CarbonTropic
Carbon Solution Institute

Gedung STC Lantai 2 Ruang 35 Jl. Asia Afrika Pintu IX Gelora Senayan Tanah Abang Jakarta 10270

Jakarta, 28 Oktober 2024

No : 001 – PPSEKN/X/2024

Lampiran : -

Perihal : Undangan

Kepada Yth Bapak **Handi Chandra-Putra**, PhD

Staf Pengajar, Prodi MPWK Univ. Tarumanagara - Jakarta

Research Fellow, Lawrence Berkeley National Laboratory

Untuk memeriahkan ulang tahunnya yang ke 15 (Januari 2010 – Januari 2025), Perhimpunan Penggiat Solusi Emisi Karbon Nusantara (PPSEKN, atau *Carbon Solution Institute*) mengundang Anda untuk menjadi pemantik diskusi *virtual* Perhimpunan pada:

Hari : Rabu, 6 November 2024

Waktu : Mulai pk 10.00 WIB.

Diskusi diharapkan dapat dihadiri oleh anggota Perhimpunan dan mitra-mitra kerjanya.

Tema diskusi adalah ***Net Zero World*** **dan Prospek Perdagangan Carbon di Indonesia**. Untuk keperluan tersebut Anda dapat menyampaikan materi dan bahan presentasi yang sesuai.

Kami akan menyiapkan link zoom-nya.

Besar harapan kami Anda dapat memenuhi undangan ini.

Ketua Perhimpunan,

PERHIMPUNAN PENGGIAT SOLUSI EMISI KARBON NUSANTARA
JAKARTA

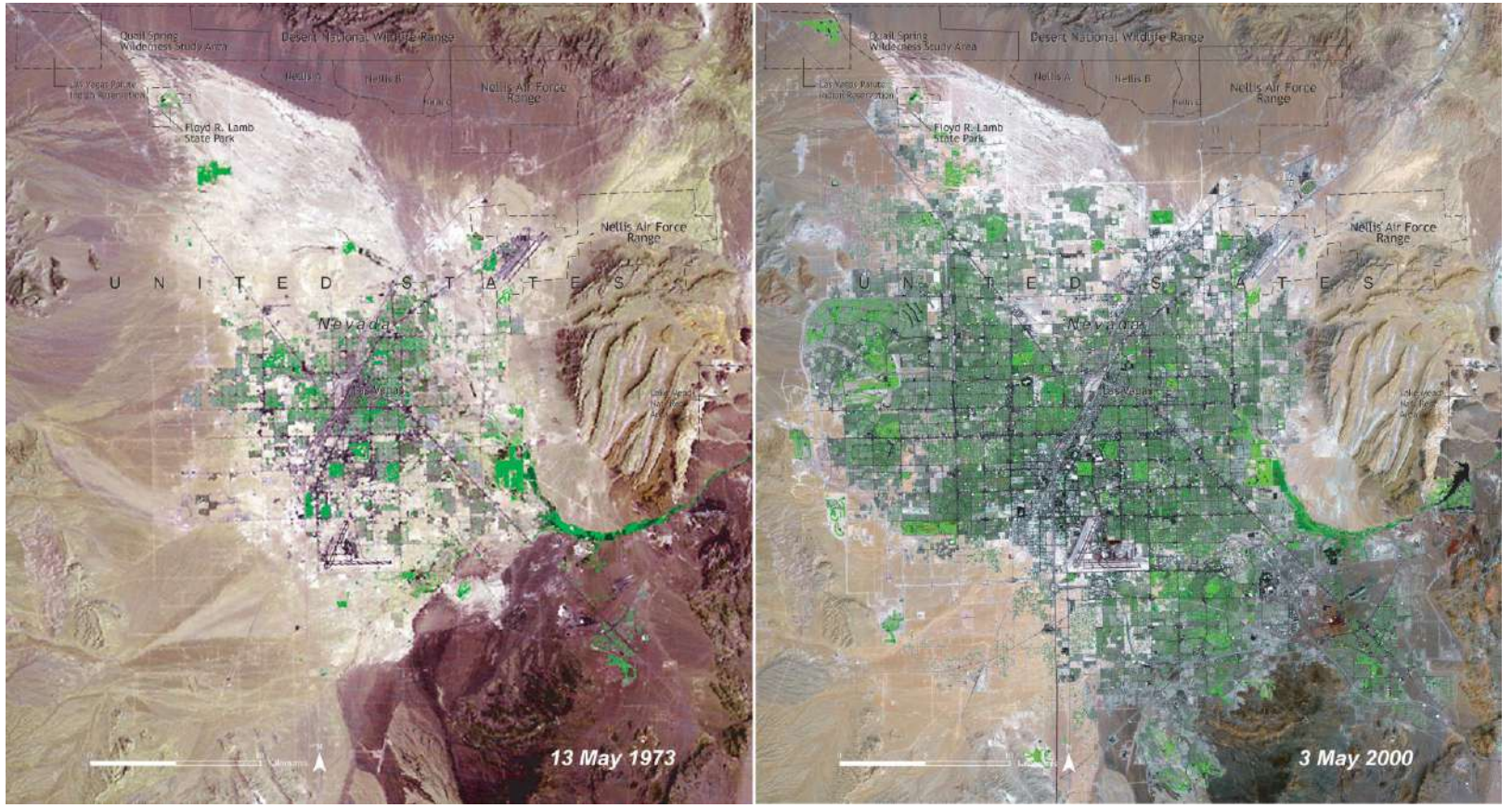
Erwin Fahmi

Achieving Net Zero World

6 November 2024
Sustainable City Development

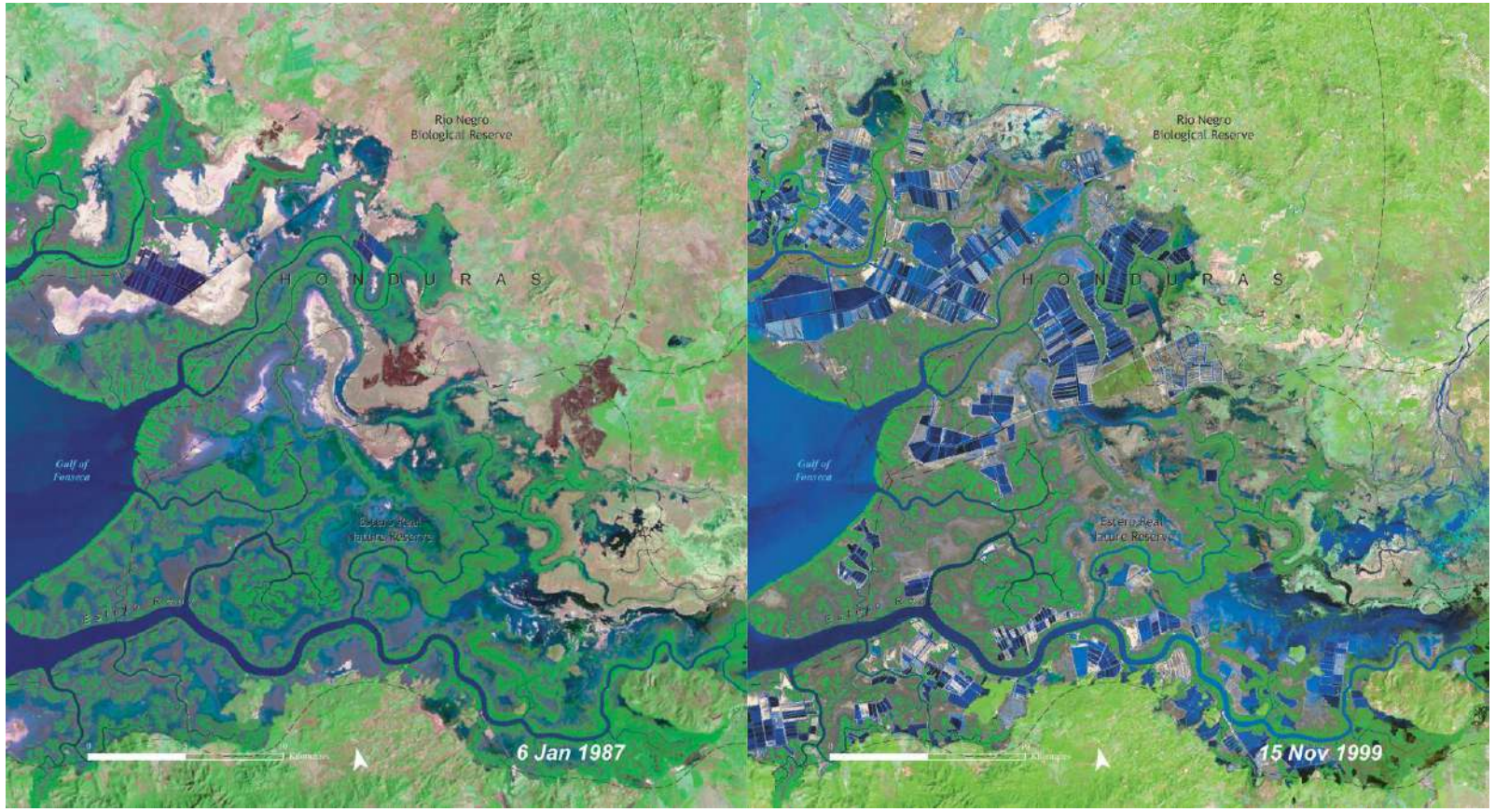
Motivation

Las Vegas in 1973 and 2000



UNEP 2005

Honduras in 1987 and 1999



UNEP 2005

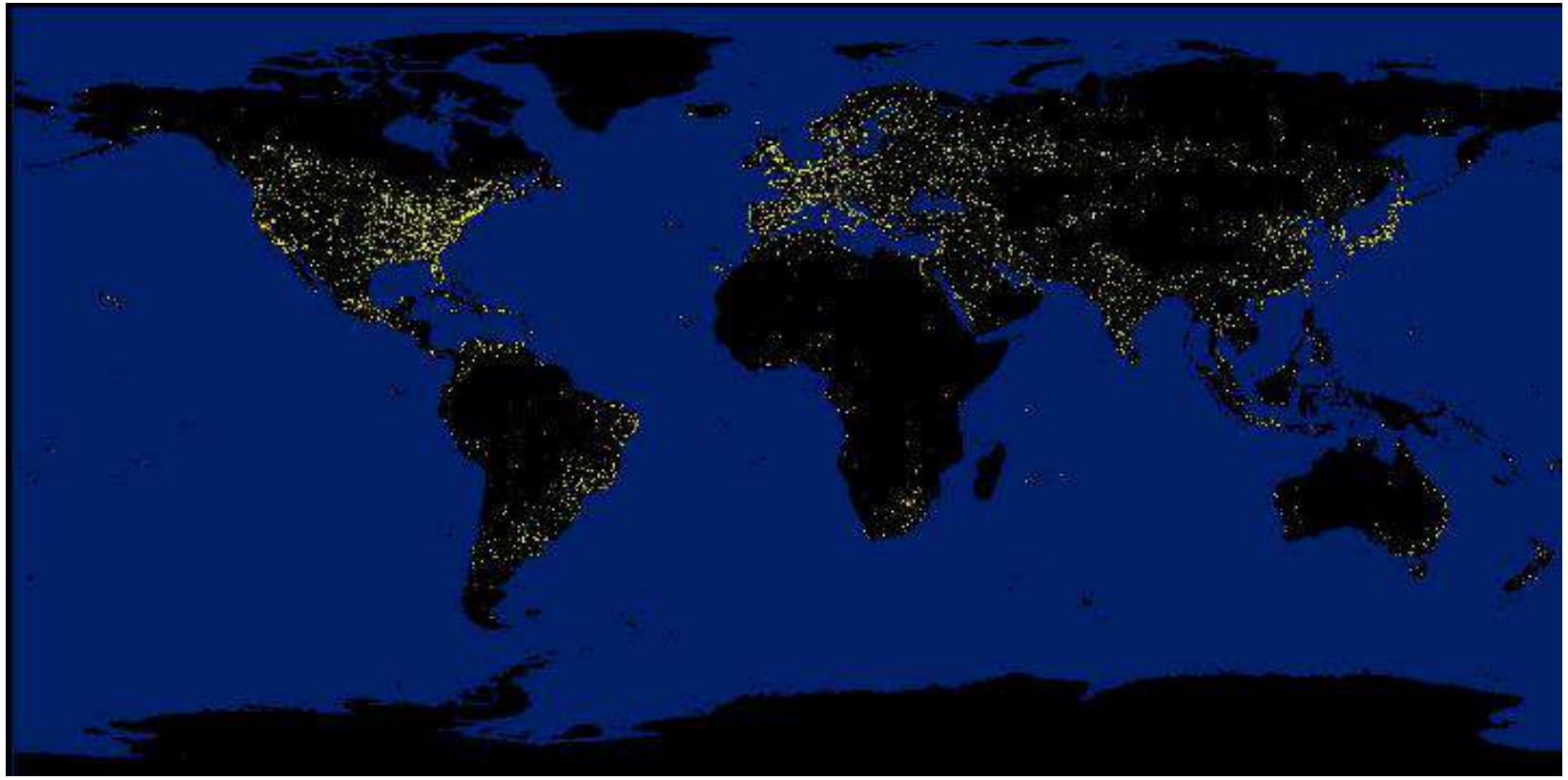
Yellow River 1979 and 2000

UNEP 2005

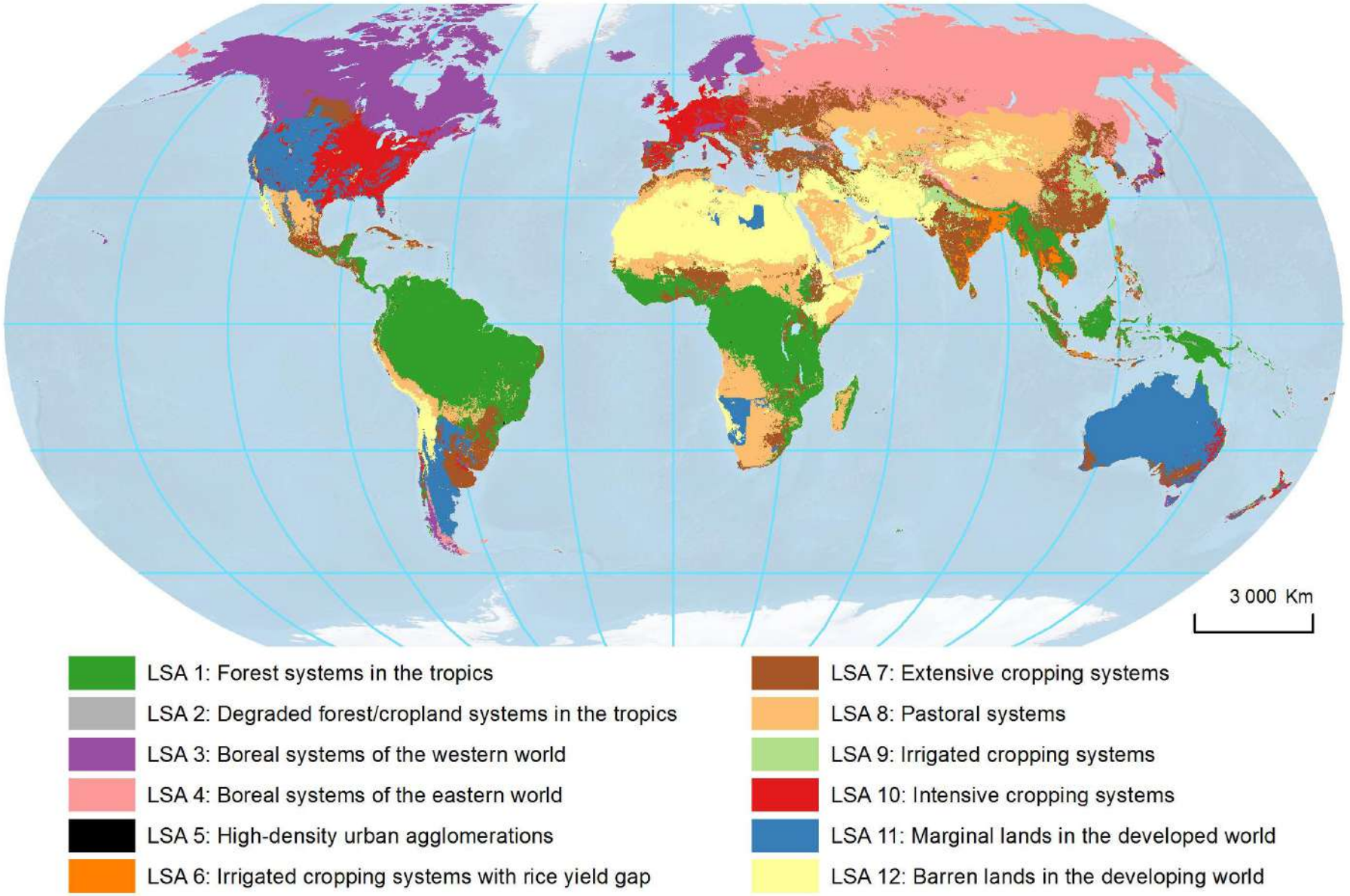
Romania 1986 and 2004

UNEP 2005

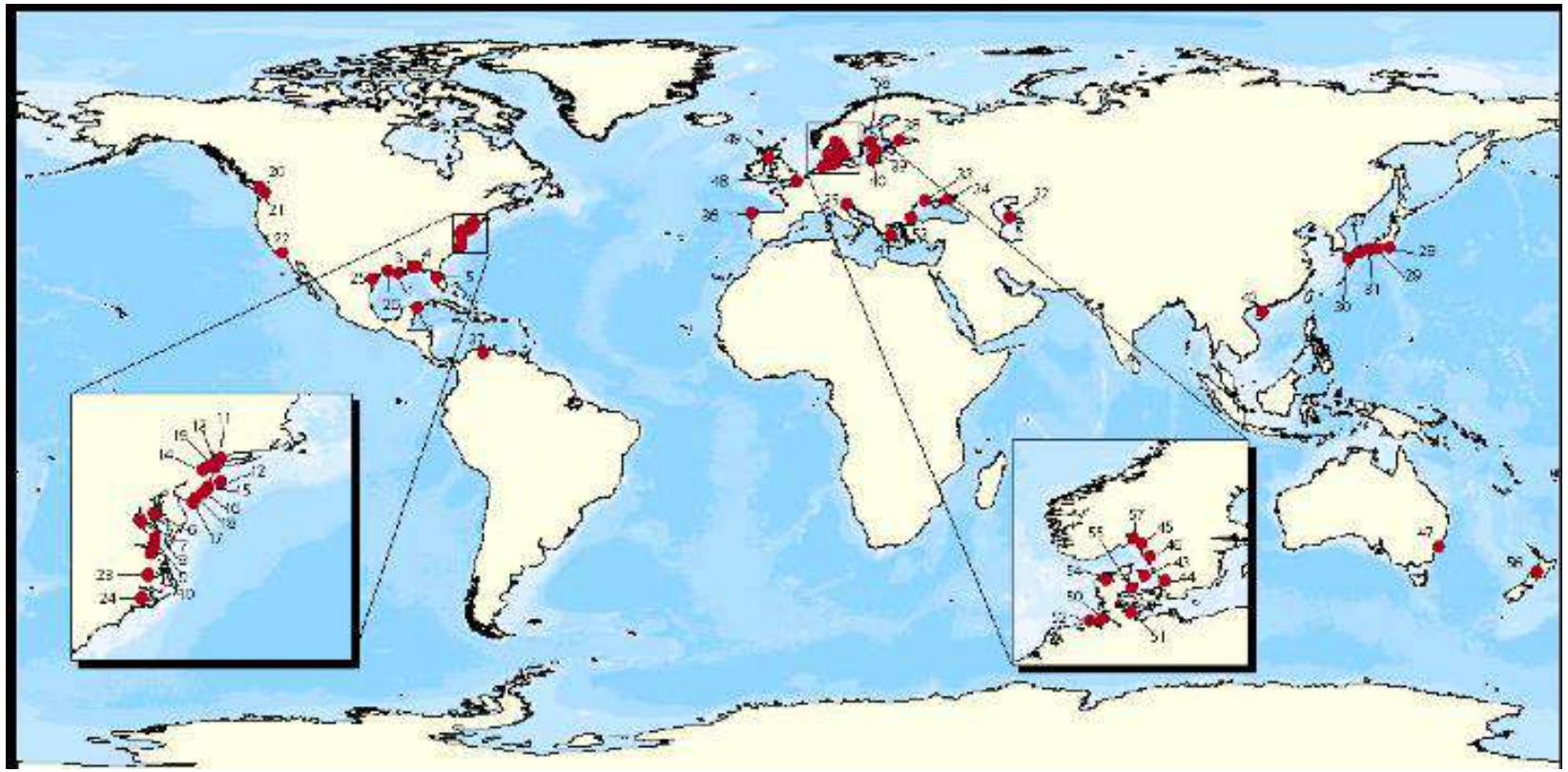
City Lights



Land Use

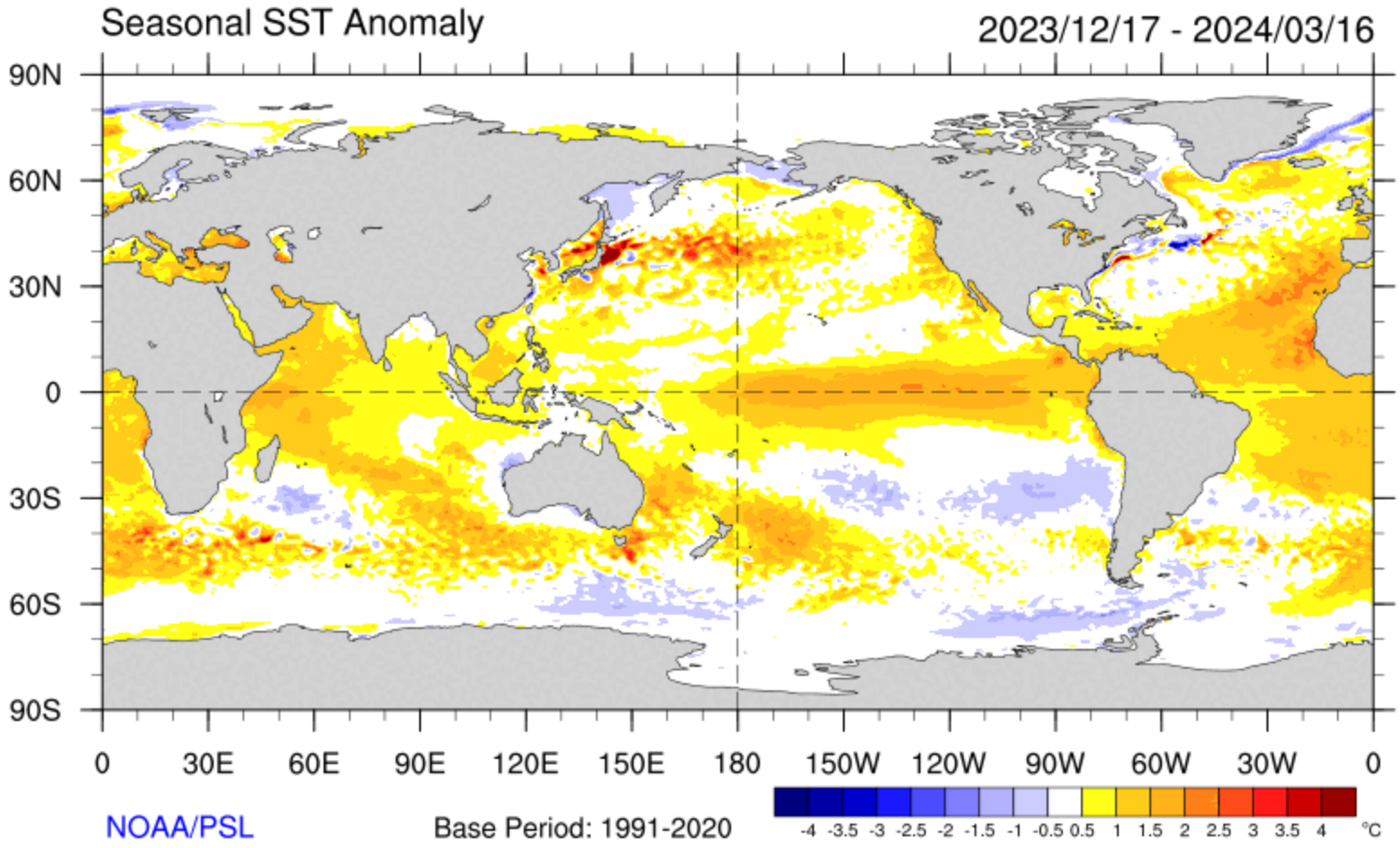

3 000 Km
LSA 1: Forest systems in the tropics
LSA 2: Degraded forest/cropland systems in the tropics
LSA 3: Boreal systems of the western world
LSA 4: Boreal systems of the eastern world
LSA 5: High-density urban agglomerations
LSA 6: Irrigated cropping systems with rice yield gap
LSA 7: Extensive cropping systems
LSA 8: Pastoral systems
LSA 9: Irrigated cropping systems
LSA 10: Intensive cropping systems
LSA 11: Marginal lands in the developed world
LSA 12: Barren lands in the developing world

Hypoxic Zones



WRI 2003

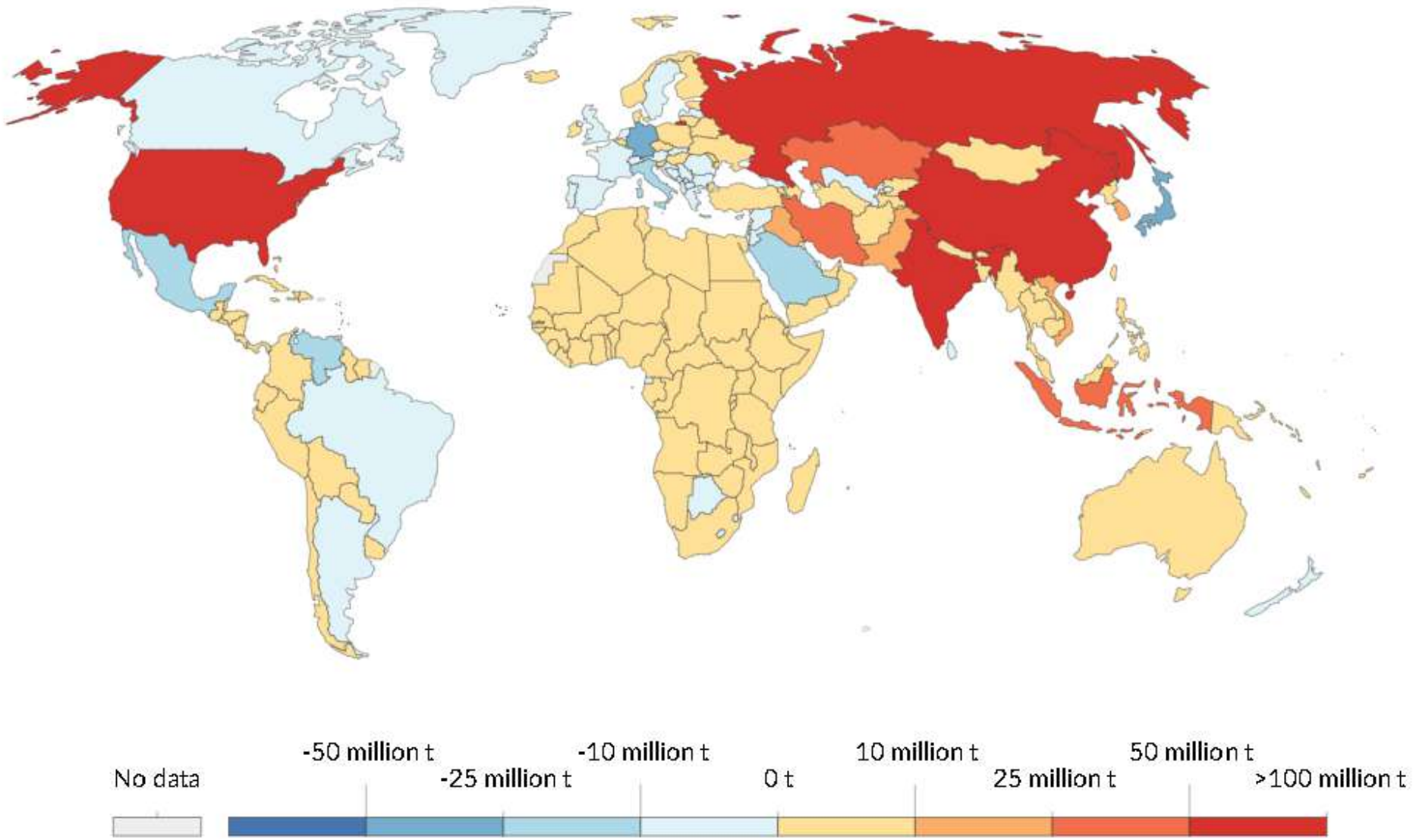
Sea Surface Temperature Anomaly



Year-on-year change in CO_2 emissions, 2018

Absolute annual change in carbon dioxide (CO_2) emissions, measured in tonnes.

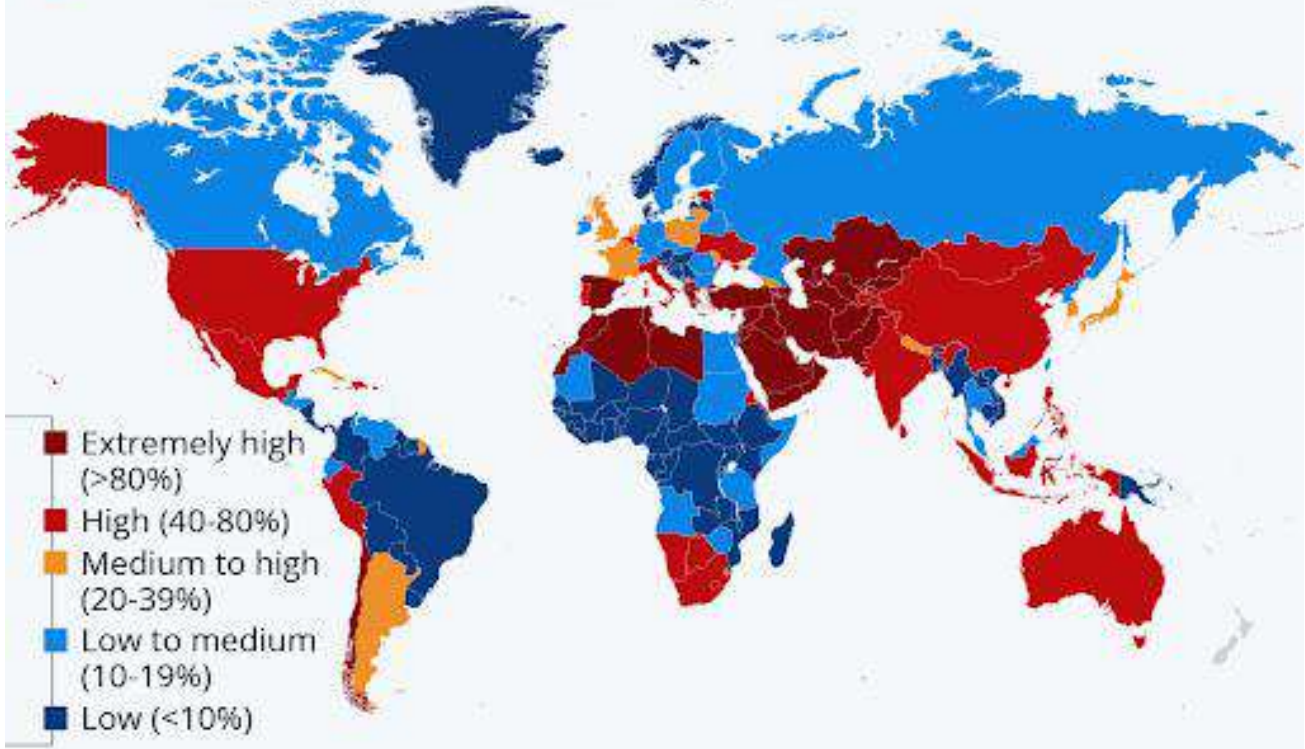
Our World in Data



Source: Our World in Data based on Global Carbon Project and CDIAC OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Where Water Stress Will Be Highest by 2040

Projected ratio of water withdrawals to water supply (water stress level) in 2040



Source: World Resources Institute via The Economist Intelligence Unit

Net Zero by 2050

A Roadmap for the Global Energy Sector

International Energy Agency

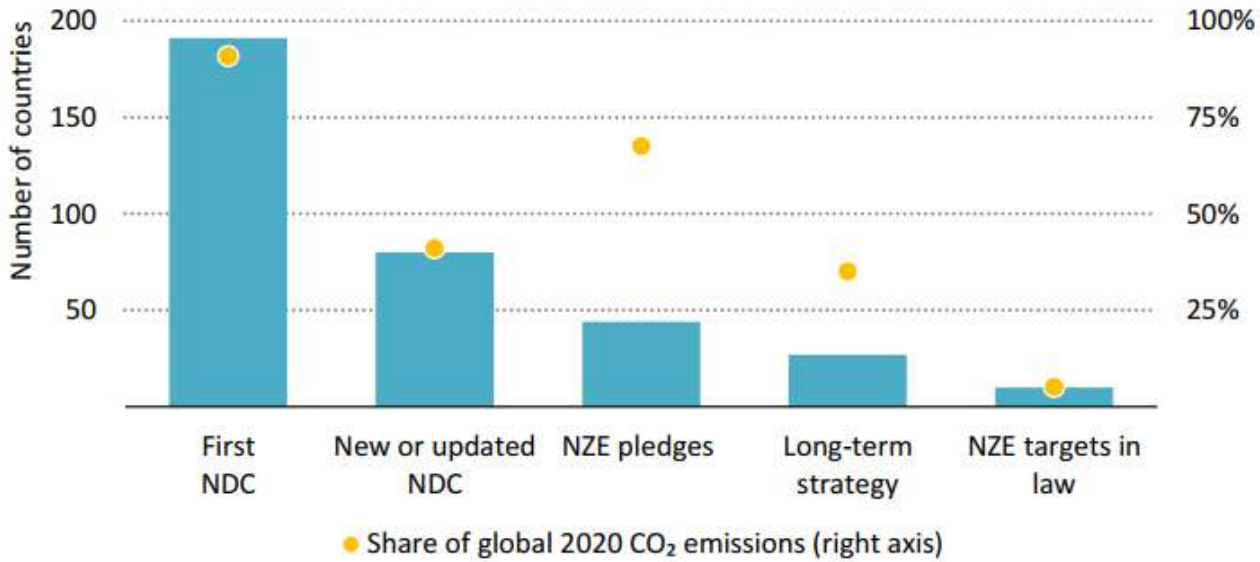
Announced net zero pledges and the energy sector

- Net Zero Pledges: It notes that a significant portion of the world's GDP and CO2 emissions are now covered by net zero pledges. However, it also points out that less than a quarter of these pledges are anchored in domestic laws, and many lack detailed plans and policies for implementation.
- Pathways to Net Zero: The passage highlights that efficiency, electrification, and transitioning from coal to low-emission electricity sources are key strategies for achieving net zero goals, particularly by 2030. The role of nuclear, hydrogen, bioenergy, and carbon capture varies by country due to differing circumstances.

Announced net zero pledges and the energy sector

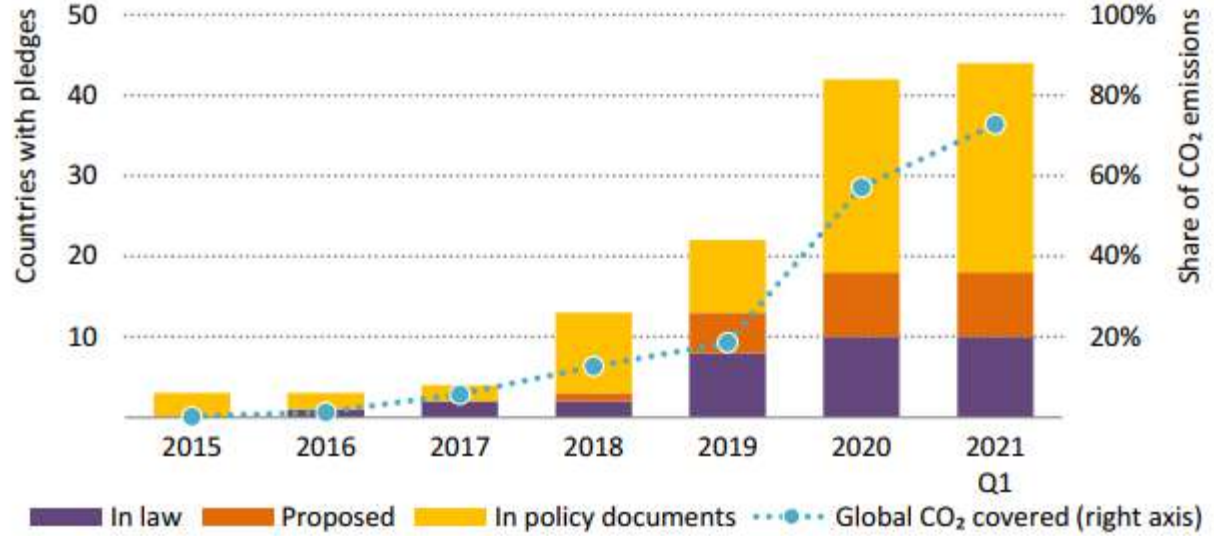
- **Stated Policies Scenario (STEPS):** This scenario considers only existing or announced policies without assuming any future action towards net zero targets. Under STEPS, CO2 emissions from energy and industrial processes are projected to increase slightly by 2030 and then plateau, leading to a potential temperature rise of about 2.7°C by 2100. It also forecasts an increase in renewable energy's share of electricity generation, but with continued reliance on fossil fuels, especially natural gas.
- **Announced Pledges Case (APC):** Unlike STEPS, the APC assumes all net zero pledges are fully achieved on schedule. In this scenario, global CO2 emissions would decrease significantly, limiting warming to around 2.1°C by 2100. Renewable energy would dominate electricity generation, and there would be significant declines in oil and coal use, although natural gas use would still increase slightly.
- **Therefore, need for Concrete Policies**

Number of countries with NDCs, long-term strategies and net zero pledges, and their shares of 2020 global CO_2 emissions



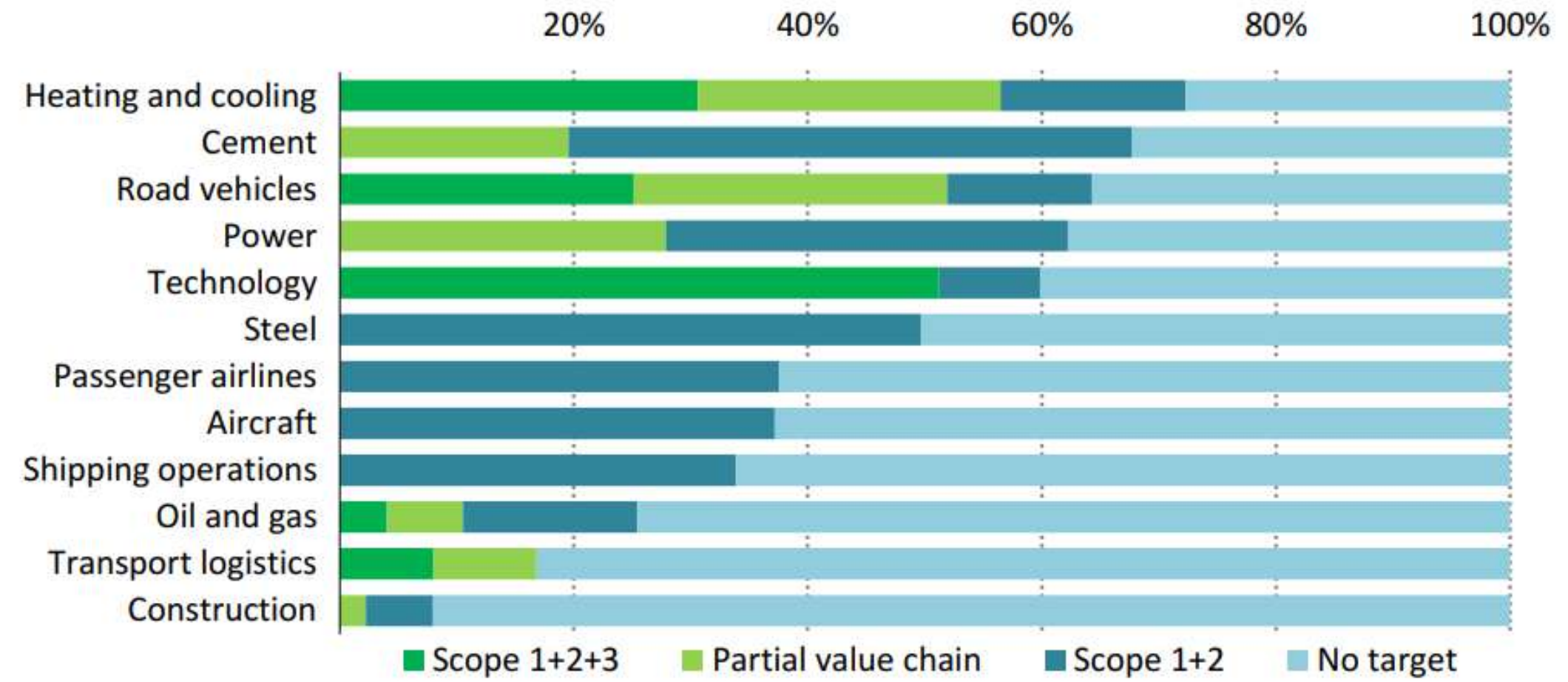
Around 40% of countries that have ratified the Paris Agreement have updated their NDCs, but net zero pledges cover around 70% of global CO_2 emissions

Number of national net zero pledges and share of global CO_2 emissions covered



There has been a significant acceleration in net-zero emissions pledges announced by governments, with an increasing number enshrined in law

Sectoral activity of large energy-related companies with announced pledges to reach net-zero emissions by 2050



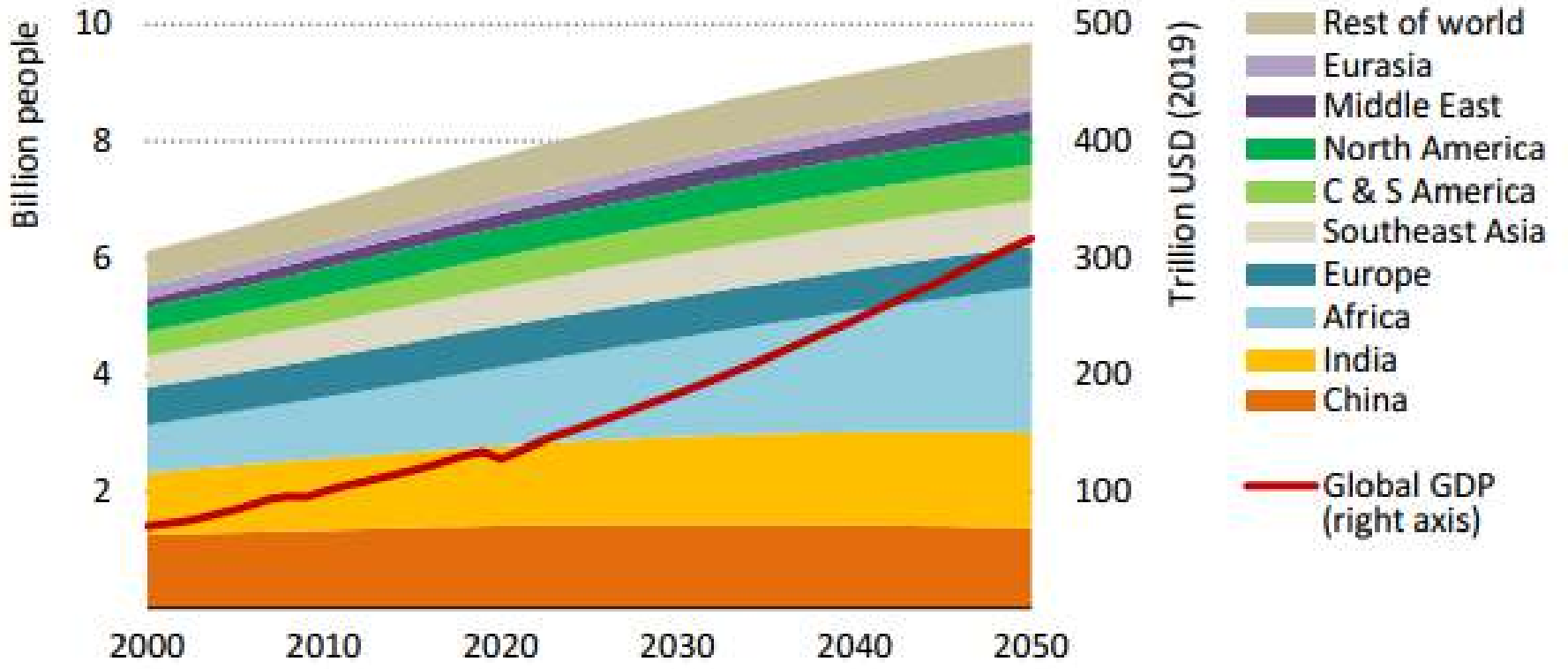
Some sectors are more advanced in terms of the extent of net zero targets by companies active in the sector

A global pathway to net-zero CO2 emissions in 2050

- The Net-Zero Emissions by 2050 Scenario (NZE) outlines the necessary steps for the global energy sector to reach net-zero CO2 emissions by 2050, aiming to limit the global temperature rise to 1.5 °C with a 50% probability. This ambitious goal requires significant increases in government ambitions beyond current commitments.

- **Emissions Reduction:** Energy-related and industrial CO2 emissions must drop nearly 40% by 2030 and reach net zero by 2050, alongside achieving universal sustainable energy access and a 75% reduction in methane emissions from fossil fuel use by 2030.

World population by region and global GDP in the NZE



By 2050, the world's population expands to 9.7 billion people and the global economy is more than twice as large as in 2020

Notes: GDP = gross domestic product in purchasing power parity; C & S America = Central and South America.

Sources: IEA analysis based on UNDESA (2019); Oxford Economics (2020); IMF (2020a, 2020b).

- **Energy Supply and Sources:** The total energy supply will decrease by 7% by 2030, stabilizing through 2050. Solar PV and wind will lead electricity sources, providing nearly 70% of global generation by 2050. The use of traditional bioenergy is eliminated by 2030.

- **Decline in Fossil Fuels:** By 2050, coal demand drops by 90%, oil by 75%, and natural gas by 55%. Remaining fossil fuel usage is limited to sectors where carbon is embedded in products, plants with CCUS, and sectors lacking low-emissions technology.

Fossil fuel prices in the NZE

Real terms (USD 2019)	2010	2020	2030	2040	2050
IEA crude oil (USD/barrel)	91	37	35	28	24
Natural gas (USD/MBtu)					
United States	5.1	2.1	1.9	2.0	2.0
European Union	8.7	2.0	3.8	3.8	3.5
China	7.8	5.7	5.2	4.8	4.6
Japan	12.9	5.7	4.4	4.2	4.1
Steam coal (USD/tonne)					
United States	60	45	24	24	22
European Union	108	56	51	48	43
Japan	125	75	57	53	49
Coastal China	135	81	60	54	50

CO_2 prices for electricity, industry and energy production in the NZE

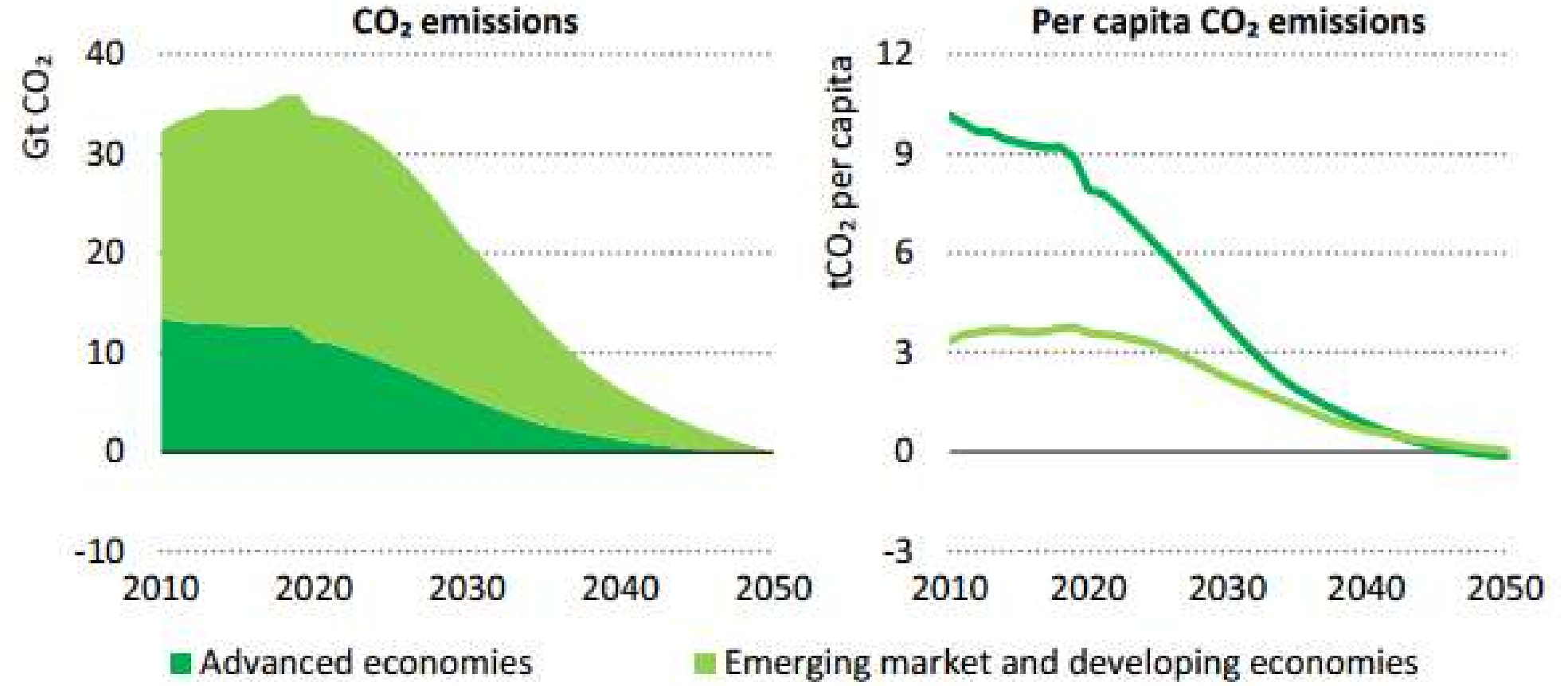
USD (2019) per tonne of CO_2	2025	2030	2040	2050
Advanced economies	75	130	205	250
Selected emerging market and developing economies*	45	90	160	200
Other emerging market and developing economies	3	15	35	55

* Includes China, Russia, Brazil and South Africa.

- **Emissions Savings:** Energy efficiency, wind, and solar account for half of the emissions savings by 2030. Post-2030, electrification, hydrogen use, and CCUS play increasing roles, with over half of the emissions savings from 2030 to 2050 coming from technologies not fully available today.

- **CO2 Removal and Hydrogen Demand**: In 2050, the NZE includes 1.9 Gt of CO2 removal and a demand for 520 million tonnes of low-carbon hydrogen. Behavioral changes contribute to avoiding 1.7 Gt of CO2 emissions in 2030.

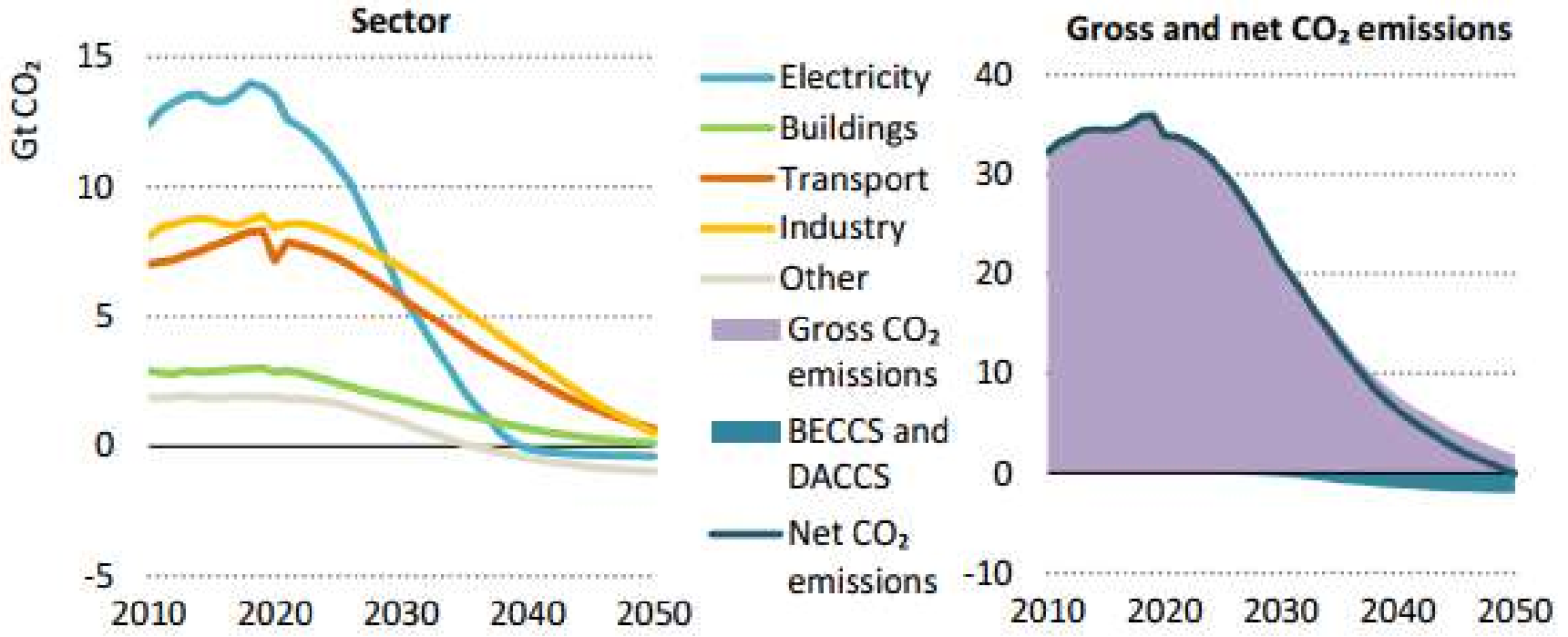
Global net CO_2 emissions in the NZE



CO_2 emissions fall to net zero in advanced economies around 2045 and globally by 2050. Per capita emissions globally are similar by the early-2040s.

Note: Includes CO_2 emissions from international aviation and shipping.

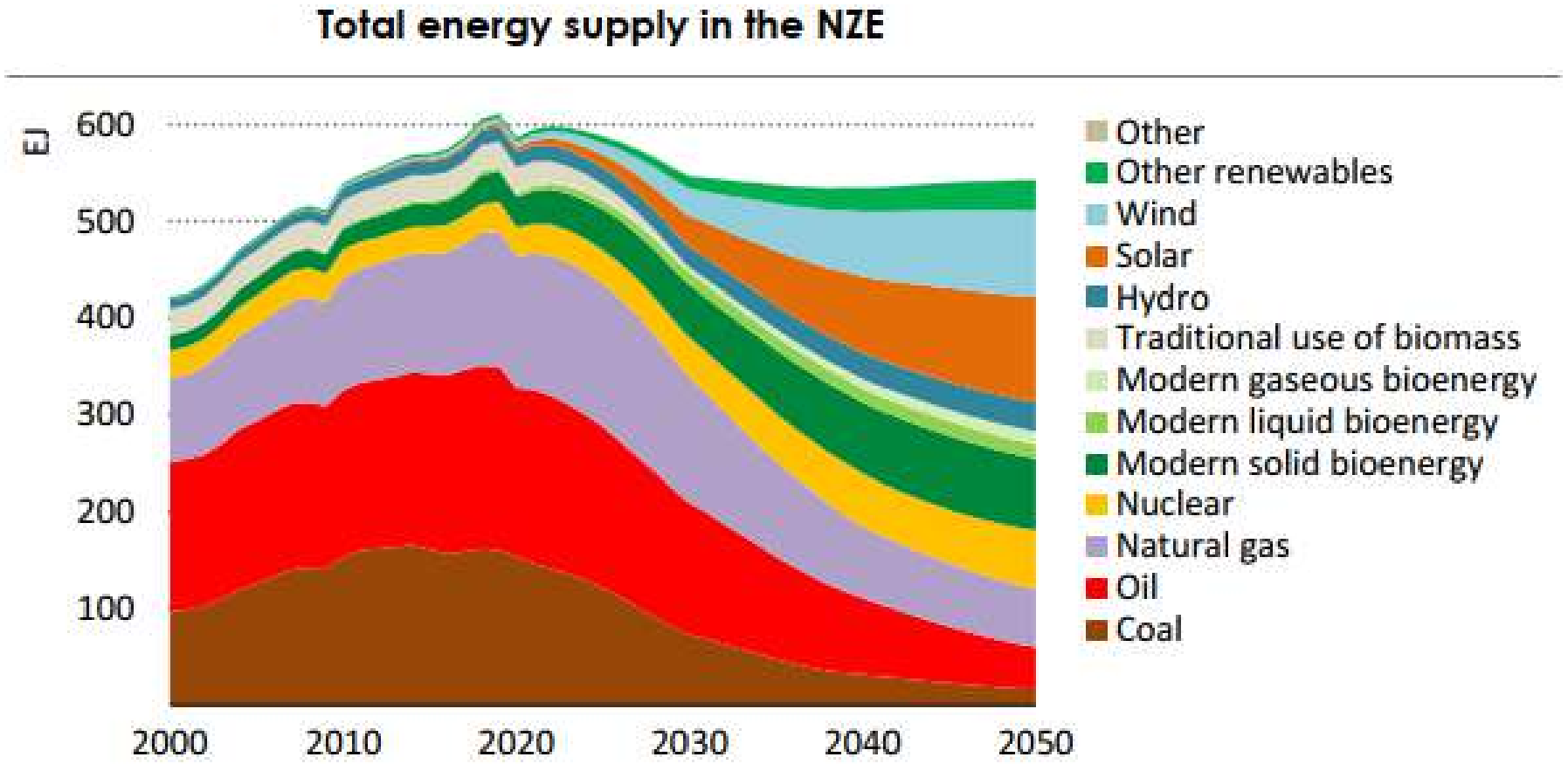
Global net-CO_2 emissions by sector, and gross and net CO_2 emissions in the NZE



Emissions from electricity fall fastest, with declines in industry and transport accelerating in the 2030s. Around 1.9 Gt CO_2 are removed in 2050 via BECCS and DACCS.

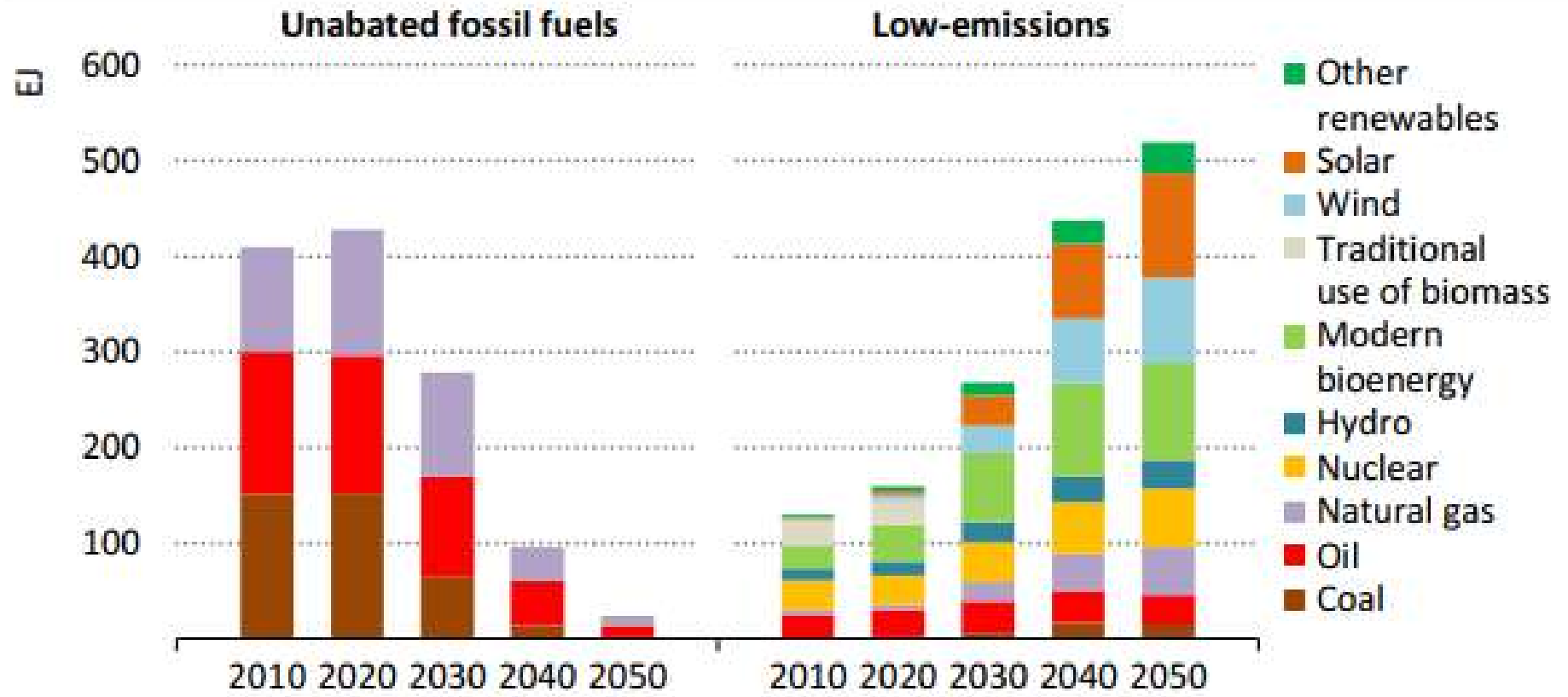
Notes: Other = agriculture, fuel production, transformation and related process emissions, and direct air capture. BECCS = bioenergy with carbon capture and storage; DACCS = direct air capture with carbon capture and storage. BECCS and DACCS includes CO_2 emissions captured and permanently stored.

Total energy supply



Renewables and nuclear power displace most fossil fuel use in the NZE, and the share of fossil fuels falls from 80% in 2020 to just over 20% in 2050

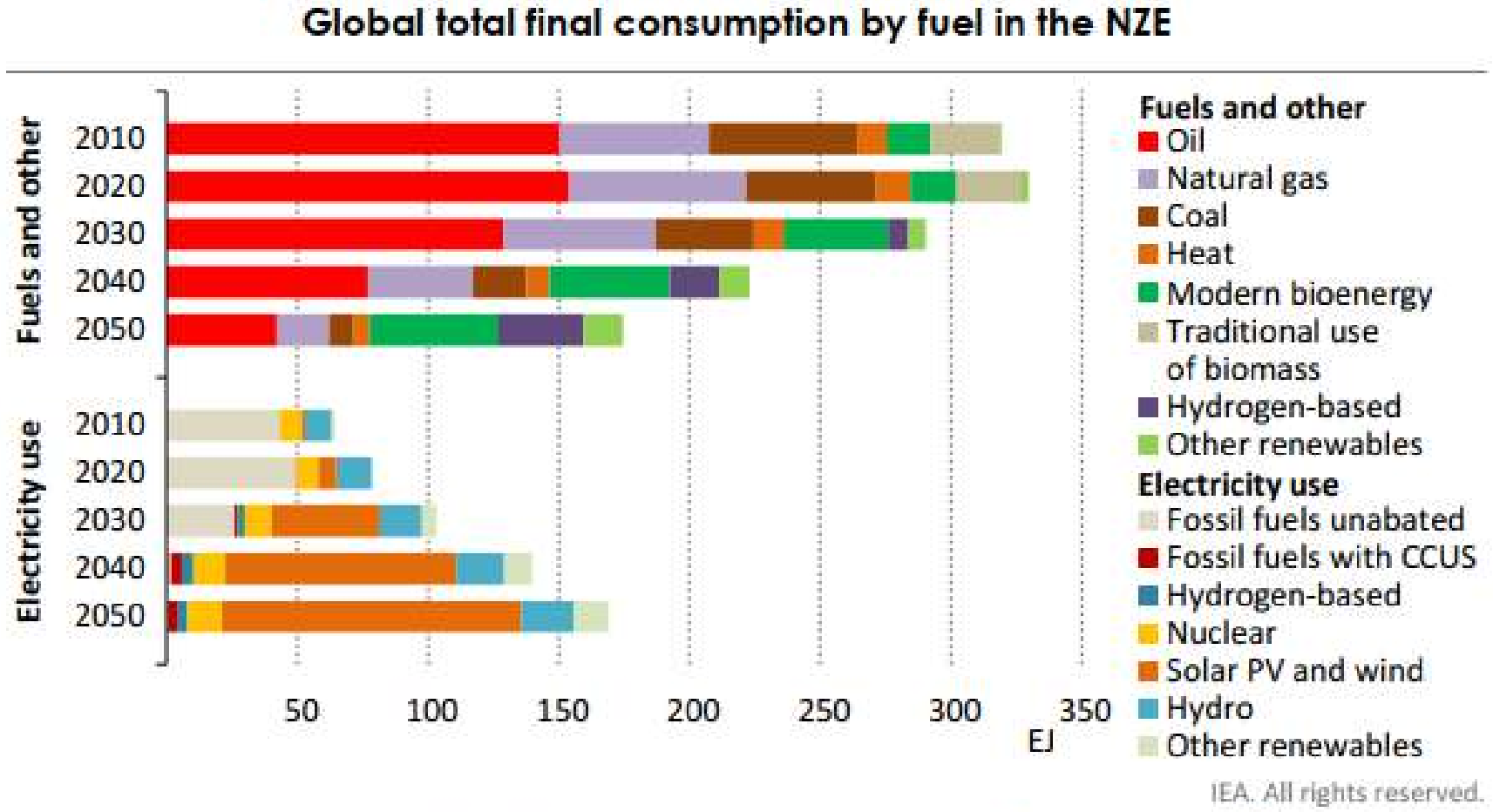
Total energy supply of unabated fossil fuels and low-emissions energy sources in the NZE



Some fossil fuels are still used in 2050 in the production of non-energy goods, in plants equipped with CCUS, and in sectors where emissions are hard to abate

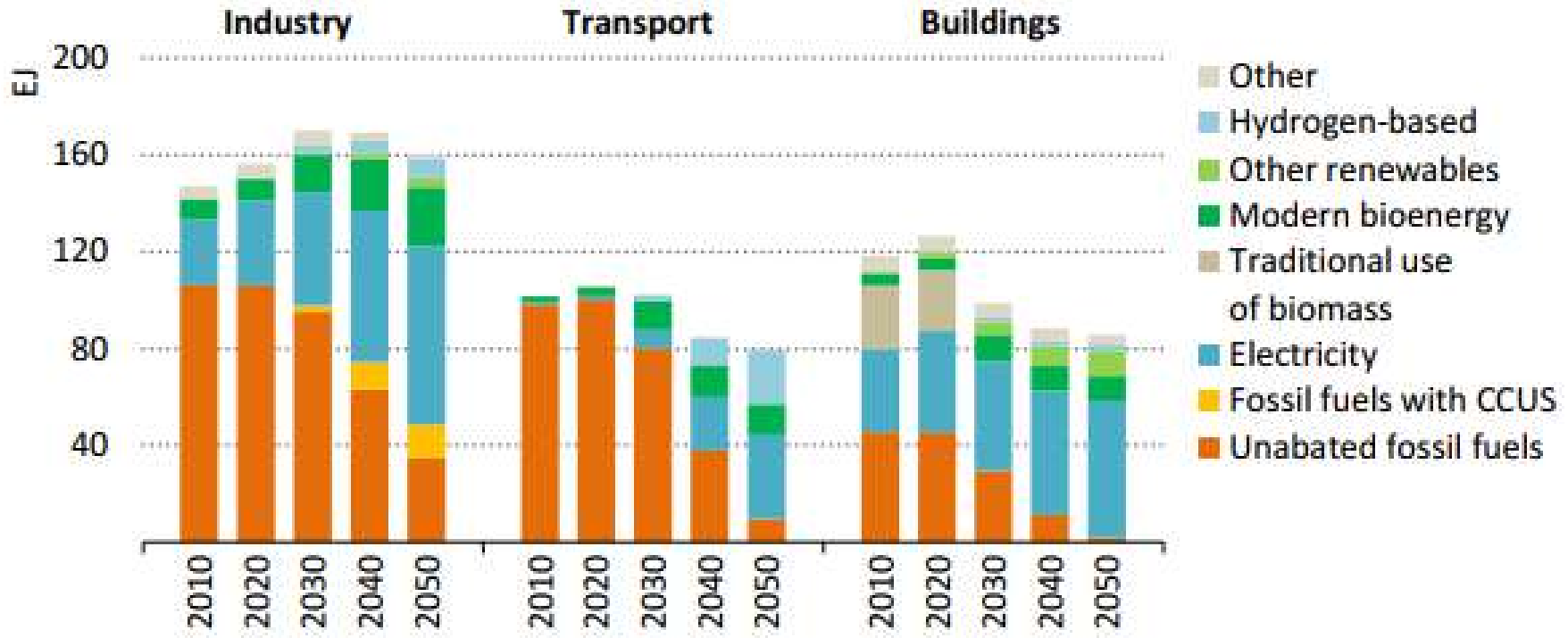
Note: Low-emissions includes the use of fossil fuels with CCUS and in non-energy uses.

Total energy consumption



Note: Hydrogen-based includes hydrogen, ammonia and synthetic fuels.

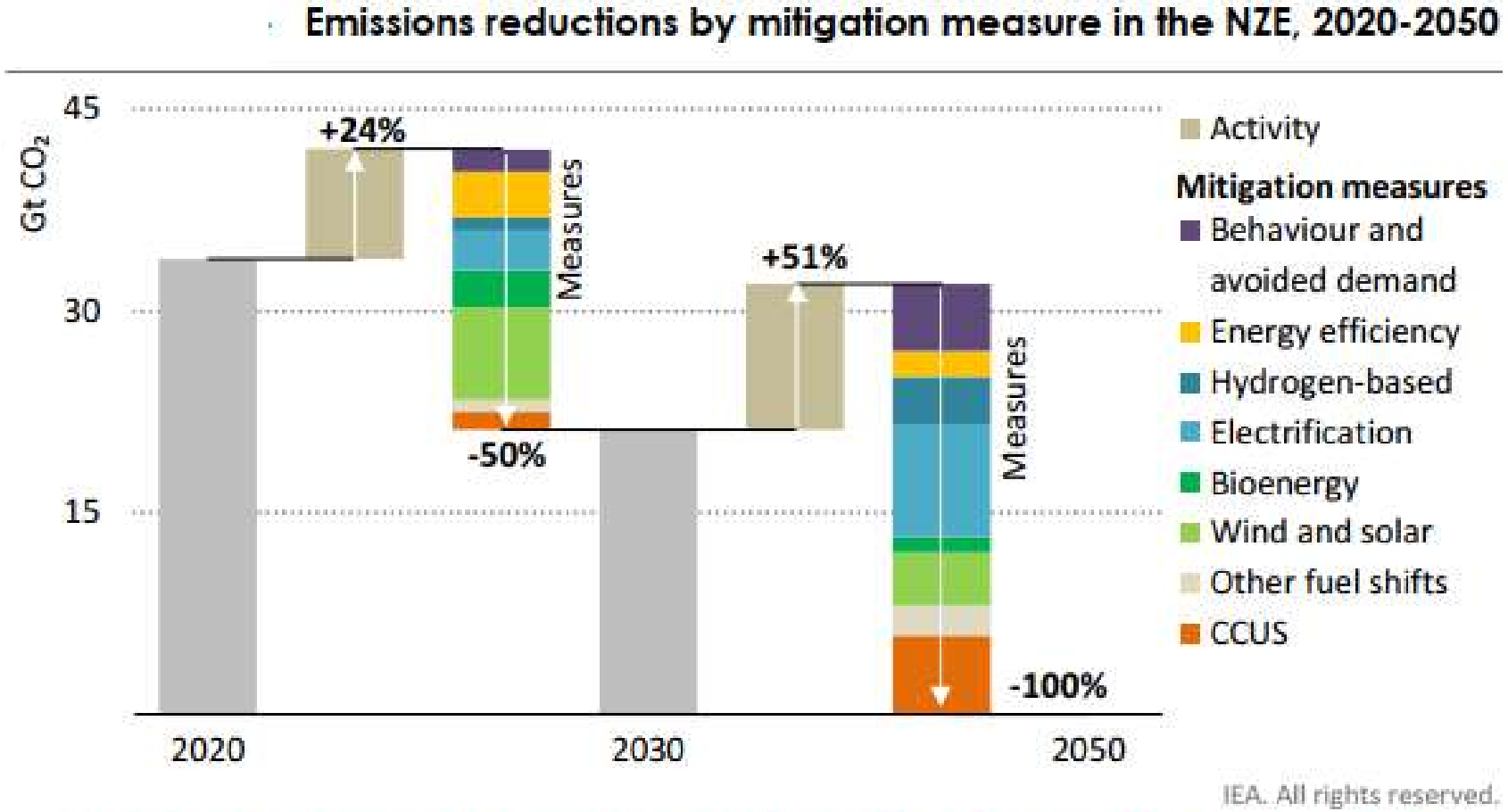
Global final energy consumption by sector and fuel in the NZE



There is a wholesale shift away from unabated fossil fuel use to electricity, renewables, hydrogen and hydrogen-based fuels, modern bioenergy and CCUS in end-use sectors

Note: Hydrogen-based includes hydrogen, ammonia and synthetic fuels.

Key pillars of decarbonization and uncertainties



Solar, wind and energy efficiency deliver around half of emissions reductions to 2030 in the NZE, while electrification, CCUS and hydrogen ramp up thereafter

Notes: Activity = energy service demand changes from economic and population growth. Behaviour = energy service demand changes from user decisions, e.g. changing heating temperatures. Avoided demand = energy service demand changes from technology developments, e.g. digitalisation. Other fuel shifts = switching from coal and oil to natural gas, nuclear, hydropower, geothermal, concentrating solar power or marine.

Key global milestones for energy efficiency in the NZE

Sector	2020	2030	2050
Total energy supply	*2010-20*	*2020-30*	*2030-50*
Annual energy intensity improvement (MJ per USD GDP)	-1.6%	-4.2%	-2.7%
Industry			
Energy intensity of direct reduced iron from natural gas (GJ per tonne)	12	11	10
Process energy intensity of primary chemicals (GJ per tonne)	17	16	15
Transport			
Average fuel consumption of ICE heavy trucks fleet (index 2020=100)	100	81	63
Buildings			
Share of zero-carbon-ready buildings in total stock	<1%	25%	>85%
New buildings: heating & cooling energy consumption (index 2020=100)	100	50	20
Appliances: unit energy consumption (index 2020=100)	100	75	60

Notes: ICE = internal combustion engine; zero-carbon-ready buildings = see description in section 3.7.

Key global milestones for behavioural change in the NZE

Sector	Year	Milestone
Industry	2020	• Global average plastics collection rate = 17%.
	2030	• Global average plastics collection rate = 27%. • Lightweighting reduces the weight of an average passenger car by 10%.
	2050	• Global average plastics collection rate = 54%. • Efficiency of fertiliser use improved by 10%.
Transport	2030	• Eco-driving and motorway speed limits of 100 km/h introduced. • Use of ICE cars phased out in large cities.
	2050	• Regional flights are shifted to high-speed rail where feasible. • Business and long-haul leisure air travel does not exceed 2019 levels.
Buildings	2030	• Space heating temperatures moderated to 19-20 °C on average. • Space cooling temperatures moderated to 24-25°C on average. • Excessive hot-water temperatures reduced.
	2050	• Use of energy-intensive materials per unit of floor area decreases by 30%. • Building lifetime extended by 20% on average.

Note: Eco-driving involves pre-emptive stopping and starting; ICE = internal combustion engine.

Key global milestones for electrification in the NZE

Sector		2020	2030	2050
Share of electricity in total final consumption		20%	26%	49%
Industry				
Share of steel production using electric arc furnace		24%	37%	53%
Electricity share of light industry		43%	53%	76%
Transport				
Share of electric vehicles in stock:	cars	1%	20%	86%
	two/three-wheelers	26%	54%	100%
	bus	2%	23%	79%
	vans	0%	22%	84%
	heavy trucks	0%	8%	59%
Annual battery demand for electric vehicles (TWh)		0.16	6.6	14
Buildings				
Heat pumps installed (millions)		180	600	1 800
Share of heat pumps in energy demand for heating		7%	20%	55%
Million people without access to electricity		786	0	0

Key deployment milestones for renewables

Sector		2020	2030	2050
Electricity sector				
Renewables share in generation		29%	61%	88%
Annual capacity additions (GW):	Total solar PV	134	630	630
	Total wind	114	390	350
	– *of which: Offshore wind*	5	80	70
	Dispatchable renewables	31	120	90
End-uses sectors				
Renewable share in TFC		5%	12%	19%
Households with rooftop solar PV (million)		25	100	240
Share of solar thermal and geothermal in buildings		2%	5%	12%
Share of solar thermal and geothermal in industry final consumption		0%	1%	2%

Note: TFC = total final consumotion.

Table 2.7 ▷ Key deployment milestones for hydrogen and hydrogen-based fuel

Sector	2020	2030	2050
Total production hydrogen-based fuels (Mt)	**87**	**212**	**528**
Low-carbon hydrogen production	9	150	520
share of fossil-based with CCUS	*95%*	*46%*	*38%*
share of electrolysis-based	*5%*	*54%*	*62%*
Merchant production	15	127	414
Onsite production	73	85	114
Total consumption hydrogen-based fuels (Mt)	**87**	**212**	**528**
Electricity	0	52	102
of which hydrogen	0	43	88
of which ammonia	0	8	13
Refineries	36	25	8
Buildings and agriculture	0	17	23
Transport	0	25	207
of which hydrogen	0	11	106
of which ammonia	0	8	44
of which synthetic fuels	0	5	56
Industry	51	93	187

Note: Hydrogen-based fuels are reported in million tonnes of hydrogen required to produce them.

Table 2.8 ▷ Key deployment milestones for bioenergy

	2020	2030	2050
Total energy supply (EJ)	**63**	**72**	**102**
Share of advanced biomass feedstock	27%	85%	97%
Modern gaseous bioenergy (EJ)	**2.1**	**5.4**	**13.7**
Biomethane	0.3	2.3	8.3
Modern liquid bioenergy (mboe/d)	**1.6**	**6.0**	**7.0**
Advanced biofuels	0.1	2.7	6.2
Modern solid bioenergy (EJ)	**32**	**54**	**74**
Traditional use of solid biomass (EJ)	**25**	**0**	**0**
Million people using traditional biomass for cooking	2 340	0	0

Notes: mboe/d = million barrels of oil equivalent per day. Bioenergy from forest plantings is considered advanced when forests are sustainably managed (see section 2.7.2).

Table 2.9 ▷ Key global milestones for CCUS

	2020	2030	2050
Total CO_2 captured (Mt CO_2)	**40**	**1 670**	**7 600**
CO_2 captured from fossil fuels and processes	39	1 325	5 245
Power	3	340	860
Industry	3	360	2 620
Merchant hydrogen production	3	455	1 355
Non-biofuels production	30	170	410
CO_2 captured from bioenergy	1	255	1 380
Power	0	90	570
Industry	0	15	180
Biofuels production	1	150	625
Direct air capture	0	90	985
Removal	0	70	630

Indonesian context

Indonesia's energy sector is facing several challenges

PLN's financial sustainability is challenged by inadequate tariff and revenue structure. Large investment will be needed for the energy transition which will require a financially sustainable utility.

The **fragmented sector regulation challenges** effective coordination of sector policies and energy transition goals.

Indonesia is lagging behind peers in Variable Renewable Energy deployment and has yet to adopt standards of automation and digitalization.

Despite some progress, **the grid quality stays low** with poor reliability.

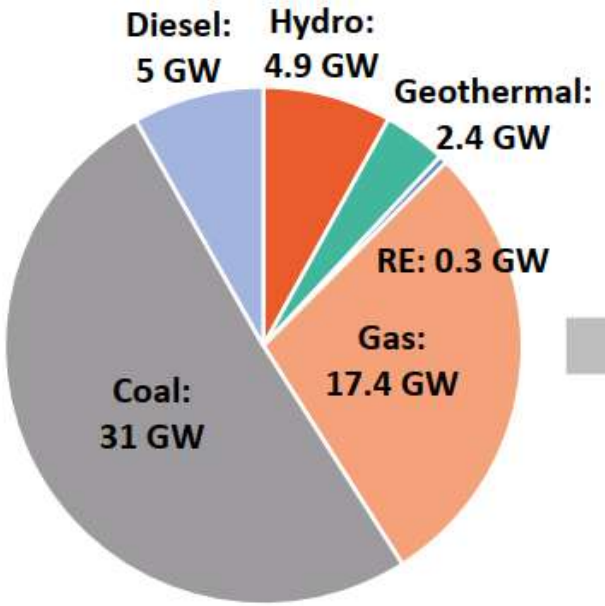
Coal and fuel subsidies as well as renewable energy pricing distortions constrain the mobilization of private investments in RE.

The **coal phasedown** is likely to have measurable economic and social impacts, including in coal-dependent regions

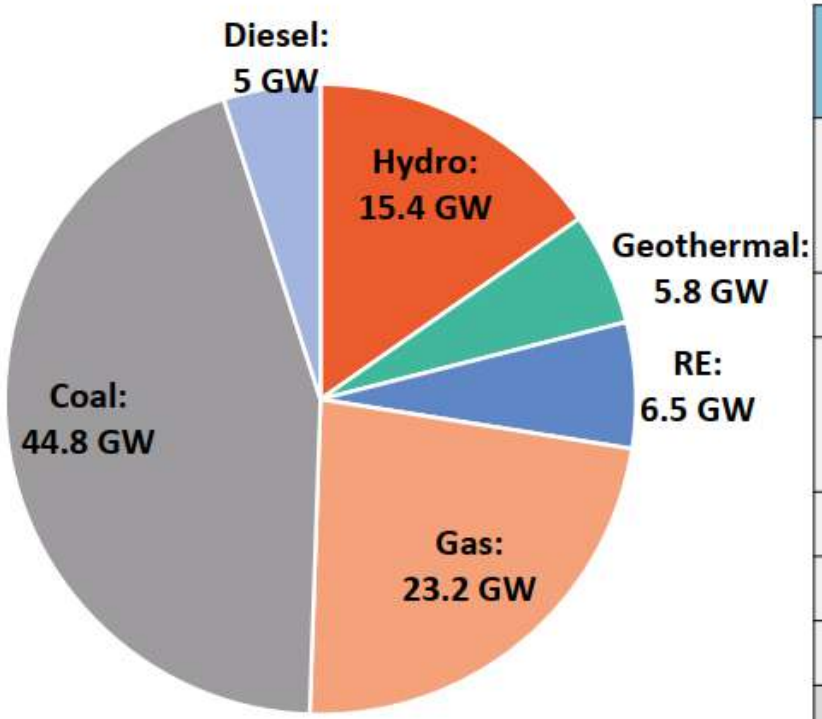
Power sector decarbonization is now a priority for the government

New RUPTL master plan significantly reduces the planned coal capacity, but more needs to be done

2020 : 61.1 GW



Target 2030: 100.7 GW



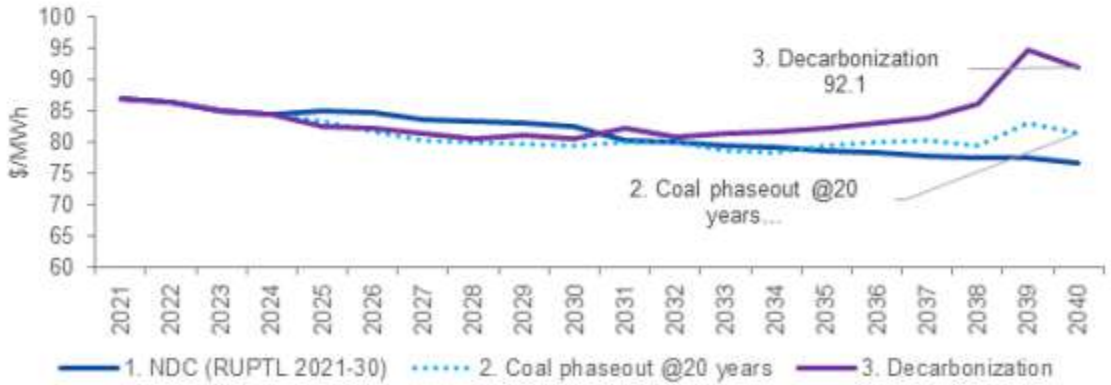
Technology	RUPTL 2019 – 2028 targets	RUPTL 2021 – 2030 targets	difference
Hydro (and pump storage)	14.5	15.4	6%
Geothermal	5.2	5.8	12%
RE (PV, wind, biomass)	2.6	6.5	145%
Gas	28.8	23.2	-20%
Coal	56	44.8	-20%
Diesel	5	5	-
Total	112.1	100.7	-10%

But decarbonization faces several challenges in Indonesia and all options need to be explored

Power sector decarbonization is facing technical and economic constraints

- **Limited space to integrate RE**
- **Complex island grid situation limiting potential for imports**
- **Excess power and potential carbon lock-in**
- **Regulatory impediments**

Average Cost of Electricity Generation under the three Transition scenarios



but options are available

- **A scenario-based analysis** focused on the Java-Bali grid was carried out to assess decarbonization options for the next two decades.
- Three scenarios were assessed: **Phasing down coal and scaling up RE are central to reducing the carbon footprint of the power sector.**
- Under the *Coal Phase down* scenario coal power generation would move from 30% of the mix in 2040 in the *baseline* scenario to 5% and **emissions would be cut by 40% while the generation cost would increase by 6% in 2040*** compared to the baseline scenario.
- Under the more ambitious decarbonization scenario (emissions cut by 70% in 2040 vs the NDC Scenario), **coal is fully phased-out in 2040** and **the generation cost is 27% higher*** than in the NDC scenario.

*Not including the cost of coal plant retirement

Policy Recommendations: Decarbonization Planning, Sector Efficiency and Performance

- **Decarbonization planning:**
  - **Aligning strategies and targets across Government agencies** will be critical to minimize the costs and risks of stranded assets in the future.
  - To that end, **appropriate pathways to phasing-down coal with innovative financing** mechanisms will need to be carefully assessed.
  - Solutions to decarbonize the grid such as **interconnections (domestic and international), Carbon Capture and Storage (CCS) or hydrogen** need to be explored further.

- To improve sector coordination, a **new inter-ministerial commission** could be created to align environment, financial and fiscal targets.

- To improve sector efficiency, **separating system planning, generation procurement and system operations from PLN's other activities** could increase transparency and reduce conflicts of interest.

Policy Recommendations: Clean Energy Deployment

- **Develop clear medium-term VRE deployment targets with associated tender timelines** would help PLN benefit from low PV and wind power prices.

- Three regulatory changes can help Indonesia boost private investment in RE: **reducing local content requirements, phasing out coal and fuel subsidies and lifting RE price controls.**

- **New investments in grid flexibility** are needed to integrate RE and **appropriate pricing mechanisms** and regulation is critical for their viability.

Policy Recommendations: Financial Sustainability

- **Setting the appropriate revenue requirements** is critical for the financial viability of PLN.
- **Increasing the share of revenue received from tariffs through a subsidy reform** will improve PLN's financial health.
- PLN could explore **new financing schemes and sources** and develop an ESG framework

Stakeholder collaboration

Net Zero Cities

Kpmg.com

https://www.youtube.com/watch?v=h7mL6nfm4eI

Energy: Reppie waste-to-energy plant[42]

The Addis Ababa City Administration in partnership with Cambridge Industries has set up the Africa's first waste to energy plant. The plant uses municipal waste as fuel for power generation. It has a capacity to treat 1400 tonnes of waste on a daily basis to generate steam that drives two 25MW turbines. The two generators combined have the capacity to generate 185,000,00 kwh. The combustion process also sorts metal. The plant has cross – sectoral impact on waste and built environment sectors as the green energy produced from 80 percent waste is used to power 30 percent household electricity needs.

Waste and sanitation: Ghabawi Landfill Gas Capture and Power Generation Project [48]

Led by the Greater Amman Municipality this waste-to energy project main objective is to conduct power generation, gas combustion using landfill gas (LFG) and methane gas generated from the site. The Ghabawi Landfill gas will generate 4.8MW per hour by burning methane that will eventually cover the municipality's energy consumption. The power generated can power the landfill and the remainder will be directed to the national grid. This project hopes to reduce greenhouse gases emitted, optimize waste treatment, and reduce to the pressure on current energy systems. This project is funded by the European Bank for Reconstruction and Development.

Waste and sanitation: Amsterdam Circular

Amsterdam has put in place a strategy that gives direction for the next five years for the municipality, residents, and business in three areas of the city's circular economy. These are food and organic waste, consumer goods and the built environment. The city has specifically selected the three areas of focus due to the economic significance to the city and they impact on the environment. The city has put in place bold ambitions such as deploying spatial planning and innovation policy to advance and deepen the decarbonization of the waste sector by designating specific locations for the collection and reuse of waste.[54]

It has set targets that by 2022, 10 percent of the city's procurement will be circular; by 2023, all of the city's invitations to tender in the built environment will be circular; by 2030, it will have 50 percent less new raw materials in Amsterdam; and by 2050, it will be a 100 percent circular city.

Built environment: Energy savings subsidy [63]

The Beijing Municipal Government and the Haidian District Government granted an energy saving endorsement and financial subsidy to the Microsoft Beijing campus rewarding the buildings performance. Johnson Controls partnered with Microsoft Beijing Campus for its ongoing retrofit and optimization of building operations, achieving 27.9 percent energy savings, and ensuring key equipment uptime to 98 percent.

The subsidy encourages developers, companies, and other key stake holders to implement energy efficiency in building operations aligning with the city's climate action plan that aims to arrive at net zero in the energy and built environment sectors.

Mobility and connectivity: BiciCarga

Freight cargo mainly old trucks are responsible for around 40 percent of fine particulate pollution in Bogotá. The BiciCarga pilot project funded by the World Bank and coordinated by the Bogotá transport commissions aims to save 16 metric tons of particulate matter each day by switching trucks for electric cargo bikes.[64]

Another objective of the project was to solve bottlenecks of last mile distribution to facilitate the delivery of merchandise quickly and efficiently and streamline operational inefficiencies in distribution.

Built environment: Cape Town ceiling retrofit project[76]

The city undertook retrofitting of several homes the city to address the demand for energy. The project involves the insulating of ceilings which would decrease the energy cost for residents and improve health complications caused by inappropriate insulation materials. Cape Town's cold climate makes its residents susceptible to tuberculosis and other illnesses, especially in low-income neighborhoods where housing often lacks the proper insulation further affecting indoor air quality. Through this project, the city has been able to address energy efficiency and public health concerns, illustrating the many ways that equitable climate action can be realized. Ultimately the initiative aims to realized reduced healthcare and energy costs, a reduction in emissions and improved quality of life for residents.

Built environment: Dubai building code[83]

The code was developed by the city to unify building design across the municipality. The building code is easy to use and mandates minimum requirements to help ensure sustainable development of buildings, health, safety, welfare of people inside and around buildings and design techniques to reduce impact of the surrounding environment.

Built environment: Al Sa'fat Dubai green building system[84]

The city has crafted its own unique green building requirements which are mandatory requirements for all new buildings to meet certain performance rankings. The Al Sa'fat system enhances buildings users' safety and aims to ensure a more sustainable environment and spurs innovation, integration between green technology in building design that leads to improved performance, low energy consumption, efficiency of electrical and mechanical system and low carbon footprint through the life cycle of the building.

Mobility and connectivity: Zukunftstaxi[89]

An innovative partnership between the City of Hamburg, Hamburg's taxi association, the Hamburg Chamber of Commerce taxis and Hamburg Taxis, will implement emission free taxis. The project is supported and financed by a consortium of private sector partners. Apart from meeting the cities net zero targets in the transport sector, the project aims to engage taxi businesses as co-partners in the transition to net zero. The EV mobility sector is increasingly becoming competitive as customers align their consumption choices to sustainable initiatives.

Energy: Solar power station carbon reduction[95]

In collaboration with the Government of Hong Kong SAR, HK Electric built the city's largest commercial power systems with a generating capacity of 1MW. Using a new technology, the solar panels perform better under the city's high temperature making them more efficient and cost effective.

The solar power system is expected to generate 1,100,000 units of electricity annually. The power generated is fed directly to HK Electric's 380 V electrical system. This project is line with the city's climate action plan that aims to achieve net zero electricity by 2050. This project is expected to reduced carbon emissions by 915 tonnes annually. [96]

Energy sector: Solar panel loans[106]

The Development Bank of Jamaica and the National Housing Trust provide low interest loans to facilitate installation and retrofitting of solar water heating systems. The aim of the initiative is to increase energy efficiency in residential and commercial buildings. The loan is available to contributors who can provide a title for a residential property or who has at least enough funds in their Contribution Account at the NHT equal to the cost of the system, plus JMD20,000. The loan can be obtained at an interest rate of 3 percent over a maximum period of five years with a 5 percent service charge.[107]

Waste and sanitation: Recycle Right citizens' workgroup[157]

As part of the City of Singapore's Zero Waste Masterplan, the government has set up a recycle right citizens workgroup to co create solutions with the public on improving recycling in the home. The government opened a call for participation and selected a total of 48 citizens from diverse backgrounds. Over a period of 30 days, the selected citizens interact with waste and recycling experts to come up with key recommendations. The recommendations are submitted to the Ministry of Environment and Water Resources and developed into projects, one of which is developed and implemented. This innovative initiative puts public participation and citizen engagement at the core of climate action.

Terima kasih

handic@pps.untar.ac.id

CarbonTropic
Carbon Solution Institute

Gedung STC Lantai 2 Ruang 35 Jl. Asia Afrika Pintu IX Gelora Senayan Tanah Abang Jakarta 10270

Ucapan Terima Kasih

No: 002 – PPSEKN/XI/2024

Perhimpunan Penggiat Solusi Emisi Karbon Nusantara (PPSEKN, atau *Carbon Solution Institute*) menyampaikan penghargaan dan terima kasih atas kesediaan Bapak **Handi Chandra-Putra, PhD** untuk menjadi pemantik diskusi Perhimpunan dengan tema ***Net Zero World*** **dan Prospek Perdagangan Carbon di Indonesia**, pada:

Rabu, 6 November 2024

Diskusi telah berjalan dengan baik dan produktif, dan dihadiri oleh anggota Perhimpunan dan mitra-mitra kerjanya.

Jakarta, 11 November 2024

Ketua Perhimpunan,

PERHIMPUNAN PENGGIAT SOLUSI EMISI KARBON NUSANTARA
JAKARTA

Erwin Fahmi