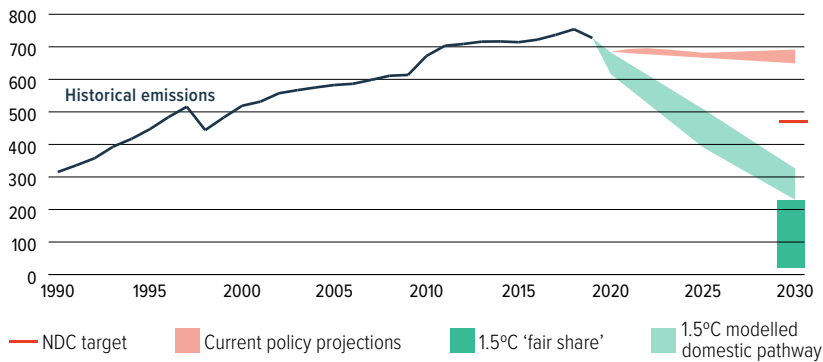


SOUTH KOREA

CLIMATE TRANSPARENCY REPORT: COMPARING G20 CLIMATE ACTION

2022

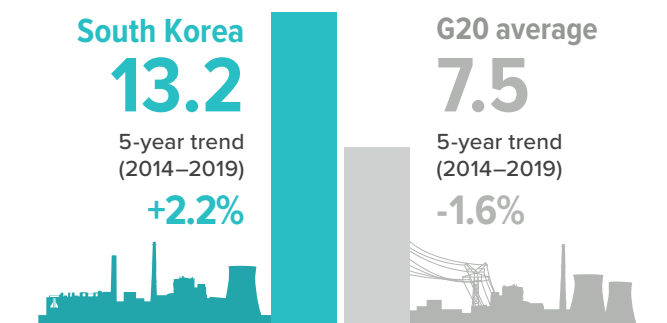

NOT ON TRACK FOR A 1.5°C WORLD

1.5°C compatible emissions pathway (MtCO₂e/year)¹


South Korea's NDC target would increase emissions 48% above 1990 levels, or to approximately 468 MtCO₂e (excl. LULUCF). To keep below the 1.5°C temperature limit, analysis by the 1.5°C Pathways Explorer shows that its emissions would need to be around 288 MtCO₂e by 2030, leaving an ambition gap of about 180 MtCO₂e. To be in line with its 'fair share' contribution to the Paris Agreement's 1.5°C temperature limit, South Korea would need to significantly strengthen its target.

*Climate Action Tracker, 2022a, 2022b;
Climate Analytics, 2022; Gütschow et al., 2021*

PER CAPITA GREENHOUSE GAS (GHG) EMISSIONS ABOVE G20 AVERAGE

tCO₂e/capita² in 2019


South Korea's per capita emissions are 1.77 times the G20 average. Total per capita emissions have increased by 2% from 2014 to 2019.

Gütschow et al., 2021; World Bank, 2022

RECENT DEVELOPMENTS



South Korea submitted its updated NDC in December 2021, which includes a target of **40% emissions reduction** by 2030 below 2018 levels.



In November 2021, then-President Moon Jae-in announced the phase-out of coal by 2050 based on South Korea's 2050 Carbon Neutrality Scenario, which **does not align with the global 1.5°C goal**.



According to the draft of the 10th National Electricity Plan, the South Korean government plans to lower its 2030 renewable energy target, **a drop from 30.2% to 21.5%**, and focus on expanding the share of nuclear in the power mix and increasing LNG capacities.

KEY OPPORTUNITIES FOR ENHANCING CLIMATE AMBITION



The new government has pledged to reform the monopoly-based electricity market by expanding the permissible range of Power Purchase Agreements to increase the capacity of renewables.



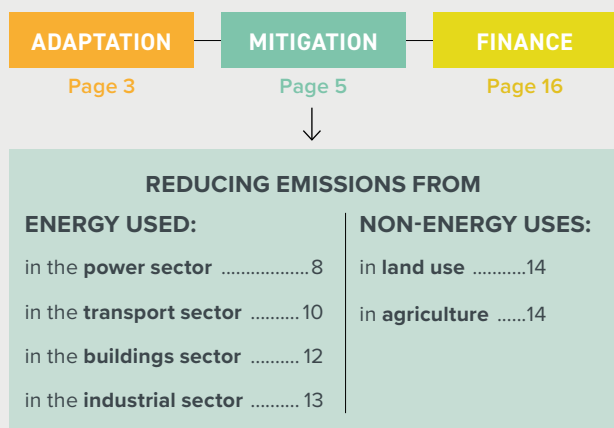
Any updates to the Emissions Trading Scheme (ETS) should further reduce emissions allowances to align with the NDC's 2030 targets, and leverage its coverage over the companies producing 75% of total GHG emissions.



South Korea's majority state-owned utility, KEPCO, reported its highest operating loss of USD 10.2bn in the first half of 2022 due to its over-reliance on fossil fuel assets, clearly highlighting the need to reform the bundled power market.

Contents

We unpack South Korea's progress and highlight key opportunities to enhance climate action across:



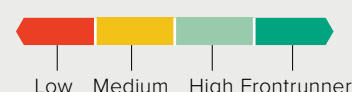
Legend

Trends show developments over the past five years for which data are available. A red exclamation mark indicates negative trends from a climate protection perspective.

Decarbonisation Ratings³ assess a country's performance compared to other G20 Members. A high score reflects a relatively good effort from a climate protection perspective but is not necessarily 1.5°C compatible.



Policy Ratings⁴ evaluate a selection of policies that are essential pre-conditions for the longer-term transformation required to meet the 1.5°C limit.



SOCIO-ECONOMIC CONTEXT

Human Development Index



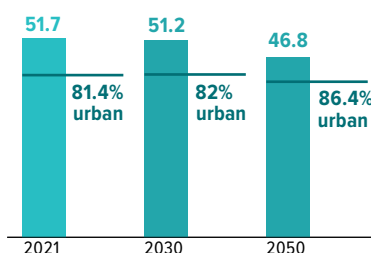
The Human Development Index (HDI) reflects life expectancy, level of education, and per capita income. South Korea ranks very high.

0.92 Very high

Data for 2019.
UNDP, 2020

Population and urbanisation projections

(in millions)

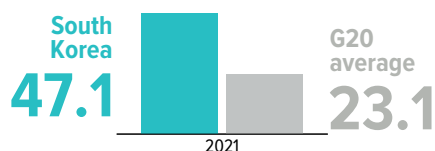


South Korea's population is projected to decrease by 9.5% by 2050, and become more urbanised. The country's urban areas are particularly vulnerable to heat stress; high temperatures worsen the existing impacts of high levels of air pollution.

Cullis et al., 2019; Gannon et al., 2018;
United Nations, 2018; World Bank, 2022

Gross Domestic Product (GDP) per capita

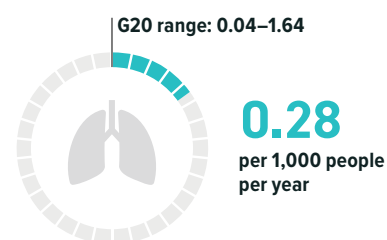
(thousand PPP constant 2015 international \$ per person) in 2021



World Bank, 2021

Death rate attributable to ambient air pollution

(death rate per 1,000 population per year, age standardised) in 2019



Over 23,100 people die in South Korea every year due to stroke, heart disease, lung cancer and chronic respiratory diseases as a result of outdoor air pollution. This is around the median level among the G20.

Institute for Health Metrics and Evaluation, 2020

A JUST TRANSITION

South Korea's economy is highly dependent on heavy industry including, for example, the production of internal combustion engine vehicles and LNG carriers. Thousands of people working in the power generation sector will also be unemployed when power plants are decommissioned. As a transition to renewable energy takes place nationally and globally, economic activity in these kinds of industries will shrink, and job losses increase. It is, therefore, of great importance that the government proactively addresses the situation of workers in these industries as part of a Just Transition.

In 2021, the Chungnam province, which has half of Korea's coal power capacity, enacted the Ordinance on the Establishment and Operation of the Just Transition Fund to raise KRW 10bn for the affected areas of coal phase-out by 2025. This fund will be used to provide employment training, retraining and relocation support, job placement, etc. This will also lead to restoration of sites affected by coal power plants and promote regional development.

Climate Analytics and SFOC, 2021; Pollin et al., 2022

ADAPTATION

Paris Agreement: Increase the ability to adapt to the adverse effects of climate change and foster climate resilience and low-GHG development.



The frequency, intensity, and persistence of heatwaves in South Korea has increased. Heat-related deaths have increased as a result. The risk of death has been observed to **increase by 5% for every 1°C increase** in temperature.



Sea levels around the Korean peninsula have risen by approximately 10 centimetres in the last 40 years. Rising sea levels increase the risk of typhoons, which have already increased in frequency and intensity.



Temperature increases are likely to allow **new weed species to emerge** while suppressing the number of food crops such as rice, potato and corn by 2100.

ADAPTATION NEEDS

Impacts of a changing climate

Exposure to warming



1.1°C
Higher

Between 2017 to 2021, the average summer temperatures experienced by people in South Korea were 1.1°C higher than the 1986–2005 average global mean temperature increase of 0.3°C.

Changes in the ability to work due to exposure to excessive heat



433m Labour hours lost
12% increase

In 2021, heat exposure in South Korea led to the loss of 433 million potential labour hours, a 12% increase from 1990–1999.

Loss of earnings from heat-related labour capacity reduction



7.65bn Loss in labour capacity (USD)
0.42% of GDP

Extreme heat can make it unbearable or even dangerous to work in a range of economically important sectors. The potential income loss in 2021 – in the service industry, manufacturing, agriculture, and construction sectors – from labour capacity reduction due to extreme heat was USD 7.65bn in 2021 in South Korea, or 0.42% of its GDP.

Romanello et al., 2022; World Meteorological Organization, 2022

Exposure to future impacts at 1.5°C warming and higher

Different levels of global warming are projected to have a wide range of impacts of varying severity across the world. The percentages at 1.5°C are calculated as an increase/decrease from the reference period of 1986–2006. Using the projected impacts at 1.5°C of warming as a reference, we compare impacts that may occur at higher levels of warming.

Climatic

	At 2°C	At 2.5°C	At 3°C
Local precipitation : +3.6% at 1.5°C warming	1.9 times	2.8 times	3.0 times
Local snowfall : -35% at 1.5°C warming	1.2 times	1.4 times	1.7 times

In South Korea, local precipitation is projected to increase by 3.6% if global temperature rises by up to 1.5°C. Further warming would lead to a wetter climate, with impacts growing two- to three-fold with warming of 2°C and beyond. Local snowfall is expected to decrease under a 1.5°C scenario by 35% from the 1986–2006 average. At 3°C of warming, the reduction would be just under twice that experienced under 1.5°C.

Fresh water

	At 2°C	At 2.5°C	At 3°C
Surface run-off : +2.7% at 1.5°C warming	2.3 times	4.8 times	5.1 times
River discharge : +2.9% at 1.5°C warming	1.6 times	2.7 times	2.7 times
Total soil moisture content : -0.1% at 1.5°C warming	4.3 times	11.7 times	14.4 times

Under 1.5°C, both surface run-off and river discharge are expected to increase by close to 3%, and increase further at greater levels of warming. Soil moisture is expected to decrease slightly with 1.5°C of warming but significantly more so with warming levels of 2.5°C or greater.

Hazards	At 2°C	At 2.5°C	At 3°C
Number of people annually exposed to heatwaves : 513 at 1.5°C warming	290.1 times	1,148.4 times	4,913 times
Number of people annually exposed to wildfires : 1,180 at 1.5°C warming	0.1 times	1.2 times	8.6 times

While the number of people exposed to wildfires is projected to be more than the number exposed to heatwaves at 1.5°C warming, the projected magnification of effects at higher temperatures is very different. At 1.5°C of warming, around 500 more people than affected between 1986–2006 are projected to be exposed to heatwaves annually, but this is projected to rise dramatically – by 290 to 4,900 times given warming of 2°C or 3°C. Even though the projected number of people annually exposed to wildfires at 1.5°C is just over 1,000 people more than the average between 1986–2006, the projected increase is not as steep, but the number of people effected is projected to be eight times higher at 3°C warming.

Economic	At 2°C	At 2.5°C	At 3°C
Annual expected damage from typhoons : + 5.3% at 1.5°C warming	2.1 times	2.9 times	3.2 times
Annual expected damage from river flood : +2.3% at 1.5°C warming	7.8 times	20.2 times	59.8 times
Labour productivity due to heat stress: -1.7% at 1.5°C warming	1.6 times	2.2 times	3 times

Annual expected damage from typhoons is expected to increase by 5.3% with from the reference period (1986–2006) average at 1.5°C of warming, and this would increase around 3 times under 3°C warming. Damage from river flooding would increase by 2.3% at 1.5°C, and this would be more susceptible to further warming, with expected damage increasing by 60 times if warming were to reach 3°C.

Labour productivity is projected to decrease by 1.7% from the baseline period, under 1.5°C of warming, and this productivity loss would be 3 times larger at 3°C of warming.

For further assessments of impacts under different warming scenarios, and a detailed explanation of the methodology, go to <https://climate-impact-explorer.climateanalytics.org>

Climate Analytics, 2021

ADAPTATION POLICIES

National Adaptation Strategies

Document name	Publication year	Fields of action (sectors)												Monitoring & evaluation process	
		Agriculture	Biodiversity	Coastal areas and fishing	Education and research	Energy and industry	Finance and insurance	Forestry	Health	Infrastructure	Tourism	Transport	Urbanism		Water
Third National Climate Change Adaptation Plan (2021–2025)	2020	✔	✔	✔	✔	✔		✔	✔	✔				✔	Annual M&E and update of the strategy every 5 years

Nationally Determined Contribution (NDC): Adaptation

TARGETS

Not mentioned

ACTIONS

Through the National Climate Change Adaptation Plan (NAP), first introduced in 2010 and updated every 5 years, the government will focus on i) improving climate resilience, ii) strengthening monitoring, forecasting, and assessment, and iii) mainstreaming adaptation in all corners of society.

MITIGATION

Paris Agreement: Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit to 1.5°C, recognising that this would significantly reduce the risks and impacts of climate change.

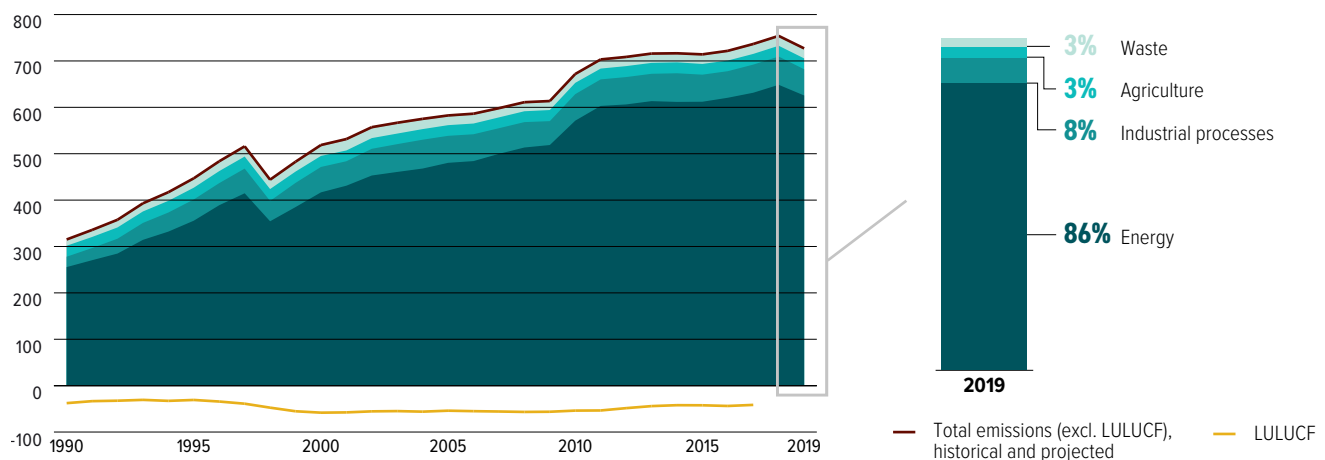
EMISSIONS OVERVIEW



South Korea's total **greenhouse gas emissions (excl. LULUCF)** have increased by **131% (1990–2019)**. In the same period, its total methane emissions (excl. LULUCF) have decreased by 7%.

GHG emissions across sectors⁵

Total sectoral GHG emissions (MtCO₂e/year)

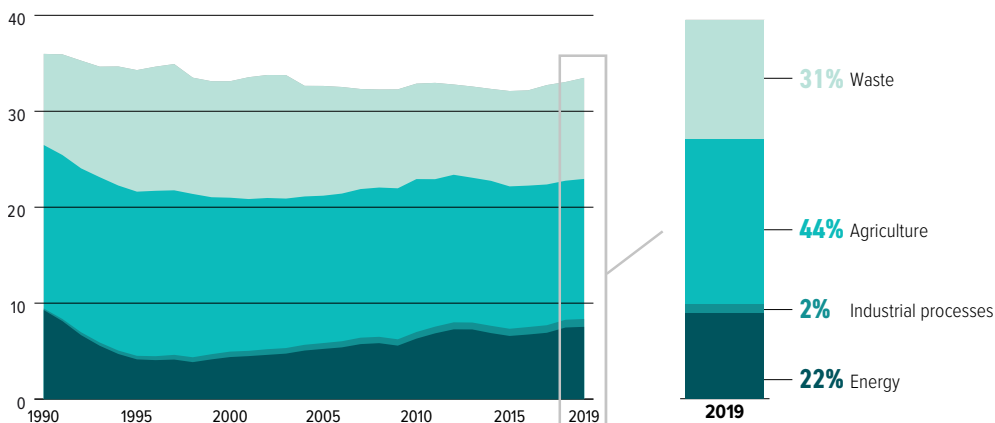


South Korea's emissions (excl. LULUCF) increased by 130.7% between 1990 and 2019 to 727 MtCO₂e/yr. When considered by category, increases were largely due to a sustained increase in energy related emissions which increased by 145%, and accounted fairly consistently for around 83% of total emissions (excl. LULUCF), over the same timeframe (1990–2019).

Gütschow et al., 2021

Methane emissions by sector

Total CH₄ emissions (MtCO₂e/year)



South Korea signed the Global Methane Pledge at COP26 in November 2021.

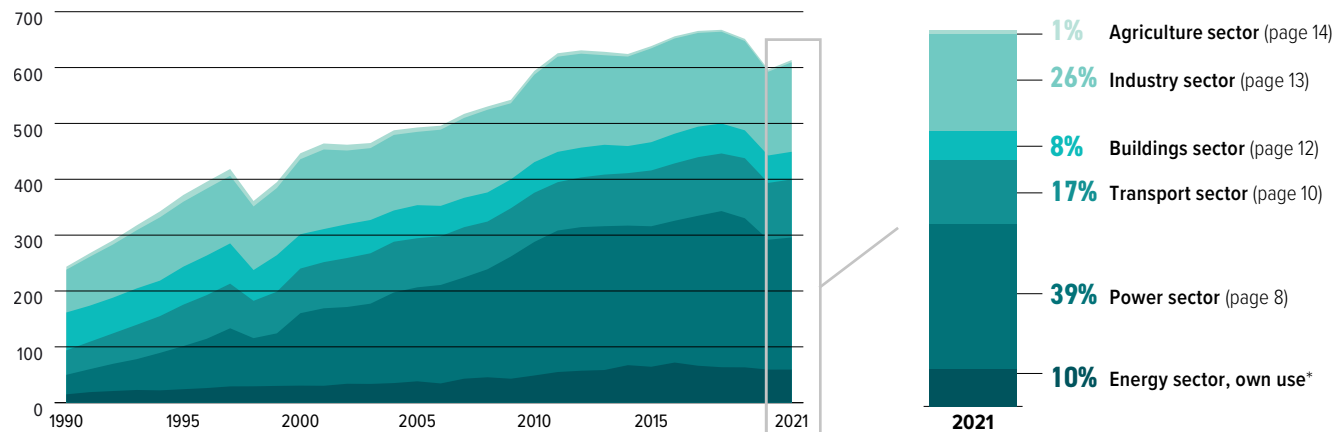
Participating countries pledged to undertake voluntary actions to contribute to a collective reduction of global methane emissions by at least 30% from 2020 levels by 2030. Further scrutiny of plans and implementation will be required.

Methane is a potent, though short-lived, greenhouse gas, accounting for an estimated third of global warming. South Korea's methane emissions (excl. LULUCF) decreased by 7% between 1990–2019 to 33 MtCO₂e/yr. The majority of 2019 methane emissions came from agriculture, followed by waste and energy. Since 1990, methane from the agriculture and energy sectors has dropped, while increasing from the waste and industrial sectors. The decline of energy sector methane emissions is due to a range of measures like the reduction of flaring, venting, and changes in the composition of the energy mix.

Climate and Clean Air Coalition, 2021; Gütschow et al., 2021

Energy-related CO₂ emissions by sector

Annual CO₂ emissions (MtCO₂/year)



The largest driver of overall greenhouse gas emissions are CO₂ emissions from fuel combustion. In South Korea, these emissions increased steadily since 1990 (with a slight decline after 1997 due to the financial crisis) and peaked in 2018. Although emissions have declined since then, it is yet to be seen if this can be sustained. Power generation is, at 38.6%, the largest contributor to energy-related CO₂ emissions, followed by industry and transport with 26% and 17%, respectively.

Enerdata, 2022

*Includes energy-related CO₂ emissions from extracting and processing fossil fuels.

ENERGY OVERVIEW



In 2021, 77% of South Korea's primary energy came from fossil fuels (largely oil and coal). Nuclear and renewables contributed 14% and 9%, respectively. Compared to the G20, South Korea has slightly lower fossil fuels, more nuclear, and fewer renewables in its energy mix.

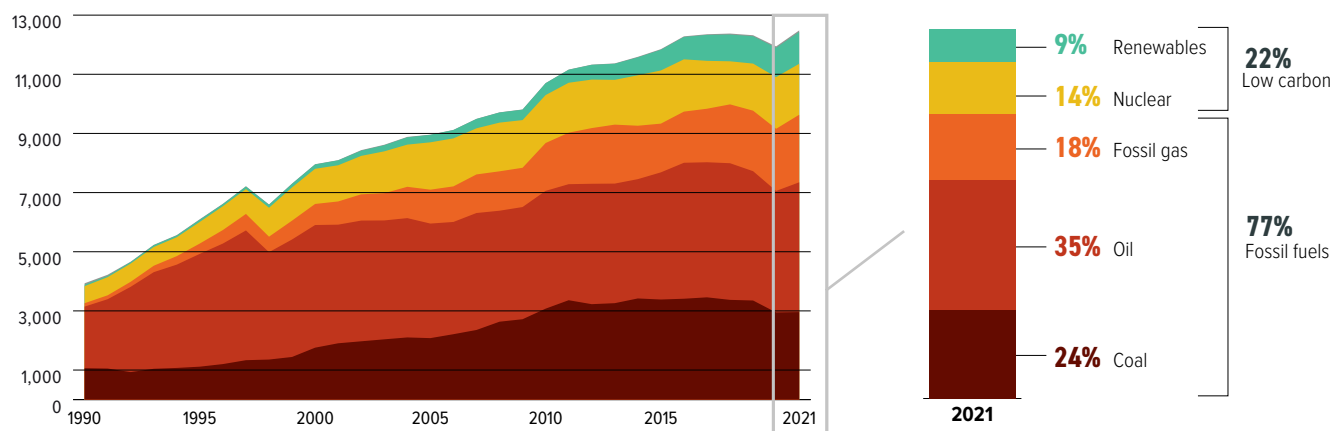


The share of fossil fuels globally needs to fall to 67% of global total primary energy by 2030 and to 33% by 2050, and to substantially lower levels without carbon capture and storage.

Rogelj et al., 2018

Energy mix

Total primary energy supply (PJ)



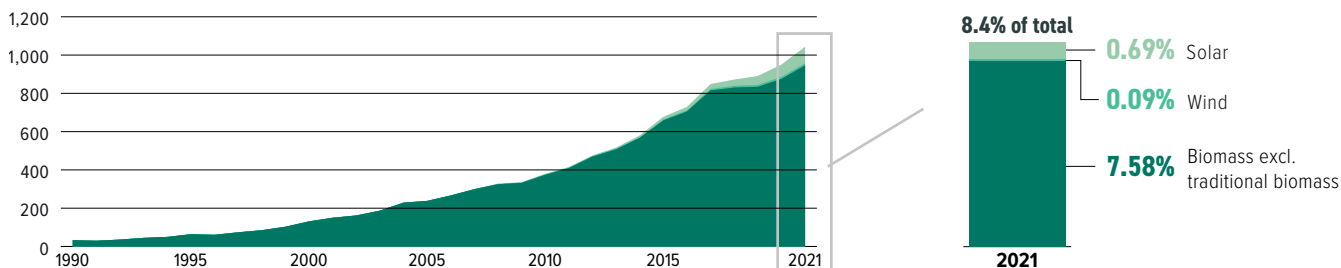
This graph shows the fuel mix for all energy supply, including energy used not only for electricity generation, heating and cooking, but also for transport fuels. **Fossil fuels (oil, coal, and gas) make up 77% of the South Korean energy mix**, lower than the G20 average. Between 1990 and 2000, oil drove increased energy supply (51% of total increase). Since then, fossil gas, coal, and renewables have contributed to 35%, 27%, and 21% of the total increase, respectively.

While renewable energy use has increased faster than that of other energy source since 2010, wind and solar only account for 0.8% of the country's current fuel mix.

Enerdata, 2022

Solar, wind, geothermal and biomass development

As a share of total primary energy supply (TPES) (PJ)

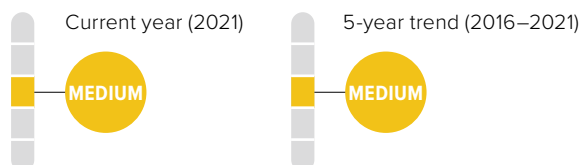


Solar, wind, geothermal and biomass, excluding traditional biomass, account for 8.4% of South Korea's energy supply – the G20 average is 7.5%. The share in total energy supply has increased by around 40.7% in the last 5 years in South Korea (2016–2021). Bioenergy (for electricity and heat) makes up the largest share by far.

Enerdata, 2022

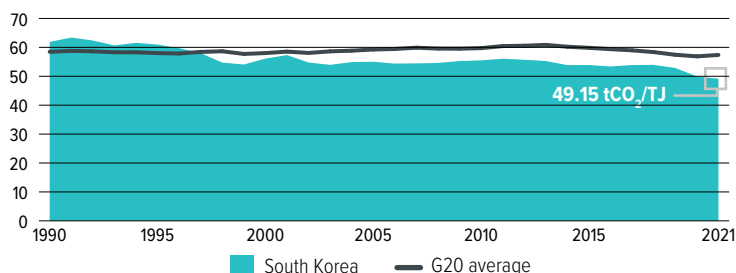
Note: Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.

Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



Carbon intensity of the energy sector

Tonnes of CO₂ per unit of TPES (tCO₂/TJ)



Carbon intensity is a measure of how much CO₂ is emitted per unit of energy supply. Since 1990, South Korea's carbon intensity has decreased from around 62 to 49 tCO₂/TJ. The 1997 financial crisis led to a switch from oil use, use and, therefore, a lower carbon intensity as more nuclear was brought online.

Enerdata, 2022

Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



Energy supply per capita

TPES per capita (GJ/capita) in 2021

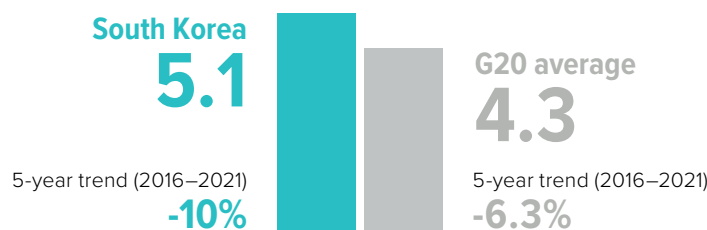


The level of energy supply per capita is closely related to economic development, climatic conditions and the price of energy. Energy supply per capita in South Korea was, at 241.2 GJ in 2021, well above the G20 average, but decreased by 1.5% between 2016–2021 in contrast to the increasing G20 average of 1.6% over the same period.

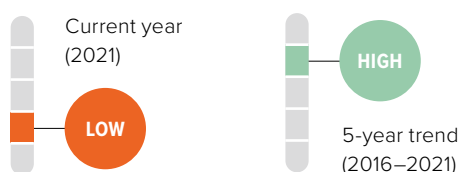
Enerdata, 2022; World Bank, 2022

Energy intensity of the economy

(TJ/million US\$2015 GDP) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

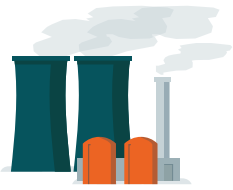


This indicator quantifies how much energy is used for each unit of GDP. This is closely related to the level of decarbonisation, efficiency achievements, climatic conditions or geography. South Korea's energy intensity is higher than the G20 average but has been decreasing at a higher rate, 10% (2016–2021), compared to the slower 6.3% average G20 decline.

Enerdata, 2022; World Bank, 2021

POWER SECTOR

Emissions from energy used to make electricity and heat



South Korea produced **35% of its electricity from coal in 2021**. The government plans to downscale its 2030 renewable energy target from 30% to 21.5%, thereby reducing renewables' share compared to the current 2030 NDC.

Power generation's share of energy-related CO₂ emissions in 2021: **39%** Direct

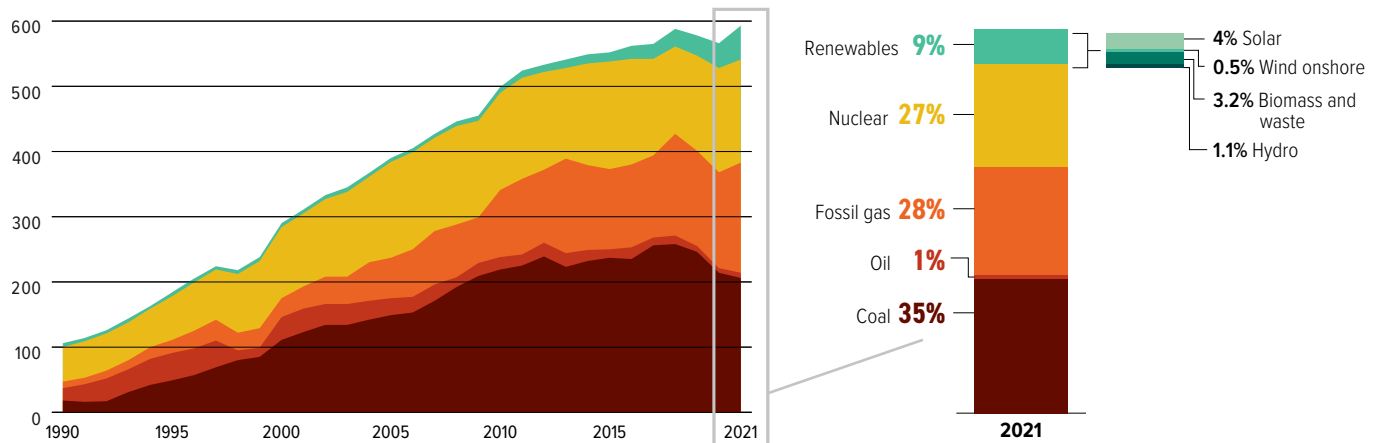


Worldwide, coal use for power generation needs to peak by 2020, and between 2030 and 2040, all the regions of the world need to phase out coal-fired power generation. By 2040, the share of renewable energy in electricity generation has to be increased to at least 75%, and the share of unabated coal reduced to zero.

Climate Action Tracker, 2020; Rogelj et al., 2018

Electricity generation mix

Gross power generation (TWh)

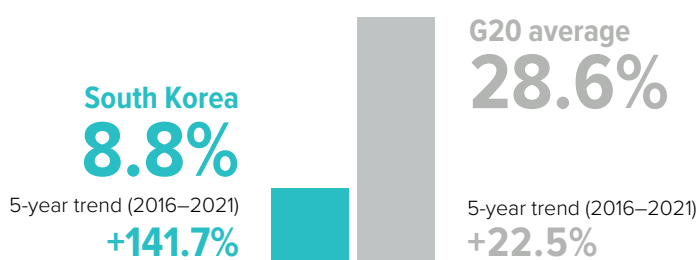


South Korea generated 64% of its electricity from fossil fuels in 2021. Coal's share of generation has recently decreased, while that from gas has increased, and nuclear energy has remained fairly constant. The share of renewables has also increased, accounting for approximately 9% of the power mix in 2021. Solar energy has been the biggest driver of increased power generation from renewables over the last decade but even so, the share of solar energy still remains a very low 4% of power generation.

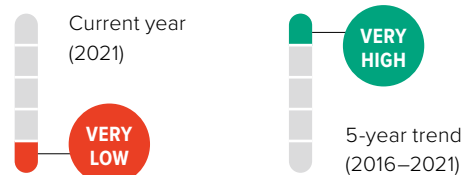
Enerdata, 2022

Share of renewables in power generation

(incl. large hydro) in 2021



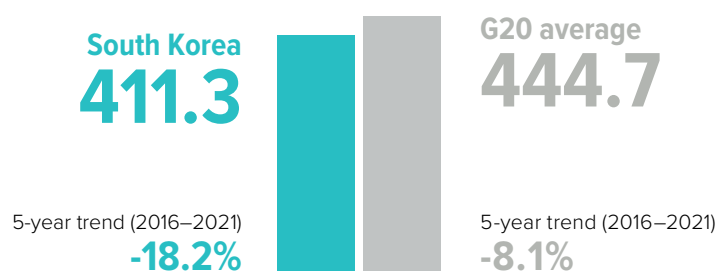
Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



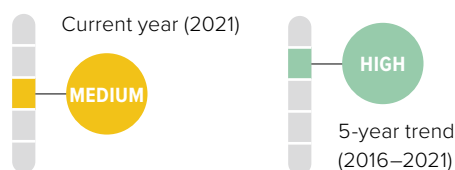
Enerdata, 2022

Emissions intensity of the power sector

(gCO₂/kWh) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



For each kWh of electricity, 411.3 g of CO₂ are emitted in South Korea. The decrease in emissions intensity is due to a decreased share of coal, and increased share of renewables, in the generation mix.

Enerdata, 2022

POLICY ASSESSMENT

Renewable energy in the power sector



As of 2021, solar and wind power account for 4.6% of the total generation mix. The Ninth Basic Plan for Power Supply and Demand sets a target for renewables to account for 20.8% of power generation by 2030. Before leaving office, President Moon committed to raising the renewables share to 30% by 2030, announcing a plan for 70% by 2050.

However, the new Yoon administration announced plans to reduce the share of renewable energy in 2030 from 30% to 21.5%. Complex permitting procedures and arbitrary municipal siting regulations and an outdated and inflexible power market system are delaying renewable development in South Korea.

IEA, 2021b; Lin, 2022; Moon, 2022; MoTIE, 2020

Coal phase-out in the power sector

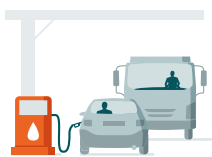


In October 2021, the Presidential Committee on Carbon Neutrality approved two roadmaps to achieve net zero emissions by 2050; both see a complete phase-out of thermal coal by that year. Assessment of the country's NDC shows coal power generation would be reduced by 44% from 2018 levels (drop from 41.9% to 21.8%) by 2030. The government plans to phase out 32 coal plant units by 2036 but convert 26 of those units to LNG facilities. While the Yoon administration has acknowledged that coal phase-out is inevitable, it still plans to extend the life of coal power plants through ammonia co-firing and policy revision, driven by the high LNG spot prices on the international market.

Climate Action Tracker, 2022; B. Kim, 2021; Lee and Kim, 2022; Lin, 2022; MoTIE, 2020; The 2050 Carbon Neutrality and Green Growth Commission, 2021a

TRANSPORT SECTOR

Emissions from energy used to transport goods and people



Emissions from transport are still on the rise. As of 2016, 79% of passenger transport is by road, while only 19% is by rail. **In 2021, the transport sector remains dominated by fossil fuels**, particularly oil, and electric vehicles (EVs) make up only 5% of car sales.



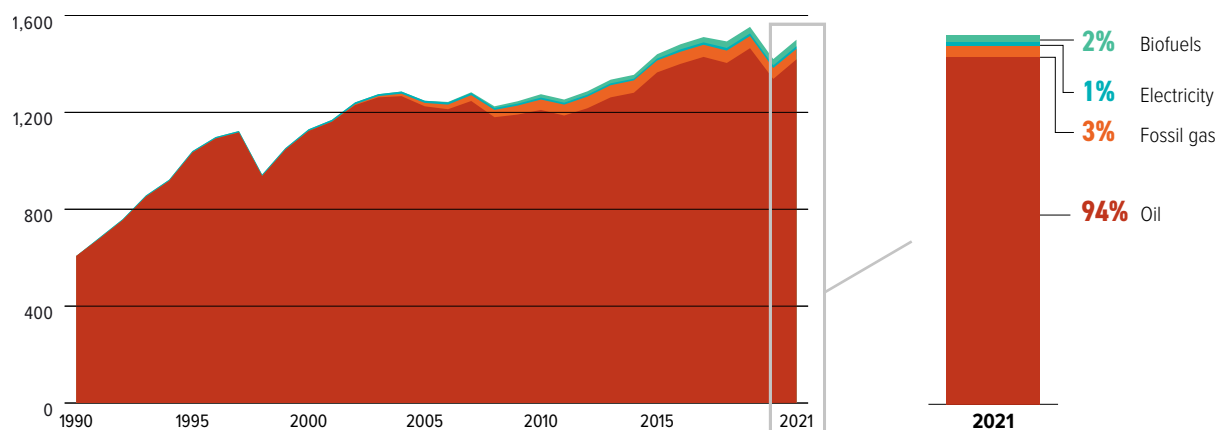
The share of low-carbon fuels in the transport fuel mix must **increase** to between 40% and 60% by 2040 and 70% to 95% by 2050.

Climate Action Tracker, 2020; Rogelj et al., 2018

Transport's share of energy-related CO₂ emissions in 2021: **16.9%** Direct **0.2%** Indirect

Transport energy mix

Final energy consumption by source (PJ/year)

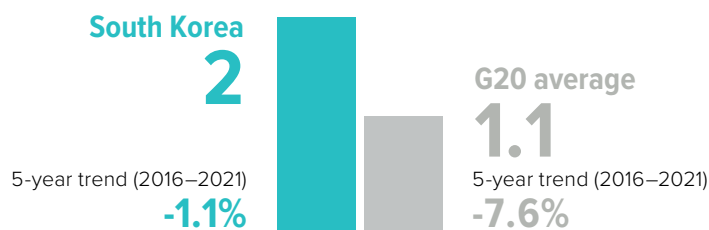


Electricity and biofuels make up only 2% of the energy mix in transport.

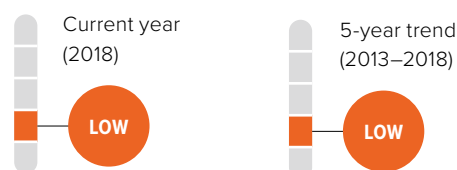
Enerdata, 2022

Transport emissions per capita

(excl. aviation) (tCO₂/capita) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members

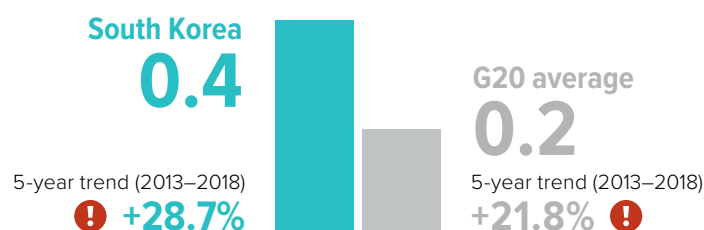


Per capita emissions in 2021 and the 5-year trend have been impacted by COVID-19 pandemic response measures and resulting economic slowdowns. For a discussion of broader trends in the G20 and the rebound of transport emissions in 2022, please see the Highlights Report at www.climate-transparency.org

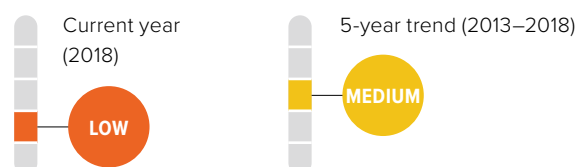
Enerdata, 2022; World Bank, 2022

Aviation emissions per capita⁶

(tCO₂/capita) in 2018

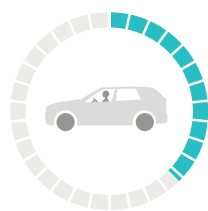


Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



Enerdata, 2022; IEA, 2021a; World Bank, 2022

Motorisation rate

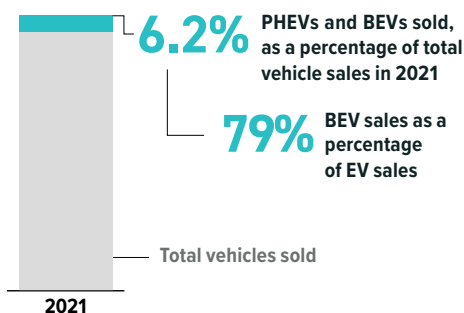


376
vehicles per 1,000
inhabitants in 2019

The number of cars has been increasing by about 3.7% per year since 2015.

Enerdata, 2022

Market share of electric vehicles in new car sales (%)

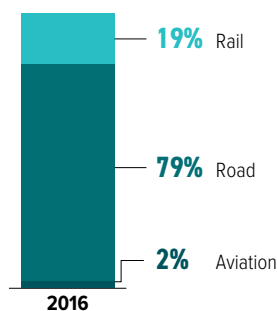


Battery-Electric Vehicles (BEVs) have greater emissions mitigation potential when they are powered by electricity produced by renewables because they have no internal combustion engine (ICE), whereas plug-in hybrids (PHEVs) still produce emissions when using the ICE.

IEA, 2022

Modal split passenger transport

(% of passenger-trips): road, rail and air in 2016



Enerdata, 2022

Modal split freight transport

(modal split in % of tonne-km)

No data available for South Korea

POLICY ASSESSMENT

Phase out fossil fuel cars



The South Korean government has no phase-out date for fossil fuel vehicles. President Yoon made a campaign pledge to ban new registration of internal combustion engine vehicles by 2035. The government has continued its ongoing efforts to incentivise electric and hydrogen-fueled vehicles through subsidies and building EV and hydrogen vehicle charging infrastructure which will provide access to hydrogen produced, initially at least, from fossil fuels. Previously, the government set a target for electric- and hydrogen-powered vehicles to account for a third of new vehicle sales by 2030, announcing that the supply of eco-friendly cars would reach 7.85 million by 2030, resulting in a 24% reduction in automobile emissions by that year.

The Government of South Korea, 2020; Jang, 2022; MoTIE, 2021; Song, 2021

Phase out fossil fuel heavy-duty vehicles



The South Korean government introduced its Hydrogen Economy Roadmap in 2019, setting the target of 6.2 million hydrogen vehicles, including 40,000 hydrogen buses and 30,000 hydrogen trucks by 2040, and 1,200 hydrogen charging stations. In February 2021, the Economic Promotion and Safety Control of Hydrogen Act came into effect, providing the overarching legal framework for developing the hydrogen economy. The government has set near-term targets for 11,000 electric buses, 193,000 electric trucks, 4,600 hydrogen buses and 900 hydrogen trucks. The government now provides USD 2.6/kg for hydrogen buses and USD 3.1/kg for hydrogen trucks from 2021, raising the amount of subsidies for electric taxis and trucks.

IEA, 2020; MoTIE, 2019, 2021

Modal shift in (ground) transport



South Korea's 2050 Carbon Neutral Strategy sees strategies to make people drive less as an important mitigation option for the transportation sector, including improving mass transit infrastructure and creating a walkable and rideable environment in cities, particularly in Seoul. It has also recognised the country's logistics system is overly dependent on road transport for freight, making it energy inefficient and emissions-intensive. It seeks to promote a modal shift to rail and marine transport. South Korea's 2050 carbon neutral scenarios forecast that facilitating the use of public transportation and personal mobility (e.g., bicycles), and a modal shift in freight transport could decrease traffic in the country 15% by 2050.

The 2050 Carbon Neutrality and Green Growth Commission, 2021b; The Government of South Korea, 2020; MOLIT, 2022

BUILDINGS SECTOR

Emissions from energy used to build, heat and cool buildings



Direct emissions and indirect emissions from the buildings sector in South Korea account for **7.5% and 15.5% of total energy-related CO₂ emissions, respectively**. Per capita emissions from the buildings sector are double the G20 average.

Buildings sector's share of energy-related CO₂ emissions in 2021:

7.5% Direct **15.5%** Indirect



By 2040, global emissions from buildings need to be reduced by 90% from 2015 levels, and be 95–100% below 2015 levels by 2050, mostly through increased efficiency, reduced energy demand and electrification in conjunction with complete decarbonisation of the power sector.

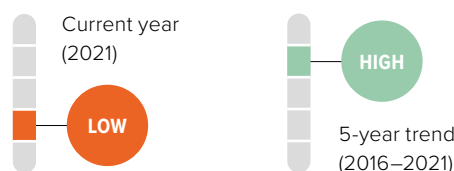
Climate Action Tracker, 2020; Rogelj et al., 2018

Buildings sector emissions per capita

incl. indirect emissions (tCO₂/capita) in 2021



Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



Buildings emissions occur directly (burning fuels for heating, cooking, etc) and indirectly (from grid-electricity for air conditioning, appliances, etc.). In South Korea, buildings-related emissions per capita were nearly double the G20 average in 2021, reflecting both a high fossil fuel share of the electricity mix and high energy use in both residential and commercial buildings. South Korea has decreased buildings emissions per capita at a rate of 12% (2016–2021), much more than the G20 average.

Enerdata, 2022; World Bank, 2022

POLICY ASSESSMENT

Near zero energy new buildings



Zero Energy Buildings (ZEB) are a key focus of the government's Green New Deal which mandates that all new public buildings with gross floor area (GFA) of 1,000 m² or larger be designed as zero-energy from 2020. By 2025, this will extend to public buildings of at least 500 m², private buildings of at least 1,000 m², and apartment buildings with at least 30 units. In 2030, all new buildings with GFA of 500 m² or larger will be ZEB. The government forecasts that ZEB requirements, and other green renovations/remodelling in the building sector, will lead to a reduction of 2.7MtCOe by 2030.

Korea Energy Agency, 2020; The 2050 Carbon Neutrality and Green Growth Commission, 2021a; The Government of South Korea, 2020

Renovation of existing buildings



The Green New Deal lists renovation of existing buildings as a key area of focus, and includes green renovations/remodelling of 225,000 units of public rental housing, 2,890 school buildings, 2,000 medical centres, and 1,000 cultural facilities. The Ministry of Trade, Industry and Energy (MoTIE) will introduce a new programme to reward owners of private and residential buildings for energy saving. Building owners who meet strengthened standards for energy consumption will get tax breaks. The government forecasts that installation of energy-efficient home appliances and lighting will lead to emissions reductions of 2.1 MtCOe by 2030.

K. Lee, 2022; The 2050 Carbon Neutrality and Green Growth Commission, 2021a; The Government of South Korea, 2020

INDUSTRY SECTOR Emissions from energy use in industry



Industrial emissions need to be reduced by 65–90% from 2010 levels by 2050.

Rogelj et al., 2018



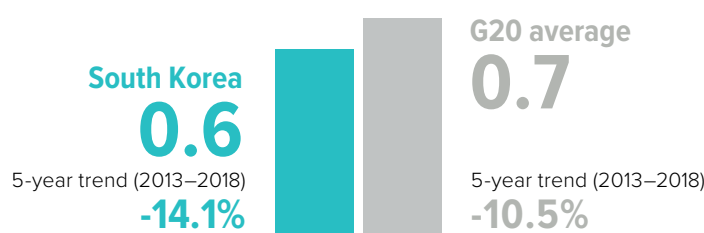
Direct and indirect emissions from industry in South Korea make up 26.1% and 19.2% of energy-related CO₂ emissions, respectively. The emissions intensity of the industrial sector has been decreasing since peaking in 2014; however, **the economy remains reliant on heavy carbon-intensive industry such as steel, cement, and petrochemical production.**

Industry sector's share of energy-related CO₂ emissions in 2021:

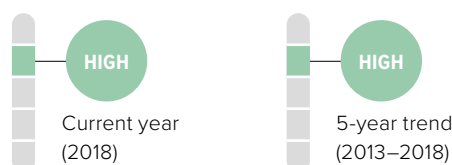


Industry emissions intensity⁷

(kgCO₂e/USD2015 GVA) in 2018



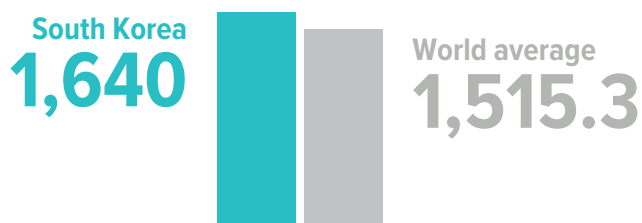
Decarbonisation: a high rating indicates more effort to decarbonise compared to other G20 Members



Enerdata, 2021; World Bank, 2022; KIER, 2021

Carbon intensity of steel production⁸

(kgCO₂/tonne product) in 2019



Steel production and steelmaking are significant GHG emissions sources, and challenging to decarbonise.

Enerdata, 2022; KIER, 2021

POLICY ASSESSMENT

Energy efficiency



The steel sector is the largest emitter of GHG emissions of all South Korea's industries, representing approximately 39% of industrial emissions and 13% of total GHG emissions. To reduce emissions from the steel sector, the government should develop green steel standards, strengthen green public procurement policies, and reduce free allowances in ETS.

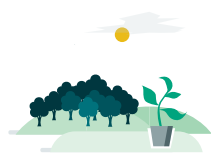
In its 2050 Carbon Neutral Strategy, the government highlighted the importance of industrial energy efficiency, listing "improving equipment efficiency" as having a "high" mitigation effect. However, it admits the country's overall per GDP energy intensity level has stagnated for years, despite its major industries (steel, petrochemicals, automobile manufacturing) having the highest-level of energy efficiency among its peers.

MoTIE has recently stated that it will sign an agreement with 30 high-energy consuming firms to lower energy demand and raise energy efficiency by 25% by 2027.

K. Lee, 2022; The Government of South Korea, 2020

LAND USE SECTOR

Emissions from land use change and forestry



To stay within the 1.5°C limit, South Korea needs to make the land use and forestry sector a net sink of emissions by, e.g., expanding forests through afforestation and reforestation, sustainably managing existing forests, and creating carbon sinks in coastal wetlands.

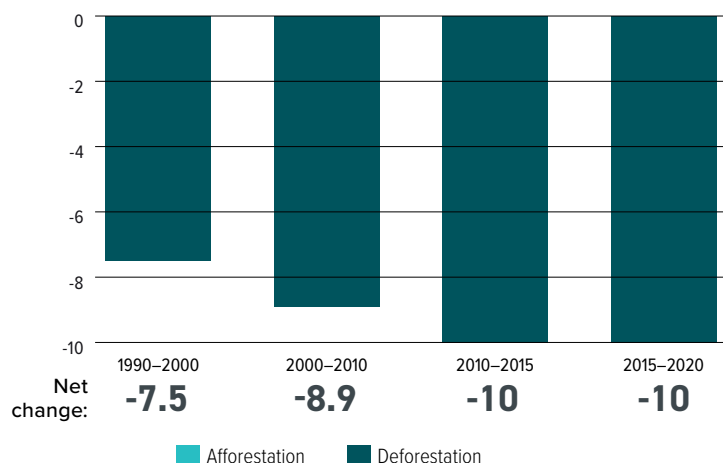


Global deforestation needs to be halted and changed to net CO₂ removals by around 2030.

Rogelj et al., 2018

Annual forest expansion, deforestation and net change

Forest area change in 1,000 ha/year

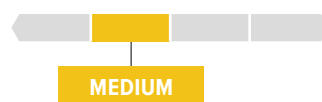


Between 2015–2020, South Korea lost 10,000 ha of forest area per year. Much of this loss was due to plantation and natural forest harvesting, with urbanisation a lesser, yet still significant, driver.

Global Forest Assessment, 2020

POLICY ASSESSMENT

Target for net zero deforestation



In the 2050 Carbon Neutral Forest Strategy, the Korea Forest Service set a target to reduce 26.7m tonnes of emissions by 2050; the previous target was to reduce 15.6m tonnes. This will be achieved through expanding carbon sinks, strengthening carbon absorption capacity and using wood products. Use of wood products and biomass is expected to reduce a further 5.4m tonnes of emissions.

Environmental groups have condemned plans to log older trees and plant new trees to improve carbon absorption. Actions to promote forest carbon sinks detailed in the NDC are projected to result in 25.5m tonnes of carbon absorption by 2030.

FAO, 2022b; KFS, 2022; H.L. Kim, 2021; S. Kim, 2022; The 2050 Carbon Neutrality and Green Growth Commission, 2021a

AGRICULTURE SECTOR

Emissions from agriculture



South Korea's agricultural emissions are mainly from the digestive processes (primarily of cattle), rice cultivation, and livestock manure. A 1.5°C compatible pathway requires behavioural and dietary shifts, and less fertiliser use.

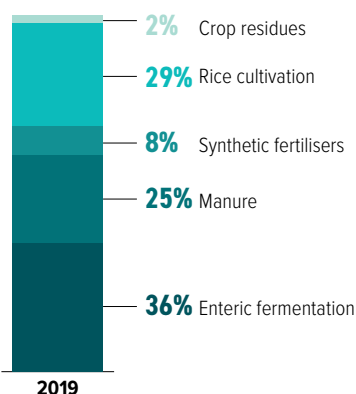


Methane emissions need to decline by 10% by 2030 and by 35% by 2050 (from 2010 levels). Nitrous oxide emissions (mainly from fertilisers and manure) need to be reduced by 10% by 2030 and by 20% by 2050 (from 2010 levels).

Rogelj et al., 2018

Emissions from agriculture

excluding energy emissions, in 2019



In South Korea, the largest sources of GHG emissions in the agriculture sector are enteric fermentation (36%), rice cultivation (29%), and manure (25%). In the Long-Term Strategy, the government identifies the following emissions reductions options for the sector: irrigation of rice paddy fields, low-input farming, coarse fodders and forage mixtures that emit low methane, and the use of manure as resources. However, meat consumption is expected to continue growing in line with the trend of an increasing number of cattle and swine and decreasing rice cultivation area.

FAO, 2022a

MITIGATION: TARGETS AND AMBITION



The science from the IPCC on the risks of exceeding 1.5°C warming is clear. The UN science body has projected that to keep the 1.5°C goal alive, the world needs to roughly halve emissions by 2030.

However, despite the Glasgow Climate Pact (1/CMA.3) agreement to "revisit and strengthen" 2030 targets this year, progress on more ambitious targets has stalled. Without far more ambitious government action, the world is heading to a warming **of 2.4°C with the current 2030 targets** and even higher warming of **2.7°C with current policies**.

Climate Action Tracker, 2021a, 2022c; IPCC, 2022; UNFCCC, 2021

AMBITION: 2030 TARGETS

Nationally Determined Contribution: Mitigation

TARGETS

40% reduction below 2018 levels by 2030



ACTIONS

Key mitigation strategies for achieving the new 2030 target by sector

Climate Action Tracker (CAT) evaluation of targets and actions



The CAT evaluates and rates several elements of climate action: policies and actions, targets and a country’s contribution to climate finance (where relevant) and combines these into an overall rating.

The “highly insufficient” rating indicates that South Korea’s climate policies and commitments are not consistent with the Paris Agreement’s 1.5°C temperature limit. South Korea’s domestic 2030 target is rated “insufficient” when compared to modelled domestic pathways. In other words, if all countries pursued this same level of ambition, it would lead to 3°C of warming. To achieve its target, South Korea would need to enhance its policies and action – currently only compatible with up to 4°C of warming compared to modelled domestic pathways. Its NDC target, including the emissions reductions abroad, are rated “critically insufficient” when compared with its fair share contribution to climate action. South Korea should significantly increase the domestic component of its emissions reduction target.

This CAT analysis was updated in March 2022.

For the full assessment of the country’s targets and actions, and the explication of the methodology see www.climateactiontracker.org

Climate Action Tracker, 2022

AMBITION: LONG-TERM STRATEGIES

The Paris Agreement invites countries to communicate mid-century, long-term, and low-GHG emissions development strategies. Long-term strategies are an essential component of the transition toward net zero emissions and climate-resilient economies.

Status	Submitted to UNFCCC, last update in December 2020
Net zero target	"Carbon neutrality" by 2050
Interim steps	Yes: 40% reduction below 2018 levels by 2030
Sectoral targets	Power sector: 20% renewable generation by 2030, 30–35% by 2040.

FINANCE

Paris Agreement: Make finance flows consistent with a pathway towards low-GHG emissions and climate-resilient development.



In 2020, South Korea spent USD 1.35bn on fossil fuel subsidies, almost all (83%) on petroleum. An emissions trading system (K-ETS) was introduced in 2015, covering around 73% of domestic emissions. The carbon price reached around USD 30/tonne at the beginning of 2020, similar to the price on the EU scheme. Since then, the K-ETS price has fallen below USD 20/tonne as opposed to the EU scheme which has increased to around USD 90/tonne.



Investment in green energy and infrastructure needs to outweigh fossil fuel investments by 2025.

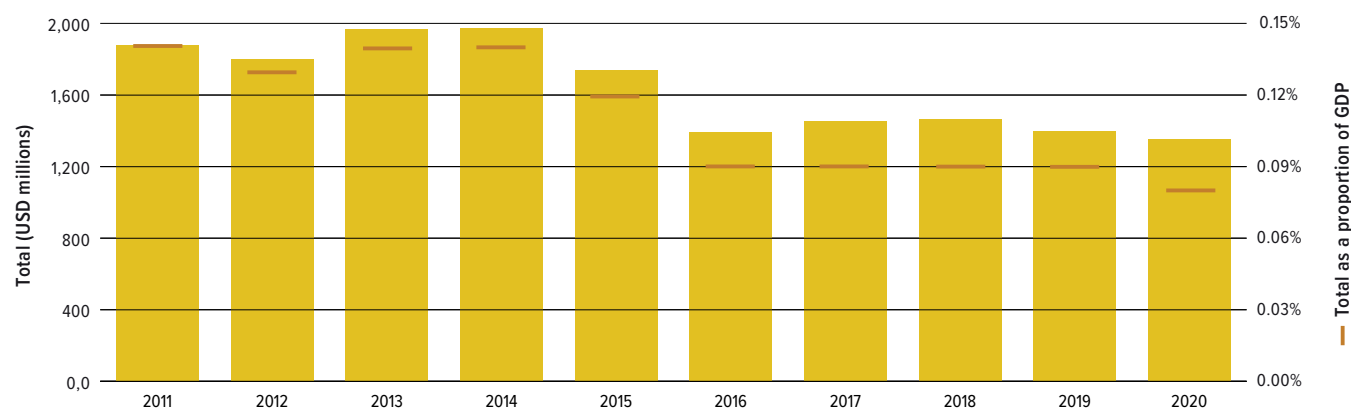
Rogelj et al., 2018

FISCAL POLICY LEVERS

Fiscal policy levers raise public revenues and direct public resources. Critically, they can shift investment decisions and consumer behaviour towards low-carbon, climate-resilient activities by reflecting externalities in the price.

Fossil fuel subsidies relative to national budgets

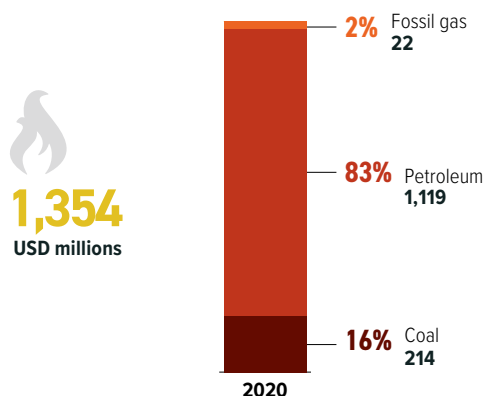
(USD millions)



OECD-IEA Fossil Fuel Support database, 2022

Fossil fuel subsidies by fuel type

(USD millions) in 2020



Between 2011–2020 fossil fuel subsidies in South Korea have slowly decreased, reaching USD 1.35bn in 2020. Of this support, 83% was directed at consumption, and the remainder to production. Petroleum received 83% of the support, with coal receiving 16% and fossil gas 3%.

The two largest subsidy measures accounted for almost two-thirds of the total in 2020. The first was a fuel tax exemption for fisheries, which saw a small drop in 2020 interrupting a slowly increasing trend. The second was a fuel tax exemption for agriculture, which has remained steady since 2016. The COVID-19 pandemic led to the announcement of a USD 2bn bailout for Korea's largest coal plant manufacturer, which mainly builds coal plants overseas. Furthermore, public banks continue to invest in overseas fossil gas projects. In June 2022, KSURE (Korea Trade Insurance Corporation) and KEXIM (Export-Import Bank of Korea) decided to fund USD 660m for offshore gas project in Barossa, Australia.

Energy Policy Tracker, 2022; Hankyoreh, 2022; OECD-IEA Fossil Fuel Support database, 2022

Carbon pricing and revenue

In 2015, South Korea introduced a national ETS. The scheme covers 73% of domestic emissions (in the power, industry, buildings, transport, aviation, construction and waste sectors), with emissions priced at USD 23/tCO₂e. The scheme generated USD 276m in revenue in 2021.

I4CE, 2022

FINANCIAL POLICY AND REGULATION

Through policy and regulation, governments can overcome challenges to mobilising green finance, including real and perceived risks, insufficient returns on investment, capacity and information gaps.

Korea has made good progress on greening its financial system. Its Financial Stability Report of June 2021 included a climate stress test to evaluate the exposure of the banking sector to transition risks. In June 2021, the Financial Services Commission (FSC) revealed the K-Taxonomy, a green taxonomy of sustainable activities for investors.

The FSC also announced that listed corporations would face mandatory disclosure of climate-related financial risks. These will be rolled out beginning in 2025 and will include all companies listed on

the Korea Composite Stock Price Index (KOSPI) by 2030. The format of the reporting requirements will be influenced by the International Sustainability Standards Board recommendations, which builds on the guidelines of the Task Force on Climate-related Financial Disclosure (TCFD).

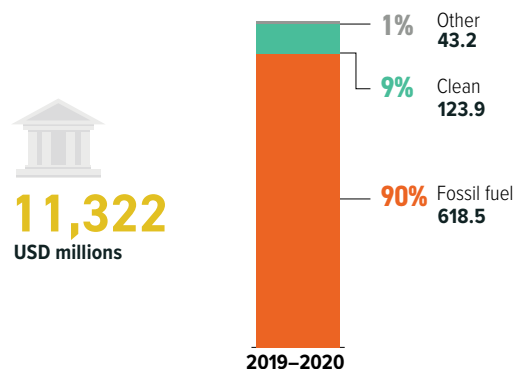
Bank of Korea, 2022; Financial Services Commission, 2021a, 2021b

PUBLIC FINANCE

Governments steer investments through their public finance institutions, including via development banks both at home and overseas, and green investment banks. Developed G20 Members also have an obligation to provide finance to developing countries, and public sources are a key aspect of these obligations under the UNFCCC.

Public finance for energy

USD millions (2019–2020 average)



Between 2019 and 2020 South Korea provided an average of USD 11.3bn in public finance per year to energy projects. Of this amount, 90% went to fossil fuels (22% to coal and 64% to fossil gas). The largest amount of financing went to Malaysia, Nigeria and Bahrain to develop oil and gas (just under USD 400m for each project). Just under USD 800m was invested in Taiwan to develop offshore wind farms.

South Korea's National Pension Service (NPS), the world's third-largest retirement fund is also its top public financier of coal projects and provided a total of USD 15.7bn to coal projects by the end of 2021. Although the NPS pledged to exit coal in May 2021, it has not developed a detailed phase-out policy.

Oil Change International, 2022; Urgewald, 2022

Provision of international public support

South Korea is not listed in Annex II of the UNFCCC and is not formally obliged to provide climate finance and, therefore, while it may channel international public finance towards climate change via multilateral and other development banks, it has not been included in this report.

Endnotes

For more detail about sources and methodologies, please download the CTR Technical Note at: www.climate-transparency.org/g20-climate-performance/g20report2022

Where referenced, “Enerdata, 2022” refers to data provided in July 2022 and, due to rounding, graphs may sum to slightly above or below 100%.

- 1 The ‘1.5°C compatible pathway’ is derived from global cost-effective pathways assessed by the IPCC’s SR15, selected based on sustainability criteria, and defined by the 5th–50th percentiles of the distributions of such pathways achieving the long-term temperature goal of the Paris Agreement. Negative emissions from the land sector and novel negative emissions technologies are not included in the assessed models, which consider one primary negative emission technology (BECCS). In addition to domestic 1.5°C compatible emissions pathways, the ‘fair share’ emissions reduction range would almost always require a developed country to provide enough support through climate finance, or other means of implementation, to bring the total emissions reduction contribution of that country down to the required ‘fair share’ level.
- 2 ‘Land use’ emissions is used here to refer to land use, land use change and forestry (LULUCF). The Climate Action Tracker (CAT) derives historical LULUCF emissions from the UNFCCC Common Reporting Format (CRF) data tables, converted to the categories from the IPCC 1996 guidelines, in particular separating Agriculture from LULUCF, which under the IPCC 2006 Guidelines is integrated into Agriculture, Forestry, and Other Land Use (AFOLU).
- 3 The Decarbonisation Ratings assess the current year and average of the most recent 5 years (where available) to take account of the different starting points of different G20 Members.
- 4 The selection of policies rated and the assessment of 1.5°C compatibility are primarily informed by the Paris Agreement and the IPCC’s 2018 SR15. The Policy Assessment Criteria table below (on page 19) displays the criteria used to assess a country’s policy performance.
- 5 In order to maintain comparability across all countries, this report harmonises all data with PRIMAP 2021 dataset to 2018. However, note that CRF data is available for countries which have recently updated GHG inventories.
- 6 This indicator adds up emissions from domestic aviation and international aviation bunkers in the respective country. In this Country Profile, however, only a radiative forcing factor of 1 is assumed.
- 7 This indicator includes only direct energy-related emissions and process emissions (Scope 1) but not indirect emissions from electricity.
- 8 This indicator includes emissions from electricity (Scope 2) as well as direct energy-related emissions and process emissions (Scope 1).

Policy Assessment Criteria

	LOW	MEDIUM	HIGH	FRONTRUNNER
Renewable energy in power sector	No policies to increase the share of renewables	Some policies	Policies and longer-term strategy/ target to significantly increase the share of renewables	Short-term policies + long-term strategy for 100% renewables in the power sector by 2050 in place
Coal phase-out in power sector	No targets and policies in place for reducing coal	Some policies	Policies + coal phase-out decided	Policies + coal phase-out date before 2030 (OECD and EU28) or 2040 (rest of the world)
Phase out fossil fuel cars	No policies for reducing emissions from light-duty vehicles	Some policies (e.g. energy/emissions performance standards or bonus/ malus support)	Policies + national target to phase out fossil fuel light-duty vehicles	Policies + ban on new fossil fuel-based light-duty vehicles by 2035 worldwide
Phase out fossil fuel heavy-duty vehicles	No policies	Some policies (e.g. energy/emissions performance standards or support)	Policies + strategy to reduce absolute emissions from freight transport	Policies + innovation + strategy to phase out emissions from freight transport by 2050
Modal shift in (ground) transport	No policies	Some policies (e.g. support programmes to shift to rail or non-motorised transport)	Policies + longer-term strategy	Policies + longer-term strategy consistent with 1.5°C pathway
Near zero energy new buildings	No policies	Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options)	Policies + national strategy for near zero energy new buildings	Policies + national strategy for all new buildings to be near zero energy by 2020 (OECD countries) or 2025 (non-OECD countries)
Energy efficiency in industry	No policies	Mandatory energy efficiency policies cover more than 26–50% of industrial energy use	Mandatory energy efficiency policies cover 51–100% of industrial energy use	Policies + strategy to reduce industrial emissions by 75–90% from 2010 levels by 2050
Retrofitting existing buildings	No policies	Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options)	Policies + retrofitting strategy	Policies + strategy to achieve deep renovation rates of 5% annually (OECD) or 3% (non-OECD) by 2020
Net zero deforestation	No policies or incentives to reduce deforestation in place	Some policies (e.g. incentives to reduce deforestation or support schemes for afforestation/ reforestation in place)	Policies + national target for reaching net zero deforestation	Policies + national target for reaching zero deforestation by 2020s or for increasing forest coverage

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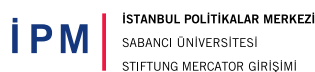
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