

SOUTH KOREA

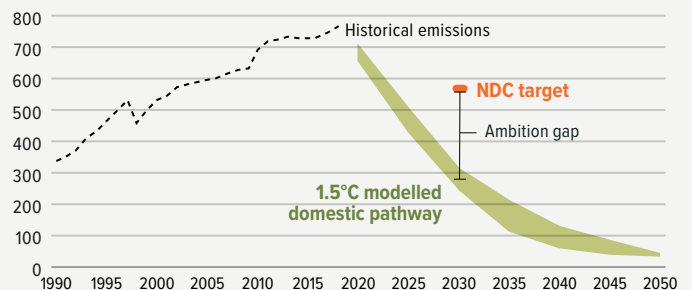


NOT ON TRACK FOR A 1.5°C WORLD

1.5°C South Korea's NDC target is to reduce emissions 13% below 2010 levels, or approximately 578 MtCO₂e, by 2030. To keep below the 1.5°C temperature limit, South Korea's 2030 emissions would need to be around 278 MtCO₂e (or 58% below 2010 levels), leaving an ambition gap of 300 MtCO₂e. All figures exclude land use emissions.

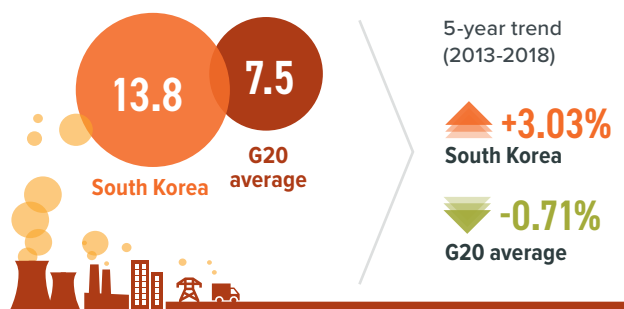
Gütschow et al., 2021; Climate Analytics, 2021

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



PER CAPITA GREENHOUSE GAS (GHG) EMISSIONS ABOVE G20 AVERAGE

GHG emissions (incl. land use) per capita (tCO₂e/capita)² in 2018



South Korea's per capita emissions are 1.85 times the G20 average. Total per capita emissions have increased by 3% between 2013 and 2018.

Climate Action Tracker, 2021; Gütschow et al., 2021; United Nations, 2019

KEY OPPORTUNITIES FOR ENHANCING CLIMATE AMBITION



Cancellation of new coal power stations and an immediate and rapid phase-out of operating coal-fired power stations by 2030.






Enact reforms in the cumbersome, renewable energy permitting schemes to **give renewables the same grid access as conventional power plants**, to facilitate a 2050 net zero pathway.



Less reliance on LNG as a source of electricity generation with an aim to achieve zero emissions from electricity by 2035, and rapid phase-out of fossil fuel finance.

Climate Analytics, 2020a; Ganti et al., 2021; IEA, 2020

RECENT DEVELOPMENTS

- 
 The leader of South Korea's ruling party recently called for the government to increase its 2030 emissions reduction target from 24.4% to at least 40% below 2017 levels.
- 
 On August 31, 2021, the South Korean legislature passed the Framework Act on Carbon Neutrality, which enshrines into law a minimum of achieving at least a 35% national GHG reduction, compared to 2018 levels.
- 
 In April 2021, President Moon Jae-In announced an end to financing new coal plants overseas. However, domestic coal already in the pipeline will still be financed.

Climate Action Tracker, 2021; Korea Times, 2021; Lee, 2021; Reuters, 2021

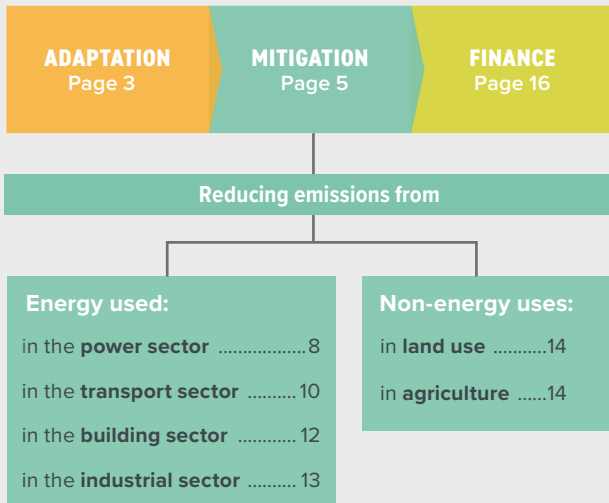
CORONAVIRUS RESPONSE AND RECOVERY

South Korea introduced its Green New Deal (GND) in July 2020 as part of wider economic stimulus package, to both aid post-COVID economic recovery and the emissions reduction goals. It focuses on three main areas: transitioning infrastructure, promoting low-carbon and decentralised energy, and facilitating innovation in green industries. The government's initial investment commitment into the plan was KRW 42.7tn (with an expected private investment of KRW 30.7tn) by 2025, anticipating that 659,000 jobs would be created by that year. Public investment increased by KRW 6tn under version 2.0 of the plan. However, the Ministry of Environment projects that the investment would only reduce emissions by around 12 MtCO₂e, bringing into question the plan's purported focus on climate change.

Ministry of Economy and Finance, 2021; Ministry of Environment Government of Korea, 2020; Republic of Korea, 2020b, 2020c

CONTENTS

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

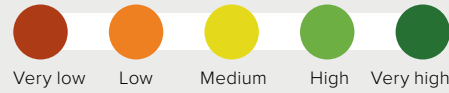


LEGEND

Trends show developments over the past five years for which data are available. The colour-coded arrows indicate assessment from a climate protection perspective: Orange is bad, green is good.



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

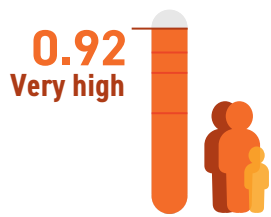


Policy Ratings⁴ evaluate a selection of policies that are essential pre-conditions for the longer-term transformation required to meet the 1.5°C limit.



SOCIO-ECONOMIC CONTEXT

Human Development Index (HDI)

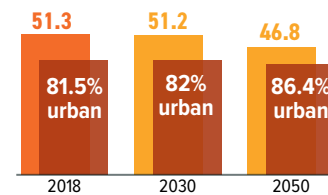


The HDI reflects life expectancy, level of education, and per capita income. South Korea ranks very high.

Data for 2019. UNDP, 2020

Population and urbanisation projections

(in millions)

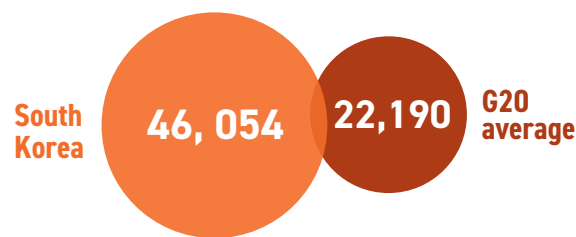


South Korea's population is projected to decrease by 9% by 2050, and become slightly more urbanised (urban share is expected to increase by 6% by 2050). Increases in population and urbanisation are both historical drivers of emissions.

United Nations, 2019; United Nations, 2018

Gross Domestic Product (GDP) per capita

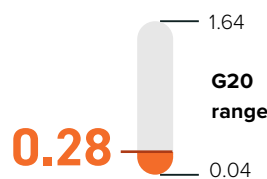
(PPP constant 2015 international \$) in 2019



World Bank, 2021; United Nations, 2019

Death rate attributable to air pollution

Ambient air pollution attributable death rate per 1,000 population per year, age standardised in 2019



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

Institute for Health Metrics and Evaluation, 2020

This source differs from the source used in last year's profiles and, therefore, the data are not comparable.

A JUST TRANSITION

As in other countries, South Korea faces tensions between realising a rapid phase-out of coal plants and ensuring the livelihoods of energy sector workers. The country's 2050 Carbon Neutral Strategy, released in December 2020, lays the framework for both a phase-out of coal-fired power plants and a just transition for those economically dependent on the country's fossil fuel industries. This includes retraining workers from these industries so as to prepare them for opportunities in new low-carbon industries. The strategy calls for mobilising financial resources for climate-vulnerable communities. Following the introduction of policies anticipated to reduce coal and nuclear power plants, the government heard calls for a just transition from unions representing coal and nuclear power workers.



Climate Analytics, 2020a; Han et al., 2020a; Korean Public Service and Transport Workers' Union (KPTU) and Korean Labour and Social Network on Energy (KLSNE), 2017; Republic of Korea, 2020a

ADAPTATION

ADDRESSING AND REDUCING VULNERABILITY TO CLIMATE CHANGE



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



Korea's average annual temperature has risen by **1.8°C** between 1912 and 2017, with an increasing occurrence of heatwaves. The global average has risen by 0.85°C.

Ministry of Environment of the Republic of Korea, 2021a



The risk of death has been observed to increase by **5%** for every 1°C increase in temperature.



In 2020, South Korea experienced the longest monsoon season on record (54 days) along with an **increased frequency and intensity of typhoons**, which caused 46 fatalities and approximately USD 1bn in losses.

ADAPTATION NEEDS

Climate Risk Index

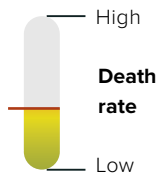
Impacts of extreme weather events in terms of fatalities and economic losses that occurred. All numbers are averages (1999-2018).

Annual weather-related fatalities



0.09
PER 100,000
INHABITANTS

RANKING:
13th
in the G20



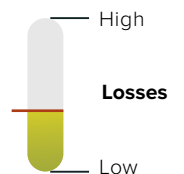
Based on Germanwatch, 2019

Annual average losses (US\$ millions PPP)



0.07
PER UNIT
GDP (%)

RANKING:
13th
in the G20



Based on Germanwatch, 2019

Exposure to future impacts at 1.5°C, 2°C and 3°C

Impact ranking scale:



		1.5°C	2°C	3°C
WATER	% of area with increase in water scarcity	Very low	Very low	Very low
	% of time in drought conditions	Very low	Very low	Very low
HEAT AND HEALTH	Heatwave frequency	Low	Medium	High
	Days above 35°C	Very low	Low	Medium
AGRICULTURE	Rice	Reduction in crop duration	Medium	High
		Reduction in rainfall	Very low	Very low

Water, Heat and Health: own research; Agriculture: Arnell et al., 2019

Note: These indicators are national scale results, weighted by area and based on global data sets. They are designed to allow comparison between regions and countries and, therefore, entail simplifications. They do not reflect local impacts within the country. Please see technical note for further information.

CORONAVIRUS RESPONSE AND RECOVERY

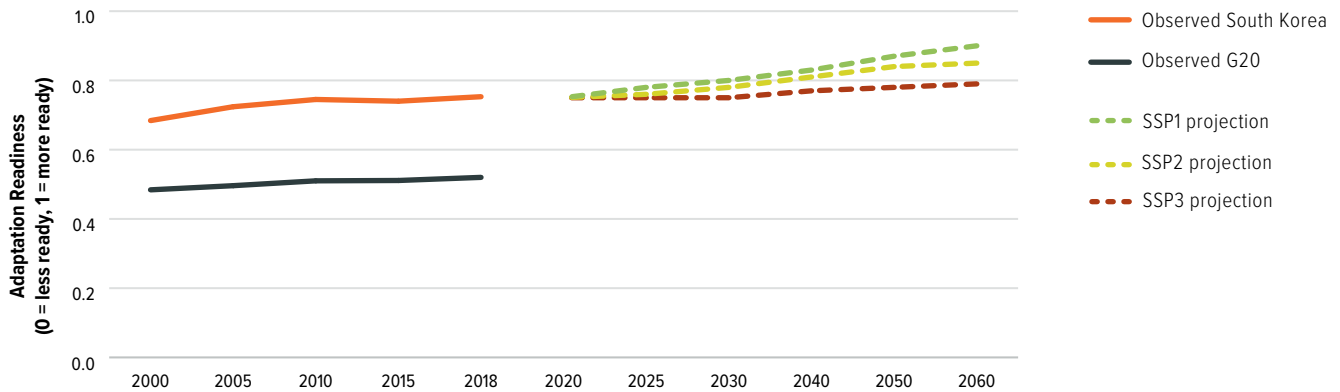
Despite the challenges of COVID-19, South Korea was able to produce its third National Climate Change Adaptation Plan covering the years 2021-2025 and also host the second Partnering for Green Growth (P4G) summit, which focused on water access, energy transition, resilient and sustainable food systems, resilient cities, and developing the circular economy.

P4G, 2021; Republic of Korea, 2021

Adaptation Readiness

The figure shows 2000-2018 observed data from the Notre Dame Global Adaptation Initiative (ND-GAIN) Index overlaid with projected Shared Socioeconomic Pathways (SSPs) from 2020 to 2060.

Notre Dame Global Adaptation Initiative (ND-Gain) Readiness Index



South Korea scored well above the G20 average between 2000 and 2018 and is projected to continue doing so given its combination of social, economic and governance structures. While adaptation challenges still exist, the country is well-positioned to adapt to the impacts of climate change.

The readiness component of the Index created by the ND-GAIN encompasses social (social inequality, information and communications technology infrastructure, education and innovation), economic, and governance indicators to assess a country’s readiness

to deploy private and public investments in aid of adaptation. The index ranges from 0 (low readiness) to 1 (high readiness).

The overlaid SSPs are qualitative and quantitative representations of a range of projections of future governance and, therefore, of possible adaptation readiness. The three scenarios shown here in dotted lines are described as a sustainable development-compatible scenario (SSP1), a middle-of-the-road (SSP2), and a ‘Regional Rivalry’ (SSP3) scenario.

Based on Andrijevic et al., 2020; ND-Gain Index, 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	
2nd National Climate Change Adaptation Plan (2016-2020)	2016	●	●	●	●	●		●	●	●						Annual M&E and update of the strategy every five years

Nationally Determined Contribution (NDC): Adaptation

TARGETS

Not mentioned

ACTIONS

Establishment of National Climate Change Adaptation Plan in 2010, updated every five years.

Launch of the Korea Adaptation Centre for Climate Change in 2009.

Adaptation planning set as a legal obligation of municipal and local governments.

MITIGATION

REDUCING EMISSIONS TO LIMIT GLOBAL TEMPERATURE INCREASE



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 GHG emissions excluding LULUCF have increased by 136% (1990-2018) and the government's current climate target of a 13% reduction from 2010 levels by 2030 is neither in line with a 1.5°C pathway nor likely to achieve their 2050 carbon neutrality goal.

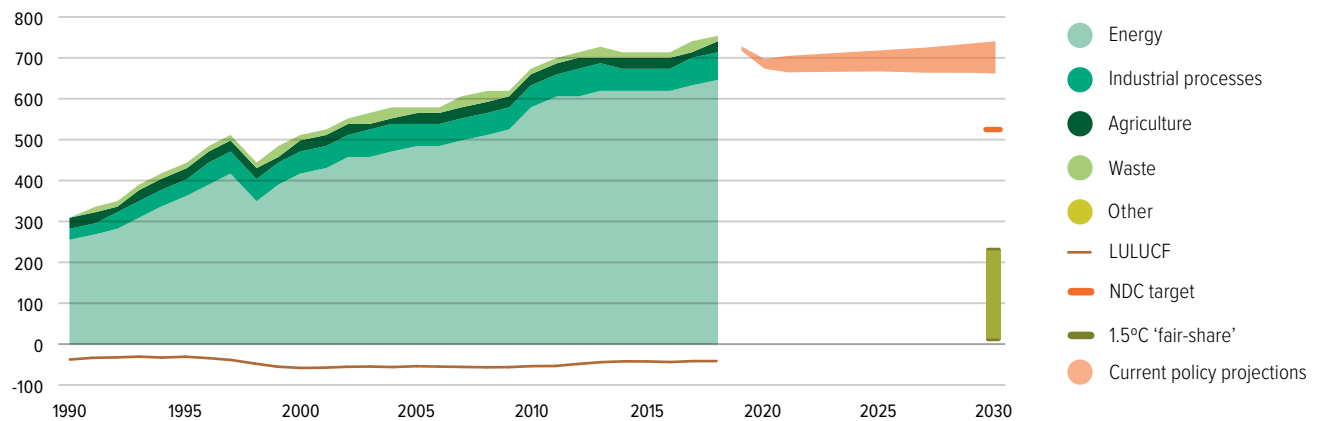


In 2030, global CO₂ emissions need to be 45% below 2010 levels and reach net zero by 2050. Global energy-related CO₂ emissions must be cut by 40% below 2010 levels by 2030 and reach net zero by 2060.

Rogelj et al., 2018

GHG emissions across sectors and CAT 1.5°C 'fair-share' range (MtCO₂e/year)⁵

Total GHG emissions across sectors (MtCO₂e/year)

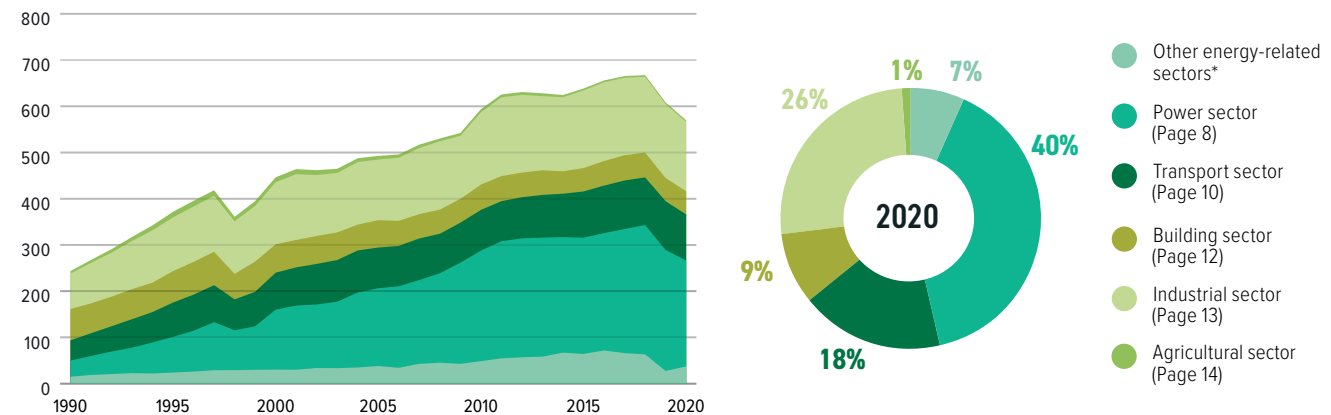


South Korea's emissions (excl. land use) increased by 136.4% between 1990-2018, to 747 MtCO₂e. When considered by category, changes in total annual emissions have been primarily driven by changes in the energy sector. South Korea's 2030 NDC target of 13% below 2010 levels is not 1.5°C 'fair-share' compatible. South Korea should strengthen its target to be in line with its 'fair-share' contribution to the Paris Agreement's 1.5°C temperature limit.

Gütschow et al., 2021; Climate Action Tracker, 2020a, 2021

Energy-related CO₂ emissions by sector

Annual CO₂ emissions from fuel combustion (MtCO₂/year)



In the Republic of South Korea, emissions have been decreasing since 2018. **Fuel combustion in the energy sector is currently the largest driver** of overall GHG emissions, but this sector has also seen the largest reduction in absolute emissions since 2018. The power sector is, with a 40% share, the largest contributor to the country's emissions, followed by industry and transport, with 26% and 18%, respectively.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

Other energy-related sectors covers energy-related CO₂ emissions from extracting and processing fossil fuels.

ENERGY OVERVIEW



South Korea's total primary energy mix consists of **76.6% fossil fuels**, 15% nuclear, and 8% renewables. In 2018, energy sector emissions accounted for 86% of the total (excl. LULUCF). The country plans to phase out coal by 2054, increase the share of renewable energy in the power mix, and develop a hydrogen economy, involving the extensive use of natural gas.

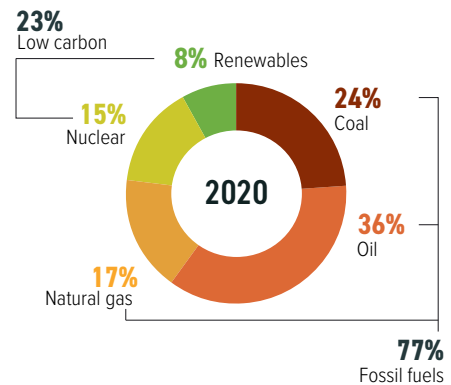
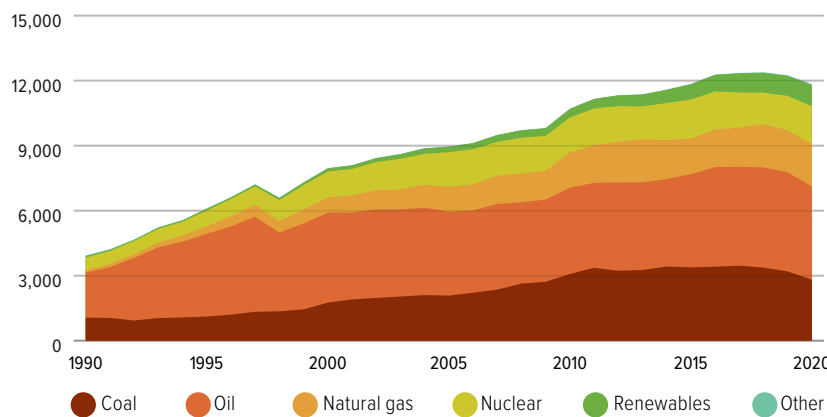


The share of fossil fuels globally needs to fall to 67% of global total primary energy by 2030 and to 33% by 2050, and to substantially lower levels without carbon capture and storage (CCS).

Rogelj et al., 2018

Energy mix

Total primary energy supply (TPES) (PJ)



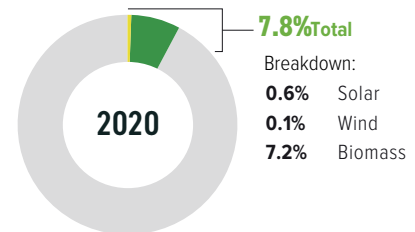
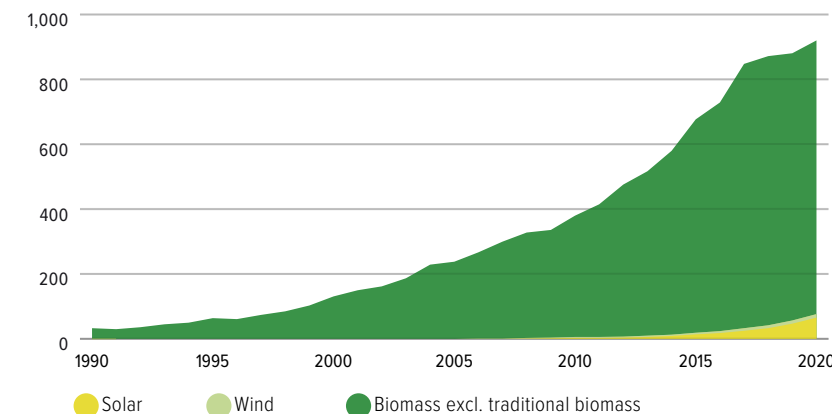
In 2020, fossil fuels (oil, coal, and gas) made up 77% of South Korea's energy mix, which was lower than the G20 average (81%). While the proportion of coal in primary energy decreased by 17% from 2018 to 2020, oil continues to make up the largest share – primarily due to use in heavy industry and transport. Nuclear has played a significant role in South Korea's energy mix since the 1970s, but given waning public support since the 2011 Fukushima accident, the government plans to phase out nuclear in the coming years.

Enerdata, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

Solar, wind, geothermal, and biomass development

TPES from solar, wind, geothermal and biomass (PJ)



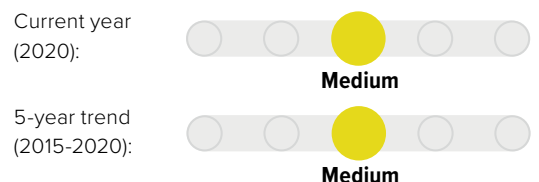
Solar, wind, geothermal and biomass account for 7.8% of Korea's energy supply – the G20 average is 7.1%. The share in total energy supply has increased by around 36% over the last five years (2015-2020). While solar has seen the largest increase over the last five years, growing more than four-fold, the share of solar remains a tiny 0.6% of total primary energy. Bioenergy (for electricity and heat) makes up by far the largest share of the renewables category, at 92%.

Enerdata, 2021; Mongabay, 2020

Due to rounding, some graphs may sum to slightly above or below 100%

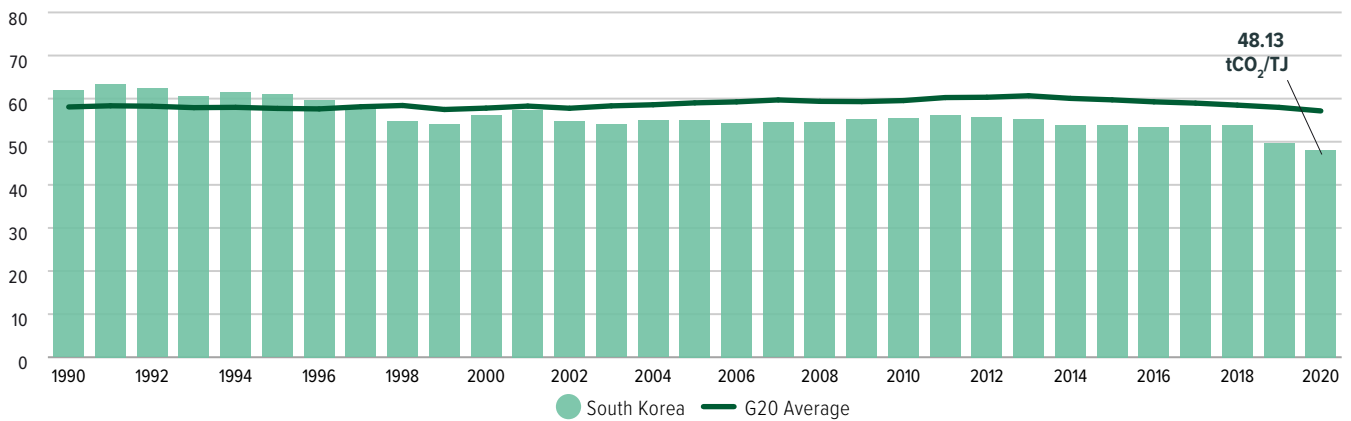
Note: Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.

Decarbonisation rating: renewable energy share of TPES compared to other G20 countries



Carbon intensity of the energy sector

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

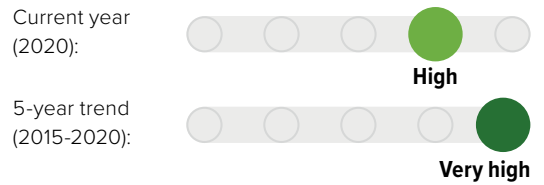


Carbon intensity is a measure of how much CO₂ is emitted per unit of energy supply.

South Korea produces around 48 tonnes of CO₂ per TJ of energy consumed. The country's carbon intensity is lower than the G20 average of 57 tCO₂/TJ in 2020 and has been since 1997. More significant is the 10.6% reduction in carbon intensity seen over the last five years, with the biggest reduction occurring between 2018 and 2019.

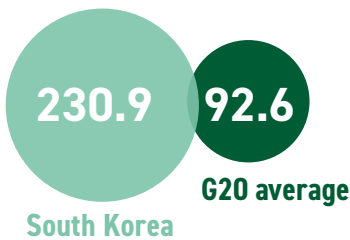
Enerdata, 2021

Decarbonisation rating: carbon intensity of the energy sector compared to other G20 countries

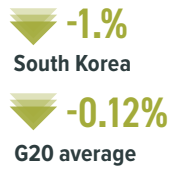


Energy supply per capita

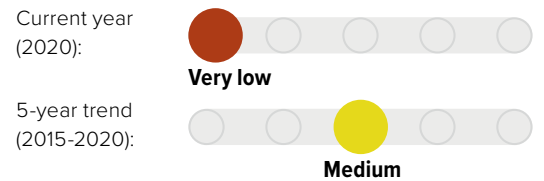
TPES per capita (GJ/capita) in 2020



TPES per capita (GJ/capita): 5-year trend (2015-2020)



Decarbonisation rating: energy supply per capita compared to other G20 countries

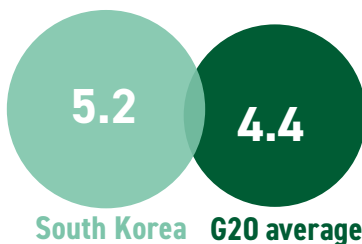


Energy use per capita in Korea is, at 230.9 GJ/capita in 2020, well above the G20 average, but has been decreasing faster, at 1% between 2015 and 2020, than the G20 average, decrease of 0.12%.

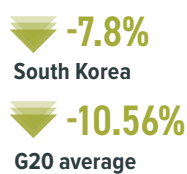
Enerdata, 2021; United Nations, 2019

Energy intensity of the economy

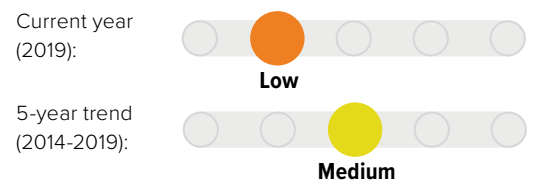
(TJ/million US\$2015 GDP) in 2019



Energy intensity of the economy: 5-year trend (2014-2019)



Decarbonisation rating: energy intensity compared to other G20 countries



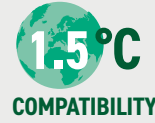
This indicator quantifies how much energy is used for each unit of GDP. This is closely related to the level of industrialisation, efficiency achievements, climatic conditions or geography. At 5.2 TJ per unit of GDP in 2019, South Korea's economy has a higher energy intensity than the G20 average of 4.4 TJ/million USD. This intensity has been decreasing at the slower rate of 7.8% (2014-2019) compared to the G20's average rate of decrease of 10.6% in that period.

POWER SECTOR

Emissions from energy used to make electricity and heat

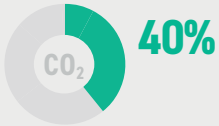


South Korea produced **37% of its electricity from coal in 2020**. While the use of coal has decreased since 2018, that of natural gas continues to increase in line with the country's plans. The share of solar and wind energy in the power mix is slowly increasing, accounting for 3.7% in power mix in 2020.



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.

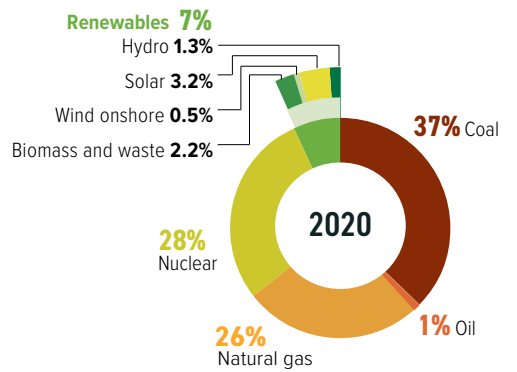
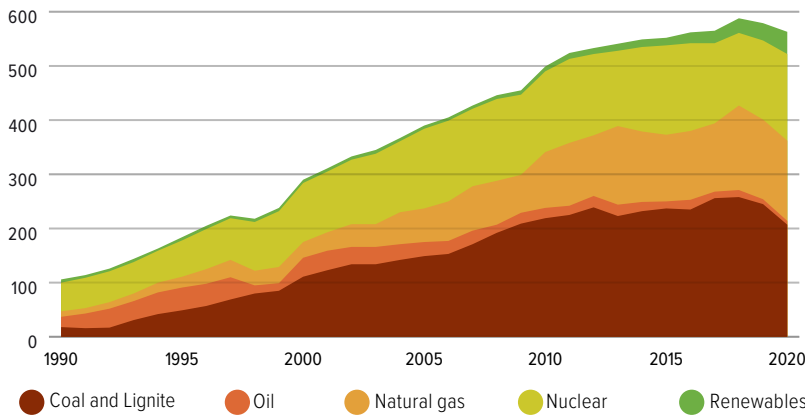
Rogelj et al., 2018; Climate Action Tracker, 2020b



Share of energy-related CO₂ emissions from electricity and heat production in 2020.

Electricity generation mix

Gross power generation (TWh)



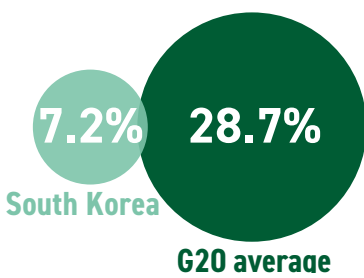
South Korea generated 64% of its electricity from fossil fuels in 2020, and a further 28% from nuclear. The share of renewable energy in South Korea's power sector has been increasing, but is still small, accounting for approximately 7% of the power mix in 2020. The government plans to significantly increase renewable capacity in the coming years (to approximately 40% of total capacity by 2034) and aims to contribute a 20% share of power generation by 2030 (and 30-35% by 2040), displacing both coal and nuclear in the power mix.

Enerdata, 2021

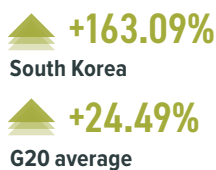
Due to rounding, some graphs may sum to slightly above or below 100%

Share of renewables in power generation

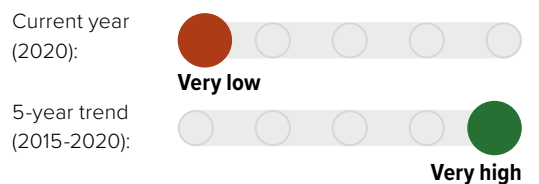
(incl. large hydro) in 2020



Share of renewables in power generation:
5-year trend (2015-2020)



Decarbonisation rating: share of renewables compared to other G20 countries



Enerdata, 2021

Emissions intensity of the power sector

(gCO₂/kWh) in 2020



For each kilowatt hour of electricity, 415.6 g of CO₂ are emitted in South Korea. The country's power sector emissions intensity has only recently dropped below that of the G20 average, and this is due to the rapid decrease in coal seen since 2018.

Enerdata, 2021

POLICY ASSESSMENT

Renewable energy in the power sector



Solar and wind power account for only 3.7% of the generation mix as of 2020. The 9th Basic Plan for Power Supply and Demand sets a target for renewables to account for 40% of installed generation capacity by 2034, with solar and wind making up 39% and 32%, respectively. Incentives for biomass are undermining the growth of solar and wind. Complicated renewable power plant permitting schemes and rigid balancing and grid access requirements are delaying renewable development in South Korea.

MOTIE, 2020; Gaworecki, 2020

Coal phase-out in the power sector



No new coal power plants have been permitted since 2013, and the South Korean government officially announced in 2017 it would not license new plants. In 2020, the National Council on Climate and Air Quality (NCCA), an ad-hoc government committee led by Ban Ki-Moon, recommended to the President that coal power should be phased out by 2045 and, if possible by 2040, given South Korea's carbon neutrality commitment.

The country has not yet set the coal phase-out year, and still has new coal power plants under construction, which, if operated for their 30 year lifespan, would not be expected to shut down until 2054.

The Carbon Neutrality Committee, an ad-hoc committee virtually replacing the NCCA, presented three net zero pathways, among which two assumed that coal power will not exist in 2050. Not only do these phase-out dates fall short of what is needed for 1.5°C compatibility, but the government plans to convert most of these coal plants to run on LNG, rather than shutting them down.

Climate Analytics, 2020, 2020b

CORONAVIRUS RESPONSE AND RECOVERY

As part of its COVID economic recovery plans, the South Korean government has committed KRW 73.4tn through its Green New Deal, to fund green infrastructure and renewable energy development and, thus, aid in climate change mitigation.

On the other hand, in 2020 the government spent around USD 2.5bn (or KRW 2.9tn) to bail out Doosan Heavy Industries, a major manufacturer of coal-fired power plants.

Energy Policy Tracker, 2021; Republic of Korea, 2020b

TRANSPORT SECTOR

Emissions from energy used to transport goods and people



Emissions from transport are still on the rise. While 79% of passenger transport is by road, however EVs make up only 2.85% of new car sales. **Oil accounts for 94% of energy use in the transport sector**, and this has remained constant over the last decade. In order to stay within a 1.5°C limit, both passenger and freight transport need to be decarbonised.



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

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

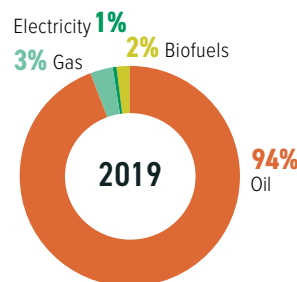
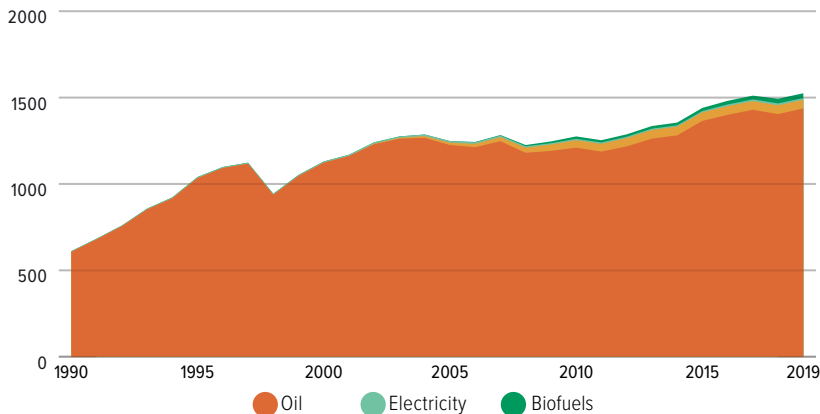


0.21%
Indirect emissions
17.51%
Direct emissions

Share of transport in energy-related CO₂ emissions

Transport energy mix

Final energy consumption of transport by source (PJ/year)



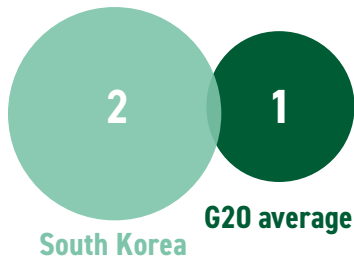
Electricity and biofuels make up only 2.5% of the energy mix in transport.

Enerdata, 2021

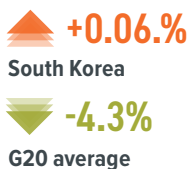
Due to rounding, some graphs may sum to slightly above or below 100%

Transport emissions per capita

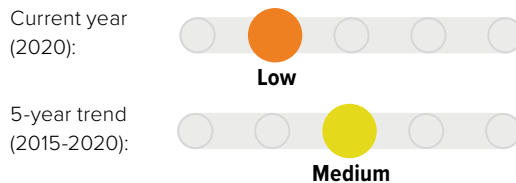
excl. aviation (tCO₂/capita) in 2020



Transport emissions:
5-year trend (2015-2020)



Decarbonisation rating: transport emissions compared to other G20 countries

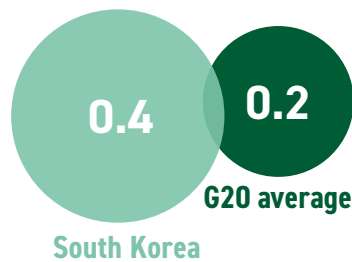


Reductions in transport emissions per capita in 2020, and concomitant changes in the 5-year trends and decarbonisation ratings, reflect widespread economic slowdowns and transport restrictions imposed in response to the COVID-19 pandemic. For a discussion of broader trends in the G20 and the rebound of transport emissions in 2021, please see the Highlights Report at www.climate-transparency.org

Enerdata, 2021; United Nations, 2019

Aviation emissions per capita⁶

(tCO₂/capita) in 2018



Aviation emissions:
5-year trend (2013-2018)

+29.49%

South Korea

+21.25%

G20 average

Decarbonisation rating: aviation emissions
compared to other G20 countries

Current year
(2018):



5-year trend
(2013-2018):



Enerdata, 2021; International Energy Agency, 2020; United Nations, 2019

Motorisation rate



376 VEHICLES

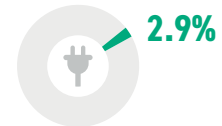
per 1,000 inhabitants in 2019 in the
South Korea*

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

Enerdata, 2021

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

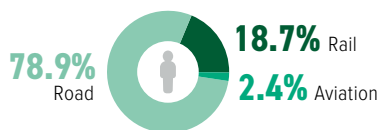
Share of EV sales in 2020
was 2.9%, and this has grown
significantly over the last five
years.



IEA, 2021

Passenger transport

(modal split in % of passenger-km) in 2018*



Enerdata, 2021

*Owing to the variety of sources and data years available, these data are not comparable across G20 countries.

Freight transport

(modal split in % of tonne-km) in 2018*

No data available

POLICY ASSESSMENT

Phase out fossil fuel cars



The South Korean government, while not having set a phase-out date for fossil fuel vehicles, has nonetheless put forth targets, infrastructure plans, and financial incentives to expedite the country's transition towards an EV fleet. These include near-term targets for building battery charging and hydrogen fuelling infrastructure, plans to support the development of local EV production, introducing leasing arrangements for EV batteries to lower consumer's up-front costs, and extending government subsidies for electric and hydrogen vehicles.

The light-duty vehicle emissions standard has been strengthened to 97 gCO₂/km in 2020, with plans to further strengthen it to 89 gCO₂/km and 70 gCO₂/km in 2030. Thus far, however, several manufacturers have failed to meet these requirements.

Climate Analytics, 2020; He-rim, 2021; Herh, 2021

Phase out fossil fuel heavy-duty vehicles



The South Korean government introduced its Hydrogen Economy Road Map in 2019, which set the target of 6.2 million hydrogen vehicles, including 40,000 hydrogen buses and 30,000 hydrogen trucks by 2040, along with 1,200 hydrogen charging stations. More recently, the government passed a "world's first" hydrogen law, that includes pricing and safety regulations, which it expects will accelerate the realisation of its previously-stated goal.

Byung-wook, 2021; Hyun-woo, 2019

Modal shift in (ground) transport



The Metropolitan Government of Seoul has set forth a long-term plan to have a pedestrian-oriented transportation system in the city by 2030. It anticipates that the plan will lead to a reduction in transport per capita GHG emissions of 25% from 2010 levels by 2030. The national government has recently announced that it plans to replace all diesel passenger trains with high-speed electric bullet trains by 2029. In so doing, it expects that transport-related GHG emissions will be cut by around 70,000 tonnes of GHG (less 0.1% of transport related CO₂), as over 90% of the country's rail passenger-km is on electric trains.

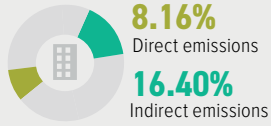
IEA, 2019; Seoul Metropolitan Government, 2013; Shin, 2021

BUILDING SECTOR

Emissions from energy used to build, heat and cool buildings



South Korea's buildings account for 8.16% of direct CO₂ emissions and 16.40% of indirect CO₂ emissions. Per capita emissions from the **building sector are more than twice the G20 average.**



Share of buildings in energy-related CO₂ emissions. Building emissions occur directly (burning fuels for heating, cooking, etc) and indirectly (grid-electricity for air conditioning, appliances, etc.)

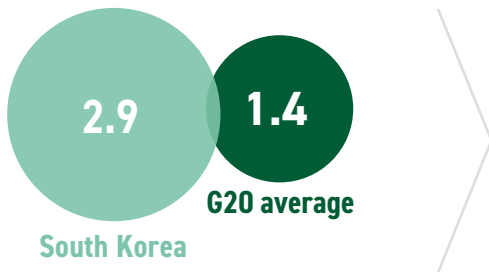


By 2040, global emissions from buildings need to be reduced by 90% from 2015 levels, and be 95-100% below 2015 levels by 2050, mostly through increased efficiency, reduced energy demand, and electrification in conjunction with complete decarbonisation of the power sector.

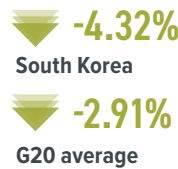
Rogelj et al., 2018; Climate Action Tracker, 2020b

Building emissions per capita

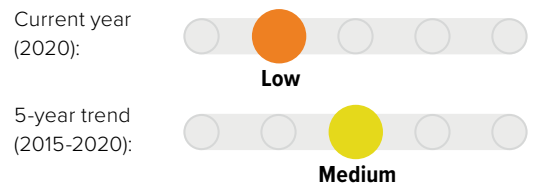
(incl. indirect emissions) (tCO₂/capita) in 2020



Building emissions: 5-year trend (2015-2020)



Decarbonisation rating: building emissions compared to other G20 countries



Building-related emissions per capita are more than twice the G20 average as of 2020, and this has been the case for the last decade. This reflects high fossil fuel share of the electricity mix, low building energy efficiency standards, and the use of natural gas for heating. Although building emissions per capita have declined since 2018, this followed four years of consecutive increases.

Enerdata, 2021; United Nations, 2019

POLICY ASSESSMENT

Near zero energy new buildings



The South Korean government has made Zero-Energy Buildings (ZEB) a key focus of its Green New Deal. Accordingly, it has mandated that all new public buildings with gross floor area (GFA) of 1,000 m² or larger be designed as zero-energy from 2020 and that this directive be extended to new public and private buildings with GFA of 500 m² or larger by 2030. These green buildings will use renewable energy for power and heating and have the maximum insulation performance.

Kim and Yu, 2020; Republic of Korea, 2020a

Renovation of existing buildings



Renovation of existing buildings is a key area of focus in the government's Green New Deal. This includes green remodelling of 225,000 units of public rental housing, 2,890 school buildings, and 2,000 medical centres. Owners of old buildings who adopt green remodeling solutions will be eligible for government incentives, such as tax cuts and some grants.

Republic of Korea, 2020a

INDUSTRY SECTOR

Emissions from energy use in industry

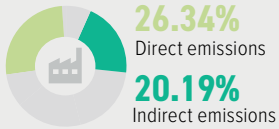


Industry makes up 26% of direct emissions and 20% of indirect electricity-related CO₂ emissions in South Korea. The emissions-intensity of the industrial sector has been decreasing over the past decade, and the government plans to promote “Green Industry” as part of its New Deal, but **the country’s economy remains substantially reliant on harder to abate heavy industry** such as steel, cement, and petrochemical production.



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

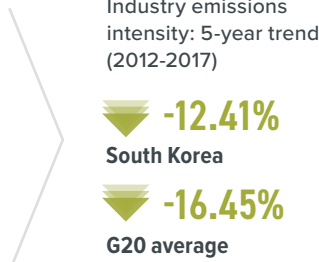
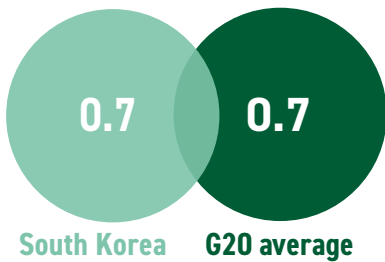
Rogelj et al., 2018



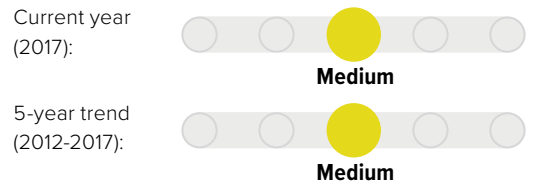
Share of industry in energy-related CO₂ emissions.

Industry emissions intensity⁷

(tCO₂e/USD2015 GVA) in 2017



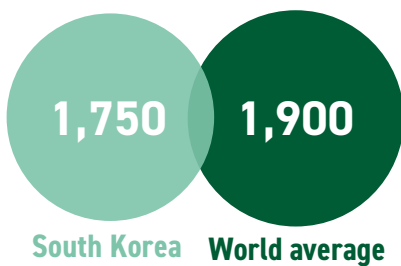
Decarbonisation rating: industry emissions intensity compared to other G20 countries



Enerdata, 2021; World Bank, 2021

Carbon intensity of steel production⁸

(kgCO₂/tonne product) in 2016

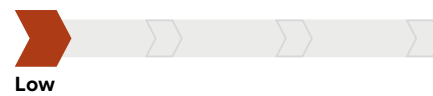


Steel production and steelmaking are significant GHG emissions sources, and challenging to decarbonise.

World Steel Association, 2018; Korea Energy Economics Institute, 2018

POLICY ASSESSMENT

Energy efficiency



South Korea’s potential for improvement in industrial sector energy efficiency is somewhat constrained by the results of previous efforts and the structure of this sector. For instance, energy efficiency policies in the industry sector rely largely on voluntary measures, the expansion of factory energy management systems, and the dissemination of high-efficiency equipment.

The government includes industrial energy efficiency in its 2050 Carbon Neutral Strategy, and lists “improving equipment efficiency” as having a “high” mitigation effect. However, the government admits that its overall per GDP energy intensity level has stagnated for years, despite its major industries (steel, petrochemicals, automobile manufacturing) having the highest-level energy efficiency among its peers.

Republic of Korea, 2020a; IEA, 2020

LAND USE SECTOR

Emissions from changes in the use of the land



To stay within the 1.5°C limit, **South Korea needs to maintain the land use and forest sector's capacity for carbon removal**, e.g., by employing sustainable forest management, creating new forests, and utilising coastal wetlands.

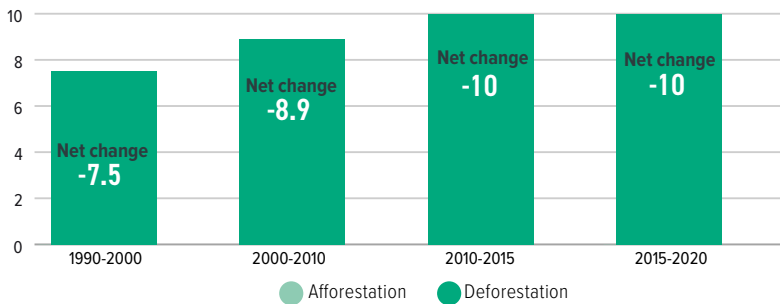


Global deforestation needs to be halted and changed to net CO₂ removals by around 2030.

Rogelj et al., 2018

Annual forest expansion, deforestation and net change

Forest area change in 1,000 ha/year



Between 2010-2020, South Korea lost an average of -10.00 kha of forest area per year. In the same time, the country has seen no significant afforestation.

Global Forest Resources Assessment, 2020

Note: There is a change of source and methodology for measuring this indicator from last year's profiles, which means the two years may not be directly comparable.

POLICY ASSESSMENT

Target for net zero deforestation



In January 2020, South Korea submitted its voluntary national report on progress towards the UN's Strategic Plan for Forests (2017-2030). This report included details on the country's policies regarding improvement of carbon sinks and forest rehabilitation. More recently, the government's 2050 Carbon Neutral Strategy includes sections on afforestation and maintaining carbon sinks. The carbon neutral forestry strategy is currently under review by a Government-Civic Committee tasked to revise the sector strategy. However, environmental groups in the country have condemned the Forest Service's plans to log older trees and replant with new as a means of improving carbon absorption.

Bang-Hyun and Kim, 2021; H. R. Kim, 2021; Korea Forest Service, 2020, 2021; Republic of Korea, 2020a

AGRICULTURE SECTOR

Emissions from agriculture



South Korea's agricultural emissions are mainly due to digestive processes and manure from livestock. Rice cultivation also accounts for a significant portion of emissions. A 1.5°C compatible pathway requires behavioural and dietary shifts and reduced use of synthetic fertiliser.

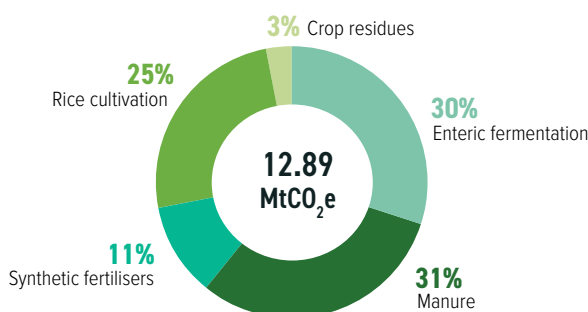


Methane emissions (mainly enteric fermentation) need to decline by 10% by 2030 and by 35% by 2050 (from 2010 levels). Nitrous oxide emissions (mainly from fertilisers and manure) need to be reduced by 10% by 2030 and by 20% by 2050 (from 2010 levels).

Rogelj et al., 2018

Emissions from agriculture (excluding energy)

Emissions from the agriculture sector in 2018



In South Korea, the largest sources of GHG emissions in the agriculture sector are enteric fermentation (digestive processes of cattle), livestock manure, and rice cultivation. Dietary changes and efficient use of fertilisers as well as reductions in food waste could help reduce emissions from this sector.

FAO, 2021

Due to rounding, some graphs may sum to slightly above or below 100%

MITIGATION: TARGETS AND AMBITION

WARMING OF

2.4°C

The combined mitigation effect of Nationally Determined Contributions (NDCs) assessed by April 2021 is **not sufficient and will lead to a warming of 2.4°C by the end of the century**. This highlights the urgent need for all countries to submit more ambitious targets by COP26, as they agreed to do in 2015, and to **urgently strengthen their climate action to align to the Paris Agreement's temperature goal**.

Climate Analytics, 2021a

AMBITION: 2030 TARGETS

Nationally Determined Contribution (NDC): Mitigation

TARGETS

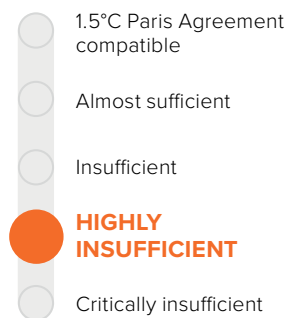
Reduction of 24.4% below 2017 levels by 2030

ACTIONS

Ban on construction of new coal-fired power plants

Climate Action Tracker (CAT) evaluation of targets and actions

SOUTH KOREA'S OVERALL RATING



This CAT evaluation is a **new, overall rating**, that combines the several, separately rated elements, of policies and actions, domestic and internationally supported targets, 'fair-share target' and the country's contribution to climate finance. 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. To achieve its target, South Korea would need to enhance its policies and action – currently only compatible with 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. To meet its 'fair-share' contribution, it needs to support additional reductions beyond that in other countries, roughly the size of the reductions implied by the current international element of its NDC. For the full assessment of the country's target and actions, and the explication of the methodology see www.climateactiontracker.org

Climate Action Tracker, 2021

**This assessment includes CAT's policy analysis from 30 July 2020 translated into the new rating methodology - without new analysis of South Korea's climate policies since then, with the exception of the NDC update submitted in June 2021.*

TRANSPARENCY: FACILITATING AMBITION

Countries are expected to communicate their NDCs in a clear and transparent manner in order to ensure accountability and comparability. The NDC Transparency Check has been developed in response to Paris Agreement decision 1/CP.21 and the Annex to decision 4/ CMA.1, which sets out the "information to facilitate clarity, transparency and understanding" as crucial elements of NDCs.

NDC Transparency Check recommendations

South Korea's NDC was submitted to the UNFCCC on 3 October 2016 and updated on 29 December 2020. A comparison of the 2016 and 2020 NDCs reveals the following additional information has been provided:

- The timeframe and period of implementation are explicitly stated.
- Provides a general description of the approach for accounting for anthropogenic greenhouse gas emissions, the land sector and removals.

There is still room for improvement to increase comparability, transparency, and understanding in South Korea's successive NDC or NDC update, including:

- Providing information on circumstances under which values of the reference indicators may be updated.
- Detailing information of the domestic and institutional arrangements for developing its NDC, including consultations with local communities and gender responsiveness.
- Detailing the implementation plans to account for its NDC and grounds to substantiate that South Korea's NDC target is fair and aligns with its net-zero target and the Paris Agreement's long-term objectives.

For more visit www.climate-transparency.org/ndc-transparency-check

AMBITION: LONG-TERM STRATEGIES

The Paris Agreement invites countries to communicate mid-century, long-term, and low-GHG emissions development strategies by 2020. Long-term strategies are an essential component of the transition toward net zero emissions and climate-resilient economies.

Status	Submitted to UNFCCC in Dec 2020
Interim steps	At least 24.4% reduction from 2017 levels by 2030, likely to be raised to 40% reduction
Sectoral targets	Yes
Net zero target	Carbon neutrality
Net zero year	2050

FINANCE

MAKING FINANCE FLOWS CONSISTENT WITH CLIMATE GOALS



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



In 2019, South Korea spent USD 1.38bn on fossil fuel subsidies. In 2015, the country launched a national emissions trading scheme (K-ETS) which today covers around 74% of domestic emissions. The revenue generated from the scheme in 2019 amounted to about 12% of fossil fuel subsidies that year.



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

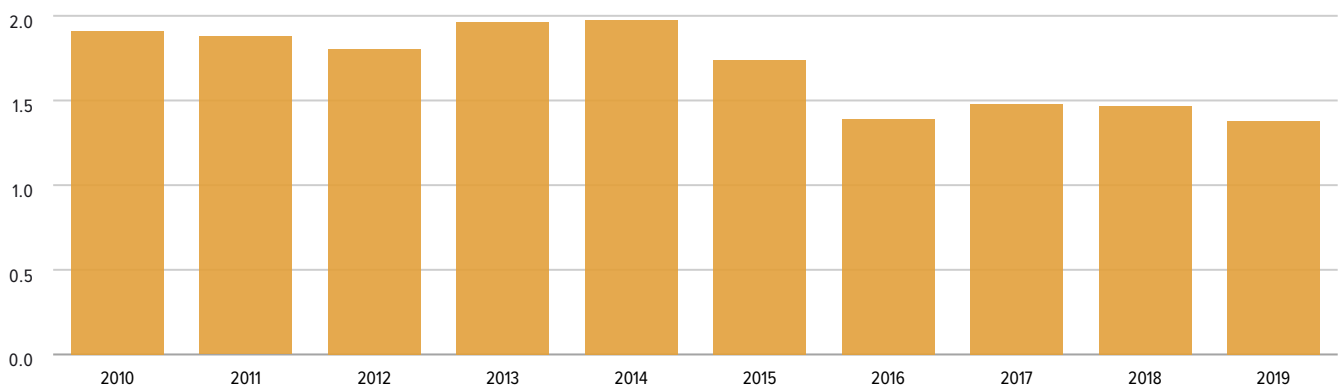
Rogelj et al., 2018

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

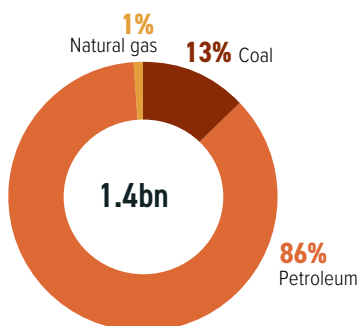
(USD billions)



OECD-IEA Fossil Fuel Support database, 2020

Fossil fuel subsidies by fuel type

USD in 2019



Over the past decade (2010-2019), South Korea's fossil fuel subsidies have oscillated slightly, reaching a value of USD 1.4bn in 2019. Over this period, most of the subsidies were directed to support the production and consumption of petroleum (OECD-IEA, 2020).

Comparable data is not available yet for 2020. However, according to the Energy Policy Tracker data, during 2020 South Korea pledged at least USD 5bn to fossil fuel energy as part of its energy-related funding commitments and COVID-19 economic response. This amount corresponds to the emergency loan to bail out the country's largest builder of coal-powered energy plants, Doosan Heavy Industries & Construction Co, and the loans, amounting to USD 2.5bn each, to bail out the two major Korean airlines, Korean Air and Asiana, in response to COVID-19 related revenue drops.

Energy Policy Tracker, 2021; OECD-IEA Fossil Fuel Support database, 2020
Due to rounding, some graphs may sum to slightly above or below 100%



CORONAVIRUS RESPONSE AND RECOVERY

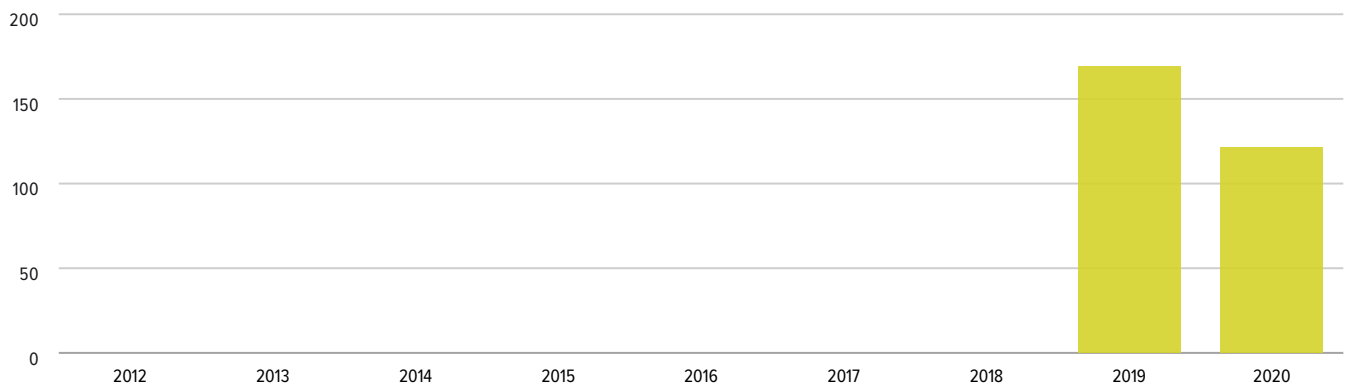
In the same year, the government provided twice this amount to bailout Doosan Heavy Industries, a major manufacturer of coal-fired power plants. The COVID-19 pandemic affected all major carbon markets, including the K-ETS. The South Korean market's carbon price, which stood at around 33 USD/tCO₂e at the beginning of 2020, has dropped to less than half of that today.

Energy Policy Tracker, 2021; ICAP, 2021

As part of the country's New Deal, the South Korean government committed about USD 1.2bn to clean energy projects in 2020.

Carbon pricing and revenue

(USD millions)



In 2015, South Korea introduced a national emissions trading scheme. The scheme covers 74% of domestic emissions (in the power, industry, buildings, transport, aviation, construction and waste sectors), with emissions priced at USD 19/tCO₂e. The share of the free allocation has decreased to 90%, and at least 10% of allocation to entities will be subject to auctioning between 2021 and 2025. The scheme generated USD 121m in revenue in 2019.

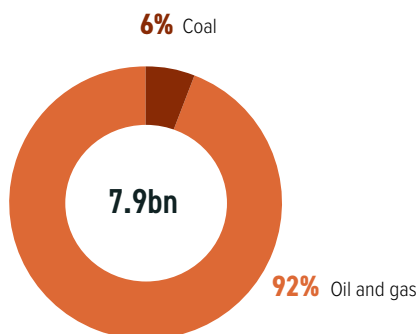
IACE, 2021; Energy Policy Tracker, 2021

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 countries 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 fossil fuels

USD, per annum (2018-19 average)



Between 2018 and 2019, South Korea was the third largest provider of public finance for fossil fuels internationally, providing an average of USD 495m per year for the coal sector, an average of USD 7.5bn per year for oil and gas (making it the largest provider of finance for the latter). Financing was provided through Export-Import Bank of Korea (Kexim), Korea Development Bank, Industrial Development Bank of Korea and Korea Trade Insurance Corporation. The financing provided includes, most notably, an agreement worth USD 1.5bn of financing between Kexim and PT Pertamina, an Indonesian state-owned oil and gas corporation, as well as USD 1.6bn financing to develop the greenfield Tahrir Petrochemicals complex in Egypt.

Oil Change International, 2020

Due to rounding, some graphs may sum to slightly above or below 100%

Provision of international public support

South Korea is not obliged to provide climate finance under the UNFCCC. Despite this, it pledged USD 100m to the Green Climate Fund's first resource mobilisation, and doubled this to pledge USD 200m at its replenishment while also hosting the fund's headquarters. The country has contributed to a number of multilateral climate change funds spread relatively evenly across themes. Its third Biennial Update Report reports bilateral climate-related finance amounting to USD 152m and climate finance spending on multilateral climate funds as USD 192m. While climate-related spending by multilateral development banks does exist, it has not been included in this report.

FINANCIAL POLICY AND REGULATION

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.



South Korea has made considerable efforts in the past year to green its financial system. In December 2020, the country stepped up its environmental, social, and governance (ESG) initiatives and the Ministry of Economy and Finance released the Korean Green

Bond Guidelines (KGBR). The guidelines are aimed at promoting the establishment of a green bond framework by the issuers and will form the basis of pilot projects for green bond issuance in 2021.

In June 2020, the Korea Exchange (KRX) launched a platform dedicated to Socially Responsible Investment (SRI) Bonds to promote green, sustainability and social bonds in compliance with International Capital Markets Association and Climate Bonds Initiative. KRX will

issue guidance on ESG disclosures to promote voluntary disclosure by listed companies until 2025. KRX will then phase in mandatory ESG disclosures until 2030.

In May 2021, the FSC announced its official declaration of support for the Task Force on Climate-related Financial Disclosure (TCFD) and its recommendations. Simultaneously, the FSC and the Financial Supervisory Service (FSS) became members of the Network of Central Banks and Supervisors for Greening the Financial System (NGFS).

The Financial Services Commission (FSC) announced the publication of the K-taxonomy in June 2021 to distinguish between green and non-green industries, and a climate risk management and oversight plan to conduct stress tests and apply climate risk factors in the financial sectors' prudential regulation and supervisory frameworks.

Financial Services Commission, 2021a, 2021b, 2021c

Nationally Determined Contribution (NDC): Finance

Conditionality	Not applicable
Investment needs	Not specified
Actions	As part of the Green New Deal, 73.4tn KRW will be invested towards mitigation by 2025
International market mechanisms	No contribution from international credits for the achievement of the target

ENDNOTES

Where referenced, “Enerdata, 2021” refers to data provided in July 2021. For more detail on the sources and methodologies behind the calculation of the indicators displayed, please download the Technical Note at: www.climate-transparency.org/g20-climate-performance/g20report2021

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) reporting tables data converted to the categories from the IPCC 1996 guidelines, in particular separating Agriculture from LULUCF, which under the new 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 five years (where available) to take account of the different starting points of different G20 countries.

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 table below displays the criteria used to assess a country’s policy performance.

5 The 1.5°C ‘fair-share’ ranges for 2030 are drawn from the CAT, which compiles a wide range of perspectives on what is considered fair, including considerations such as responsibility, capability, and equality. Countries with 1.5°C ‘fair-share’ ranges reaching below zero, are expected to achieve such strong reductions by

domestic emissions reductions, supplemented by contributions to global emissions reduction efforts via, for example, international finance. On a global scale, negative emissions technologies are expected to play a role from the 2030s onwards, compensating for remaining positive emissions. In order to maintain comparability across all countries, this report harmonises all data with PRIMAP, 2021 dataset to 2018. However, note that Common Reporting Format (CRF) data is available for countries which have recently updated GHG inventories. Where countries submitted updated NDC targets before August 2021, these have been analysed and included.

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).

On endnote 4.	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

BIBLIOGRAPHY

- Andrijevic, M. et al. (2020). “Governance in Socioeconomic Pathways and its Role for Future Adaptive Capacity”, *Nature Sustainability*. <https://doi.org/10.1038/s41893-019-0405-0>
- Arnell, N. W. et al. (2019). “Global and Regional Impacts of Climate Change at Different Levels of Global Temperature Increase”, *Climatic Change*. <https://link.springer.com/article/10.1007%2Fs10584-019-02464-z>
- Bang-Hyun, K., and Kim, S. (2021). *Planting 3 Billion Trees: Carbon Neutrality Pitch or Logging Campaign?* <https://koreajoongangdaily.joins.com>
- Byung-wook, K. (2021). *World’s First ‘Hydrogen Law’ Takes Effect. What’s in It?* <http://www.koreaherald.com/view.php?ud=202102080000926>
- Climate Action Tracker (CAT). (2020a). *Climate Action Tracker Country Assessments*. Climate Analytics, NewClimate Institute. <https://climateactiontracker.org/countries/>
- — —. (2020b). *Paris Agreement Compatible Sectoral Benchmarks Study*. https://climateactiontracker.org/documents/753/CAT_2020-07-10_ParisAgreementBenchmarks_FullReport.pdf
- — —. (2021a). *Climate Summit Momentum: Paris Commitments Improved Warming Estimate to 2.4°C*. https://climateactiontracker.org/documents/853/CAT_2021-05-04_Briefing_Global-Update_Climate-Summit-Momentum.pdf
- — —. (2021). *CAT Climate Target Update Tracker*. <https://climateactiontracker.org/climate-target-update-tracker/>
- Climate Analytics. (2020a). *Transitioning Towards A Coal-Free Society: Science-Based Coal Phase-Out Pathway for South Korea Under The Paris Agreement*. <https://climateanalytics.org>
- — —. (2021). *1.5°C National Pathways Explorer*. <http://1p5ndc-pathways.climateanalytics.org/>
- Enerdata. (2021). *Global Energy and CO₂ Data*. <https://www.enerdata.net/research/energy-market-data-co2-emissions-database.html>
- Energy Policy Tracker. (2021). *G20 Countries*. <https://www.energypolicytracker.org/>
- Financial Services Commission. (2021a). *Green Finance to Support 2050 Zero Carbon Goals*. <https://www.fsc.go.kr/eng/pr010101/75227>
- — —. (2021b). *FSC Plans to Improve Corporate Disclosure Rules*. <https://www.fsc.go.kr/eng/pr010101/75177>
- — —. (2021c). *Financial Authorities and Relevant Institutions Declare Support for TCFD and Its Recommendations*. <https://www.fsc.go.kr/eng/pr010101/75957>
- Food and Agriculture Organisation (FAO). (2021). *Emissions Totals: Agriculture*. <http://www.fao.org/faostat>

Ganti, G. et al. (2021). *Assessing the Health Benefits of a Paris-Aligned Coal Phaseout for South Korea*. https://climateanalytics.org/media/air_pollution_brief_final_2.pdf

Gaworecki, M. (2020). *South Korea Subsidizing Biomass so Heavily that Wind and Solar are Being Crowded Out of the Market*. <https://news.mongabay.com/2020/04/south-korea-subsidizing-biomass-so-heavily-that-wind-and-solar-are-being-crowded-out-of-the-market/>

Germanwatch. (2019). *Global Climate Risk Index 2020. Who Suffers Most from Extreme Weather Events?* <http://www.germanwatch.org/>

Global Forest Resources Assessment. (2020). *Annual Forest Expansion, Deforestation and Net Change Indicator*. <https://fra-data.fao.org/WO/fr/2020/forestAreaChange/>

Government of the Republic of Korea. (2020). *The Korean New Deal – National Strategy for a Great Transformation*. <http://english.moef.go.kr/>

Gütschow, J. et al. (2021). *The PRIMAP-hist National Historical Emissions Time Series (1850-2018)*, V.2.2. Zenodo open access repository. <https://doi.org/10.5281/zenodo.4479172>

Han, B., Younsung, K., Hyodong, M., and K. Jieun. (2020). *Understanding Social Context for a Just Transition in South Korea's Coal Sector*. <http://rics.re.kr/>

He-rim, J. (2021). *Who Drives Electric Vehicles in South Korea?* <http://www.koreaherald.com/view.php?ud=20210621000270>

Herh, M. (2021). *Electric Vehicle Prices to be Halved by 2025*. *Business Korea*. <http://www.businesskorea.co.kr/news/articleView.html?dxno=60769>

Hyun-woo, N. (2019). *Gov't Unveils Roadmap for Hydrogen-Powered Economy*. *The Korea Times*. https://www.koreatimes.co.kr/www/tech/2019/01/419_262238.html

International Energy Agency (IEA). (2021). *Global Electric Vehicle Outlook 2021*. <https://www.iea.org/reports/global-ev-outlook-2021>

ICAP. (2021). *Emissions Trading Worldwide: Status Report 2021*. <https://icapcarbonaction.com/en/icap-status-report-2021>

IEA. (2019). *The Future of Rail Opportunities for Energy and the Environment*. <https://www.iea.org/reports/the-future-of-rail>

---. (2020). *Korea 2020*. <https://www.iea.org/reports/korea-2020>

Institute for Climate Economics (I4CE). (2021). *Global Carbon Accounts 2021*. <https://www.i4ce.org/download/global-carbon-account-in-2021/>

Institute for Health Metrics and Evaluation (IHME). (2020). *Global Burden of Disease Study 2020*. <http://ghdx.healthdata.org/gbd-results-tool>

KEPCO. (2021). *Statistics of Electric Power in Korea*. <https://home.kepco.co.kr>

Kim, H. R. (2021). *Korean Federation for Environmental Movements Held a Press Conference to Condemn the South Korea Forest Service's "Carbon-Neutral" Logging Policy on Earth Day*. <http://kfem.or.kr/?p=215700>

Kim, Y., and Yu, K. H. (2020). "Study on the Certification Policy of Zero-Energy Buildings in Korea". *Sustainability*. <https://doi.org/10.3390/su12125172>

Korea Energy Economics Institute. (2018). *Development of Assessment Criteria for Implementation of Low Carbon Policies in Korea*. <http://www.keei.re.kr/keei/download/KIP1818.pdf>

Korea Forest Service. (2020). *National Report of the Republic of Korea on United Nations Strategic Plan for Forests 2017-2030*. <https://www.un.org/esa/forests/wp-content/uploads/2020/02/Republic-of-Korea.pdf>

---. (2021). *Minister at the Meeting on Carbon Neutral Forest*. <https://english.forest.go.kr/>

Korea Times. (2021). *Carbon Neutrality Committee Presents 3 Road Maps to Phase Out Greenhouse Gas By 2050*. https://www.koreatimes.co.kr/www/nation/2021/08/371_313445.html

Korean Public Service and Transport Workers' Union (KPTU) and Korean Labour and Social Network on Energy (KLSNE). (2017). *Korean Unions Call for a "Just Energy Transition" to Move Away From Coal and Nuclear*. <http://unionsforenergydemocracy.org/korean-unions-call-for-a-just-energy-transition-to-move-away-from-coal-and-nuclear/>

Lee, S. (2021). *South Korea Faces a Public Reckoning for Financing Coal Plants in Indonesia*. <https://news.mongabay.com/2021/04/south-korea-faces-a-public-reckoning-for-financing-coal-plants-in-indonesia/>

Ministry of Economy and Finance. (2021). *Government Announces Korean New Deal 2.0*. <https://english.moef.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=5173>

Ministry of Environment. (2021a). *Korean Climate Change Assessment Report 2020*. http://www.climate.go.kr/home/cc_data/2020/Korean_Climate_Change_Assessment_Report_2020_2_eng_summary.pdf

---. (2021b). *A First Step of the Green New Deal to Achieve a Carbon-neutral Society*. <http://eng.me.go.kr/eng/web/board/read.do?sessionId=X2JzeGt9RDYtF4W5W+N3NRz>

Ministry of Trade, Industry and Energy (MOTIE). (2020). *The 9th Basic Plan for Power Supply and Demand*. http://www.motie.go.kr/motie/press/press2/bbs/bbsView.do?bbs_cd_n=81&bbs_seq_n=163670

Notre Dame Global Adaptation Initiative (ND-GAIN). (2021). *ND-GAIN Country Index*. University of Notre Dame. <https://gain.nd.edu/our-work/country-index/>

Organisation for Economic Co-operation and Development (OECD). (2020). *Effective Carbon Rates 2020: Pricing Carbon Emissions Through Taxes and Emissions Trading*. <https://doi.org/10.1787/9789264305304-en> and country profile supplement: <https://www.oecd.org/tax/tax-policy/effective-carbon-rates-all.pdf>

OECD-IEA. (2020). *OECD Analysis of Budgetary Support and Tax Expenditures. Fossil Fuel Support Database*. <http://www.oecd.org/fossil-fuels/data/>

Oil Change International. (2020). *Shift the Subsidies Database*. <http://priceofoil.org/shift-the-subsidies>

P4G. (2021). *2021 P4G Seoul Summit*. <https://p4gpartnerships.org/news-events/2021-p4g-seoul-summit>

Republic of Korea. (2020a). *2050 Carbon Neutral Strategy of the Republic of Korea: Towards a Sustainable and Green Society*. UNFCCC. https://unfccc.int/sites/default/files/resource/LTS1_RKorea.pdf

---. (2020b). *Submission Under the Paris Agreement The Republic of Korea's Update of its First Nationally Determined Contribution*. <https://www4.unfccc.int/sites/NDCStaging/pages/Party.aspx?party=KOR>

---. (2020c). *The Korean New Deal - National Strategy for a Great Transformation*. http://english.moef.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=4948#fn_download

---. (2021). *3rd National Climate Change Adaptation Plan [in Korean]*. http://www.climate.go.kr/home/cc_data/policy/3_nation_climate_change_adaptation_step_summary.pdf

Reuters. (2021). *South Korea's Moon Vows to End New Funding for Overseas Coal Projects*. <https://www.reuters.com/article/global-climate-summit-southkorea-idUSL4N2MF3R2>

Rogelj, J. et al. (2018). "Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development", in Masson-Delmotte, V. et al. (eds) *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C*. IPCC. <https://www.ipcc.ch/>

Seoul Metropolitan Government. (2013). *Seoul Transportation 2030*. [https://www.seoulsolution.kr/sites/default/files/gettoknowus/Seoul Transportation 2030.pdf](https://www.seoulsolution.kr/sites/default/files/gettoknowus/Seoul%20Transportation%2030.pdf)

Shin, H. (2021). *South Korea to Cut Railway CO₂ Emissions by Replacing Diesel Trains by 2029*. <https://www.reuters.com/article/us-climate-change-southkorea-train-idUSKBN299108>

Stangarone, T. (2020). "South Korean Efforts to Transition to a Hydrogen Economy". *Clean Technologies and Environmental Policy*. <https://doi.org/10.1007/s10098-020-01936-6>

United Nations. (2018). *World Urbanisation Prospects*. UN Department of Economic and Social Affairs, Population Division. <https://population.un.org/wup>

---. (2019). *World Population Prospects, 2019 Highlights*. UN Department of Economic and Social Affairs, Population Division. <https://population.un.org/wpp>

United Nations Development Programme (UNDP). (2020). *Human Development Index Database*. <http://hdr.undp.org/en/data#>

The World Bank. (2019). *Population, total*. Washington, DC: USA. <https://data.worldbank.org/indicator/SP.POP.TOTL>

The World Bank. (2020). *GDP, PPP (current international \$)*. Washington, DC: USA. <https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD>

World Steel Association. (2018). *Steel's Contribution to a Low-Carbon Future and Climate-Resilient Societies*. <https://www.worldsteel.org/>



This country profile is part of the Climate Transparency Report 2021. Find the Highlights Report and other G20 country profiles at www.climate-transparency.org



For more information on the country profile for South Korea, please contact: Solutions for our climate (SFOC) – JoojinKim, joojin.kim@fourclimate.org

PARTNERS





DATA PARTNERS



FUNDERS



Supported by:
 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
 WORLD BANK GROUP
 based on a decision of the German Bundestag