	**Is this SIP required to:** • Halve GHG emissions by 2030 • Start this decade in order to halve GHG emissions again by 2040 • Start this decade in order to remove GHG from the atmosphere by 2050
Impact 	**Will this SIP:** • Reduce GHG emissions by at least 1GT by 2020; or • Reduce GHG emissions by at least 1GT/y by 2040
Practicality 	**Is the actor or group capable of taking this action; how effective will resistance be; and how robust and ready is the system and the technology? Think –** • Politically • Economically • Technically
Risks 	**What is the level of risk associated with this SIP. Think –** • Reversibility – how easily could it be reversed, and the benefits lost or worse • Trade-offs – doing this SIP harms other better options. • Unintended consequences – that would substantially offset the benefit of this SIP

Sensitive Intervention Points

for Achieving Climate Neutrality

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GREENHOUSE GAS REMOVAL (GGR) FOR CLIMATE NEUTRALITY

! An urgent need to invest in R&D to scale GGR in order for it to be available when it is needed !

The range of proposed GGR techniques: biological approaches, such as afforestation, investment in marine ecosystems or soil sequestration, and **engineered approaches,** such as enhancing the rate at which certain minerals weather and devices that directly capture CO2 from the air.

Carbon Takeback Obligation:

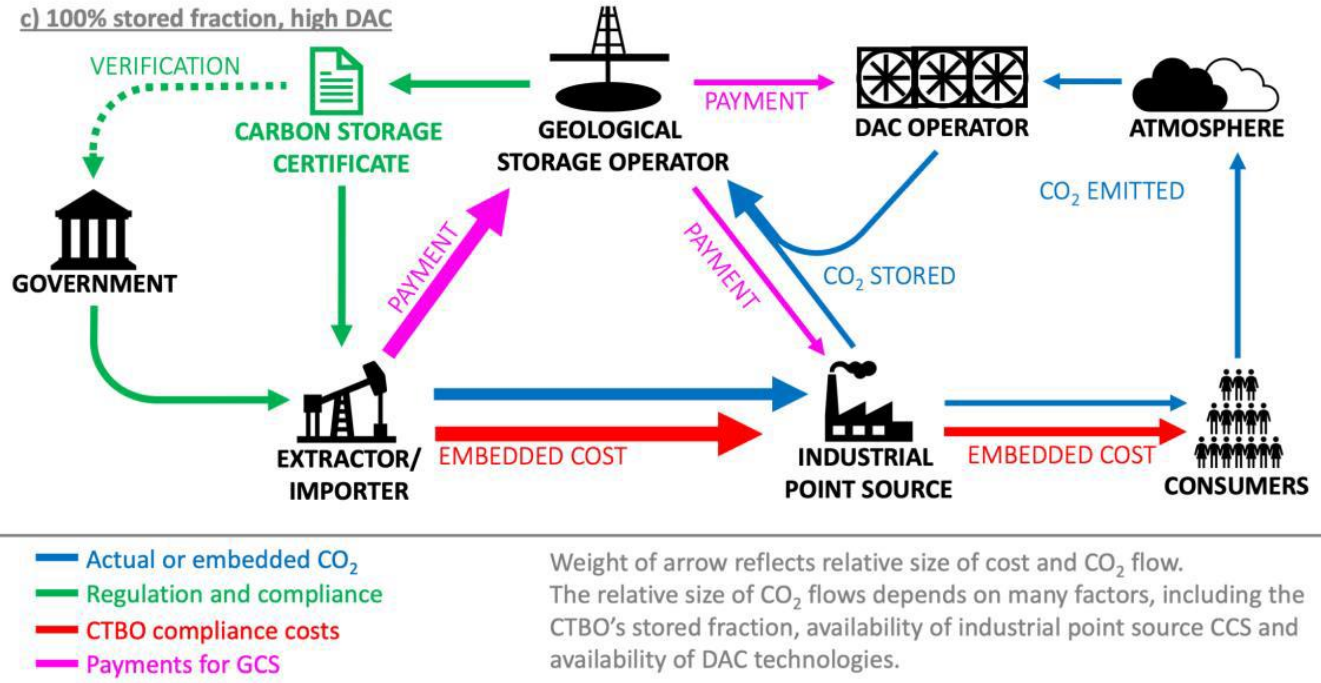
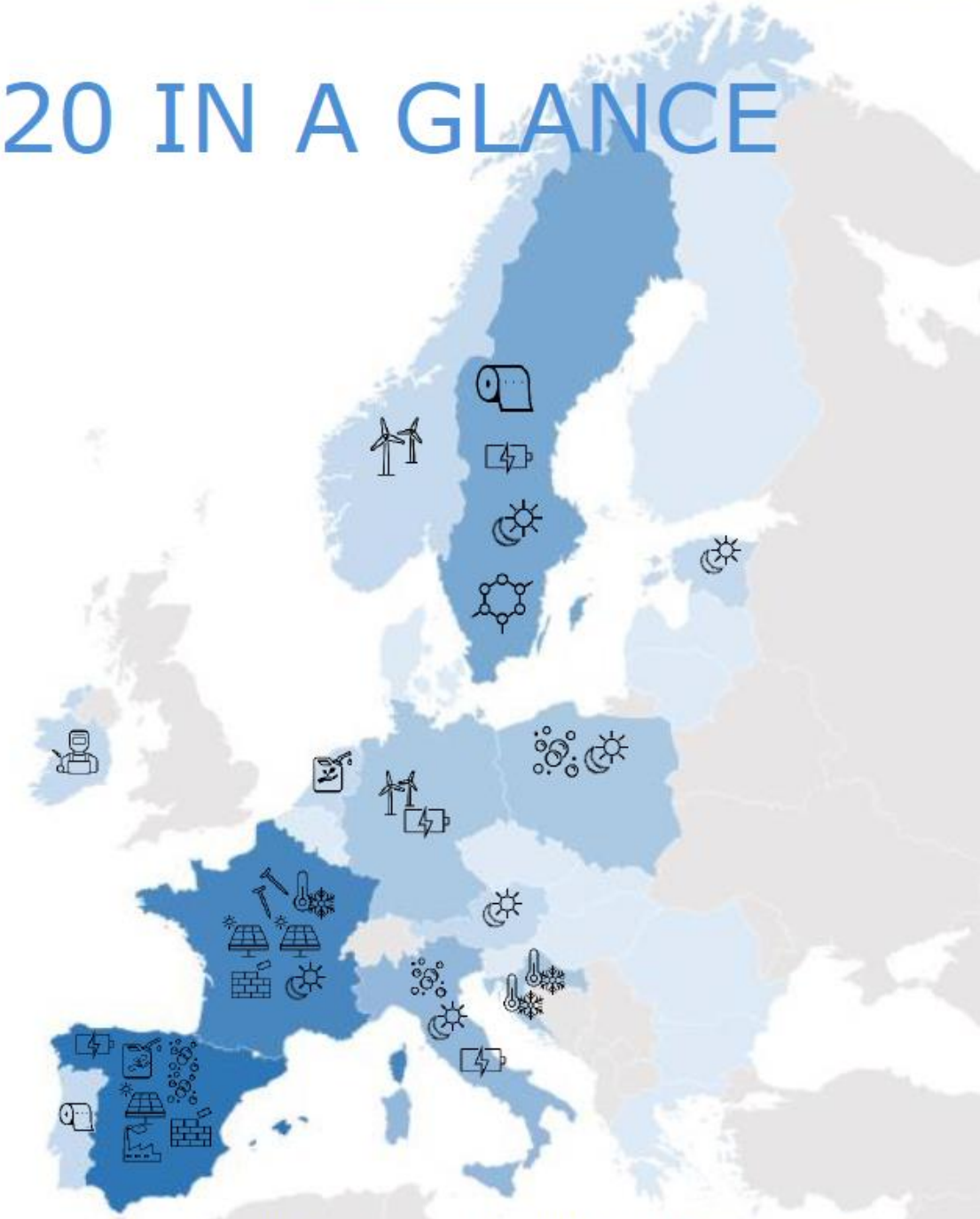


Figure: Key interactions for a carbon takeback obligation. CO2 is recaptured and stored, through a mixture of CCS at industrial point sources and direct air capture. Regulation and verification of storage is only required between government and the fossil fuel industry, with costs of storage passed onto consumers of fossil fuels.

SMALL SCALE CALL 2020 IN A GLANCE

- 32 projects cover 14 different sectors and 12 Member States + Norway and Iceland
- France, Spain and Sweden have the highest number of selected projects

- Solar energy
- Wind energy
- Biofuels and biorefineries
- Renewable heating/cooling
- Iron and steal
- Non-ferrous metals
- Pulp and paper
- Chemicals
- Glass, ceramics and construction material
- Hydrogen
- CO2 transport and storage
- Refineries
- Intra-day electricity storage
- Other energy storage



*cross-border projects are also included on the map

SUSTAINABLE ENERGY WEEK

European Commission

https://cinea.ec.europa.eu/document/download/2c19b1c3-7787-4d82-8f0e-0a016081b90b_en

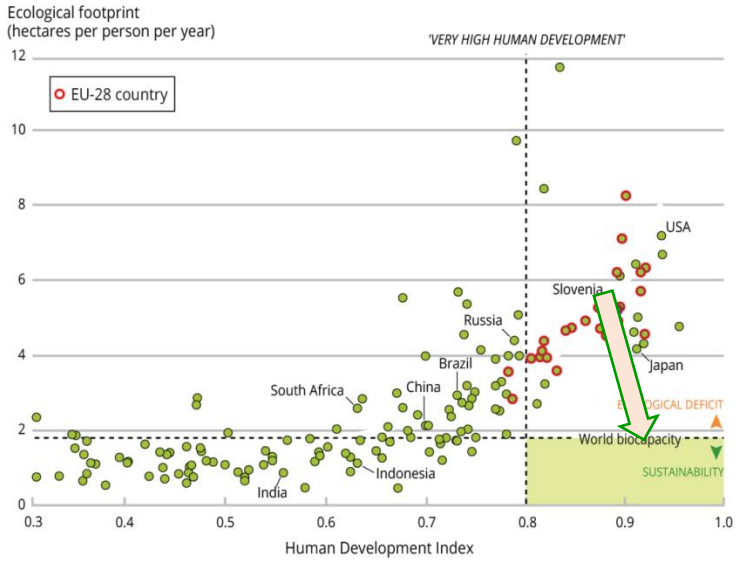
Slovenian National Development Strategy 2030 (adopted: Dec 2017)

GOAL 9: SUSTAINABLE NATURAL RESOURCE MANAGEMENT

Indicator	Source	Izhodiščna vrednost	Ciljna vrednost za leto 2030	EU Average
Utilised Agricultural Area	Eurostat	23,7 % (2016)	> 24 %	40 % (2013)
Biochemical Oxygen Demand in Rivers	ARSO, EEA	1,05 mg O_2/l (2015)	< 1 mg O_2/l	2,19 mg O_2/l (2012)
Ecological Footprint - 20 %	**GFN**	**4,7** gha/person (2013)	**3,8** gha/person	**4,9** gha/person(2013)

GOAL 8: LOW-CARBON CIRCULAR ECONOMY

Kazalnik	Vir	Izhodiščna vrednost	Ciljna vrednost za leto 2030	Povprečje EU
Material productivity	Eurostat	1,79 SKM/kg (2015)	3,5 SKM/kg	2,19 SKM/kg (2015)
Share of Renewable Energy in Gross Final Energy Consumption	Eurostat	22 % (2015)	27 %	16,7 % (2015)
GDP per Total Greenhouse Gas Emissions	Eurostat, ARSO	2,9 SKM/kg CO_2 ustreznik	Povprečje EU v letu 2030	3,3 SKM/kg CO_2 ustreznik (2015)



Ecological Footprint also key indicator in the NEAP 2030, with the 20% reduction target.

Projected effects of mixes of selected policy measures on EF reduction in Slovenia by 2030 (national environmental agency):

- Sustainable forest management in terms of providing a carbon sink and adapting to climate change: -7.1%

- Introduction of PV panels on buildings and other built-up areas, in connection with electro-mobility and diffuse storage in batteries: -9.3%

Development of public passenger transport, multimodal centers and the cycling network to reduce the EF of daily migrations: -8.2%

Etc.