

# Routledge Handbook on the Green New Deal

---

**Edited by**  
**Kyla Tienhaara and Joanna Robinson**

ISBN: 978-0-367-62804-8 (hbk)

ISBN: 978-0-367-62805-5 (pbk)

ISBN: 978-1-003-11088-0 (ebk)

## Chapter 15

---

### South Korea's Green New Deal 2.0

Old wine in new bottles?

*Kyla Tienhaara, Sun-Jin Yun and Ryan Gunderson*

(CC BY-NC-ND 4.0)

The funder for this chapter is Canada Research Chair Program

DOI: 10.4324/9781003110880-19

# SOUTH KOREA'S GREEN NEW DEAL 2.0

## Old wine in new bottles?

*Kyla Tienhaara,<sup>1</sup> Sun-Jin Yun<sup>2</sup> and Ryan Gunderson*

### Introduction

It is rarely acknowledged in discussions about the Green New Deal that South Korea was the first country to formally adopt a policy under this banner. In 2009, the government released a stimulus package – the Korean Green New Deal (KGND) – in response to the Global Financial Crisis (GFC). The KGND was dubbed by several commentators outside the country as the “greenest” stimulus package in the world (see, e.g., Bernard et al. 2009). However, within Korea it was highly controversial.

Just over a decade later, a new crisis – the COVID-19 pandemic and subsequent economic downturn – sparked the development of a new Green New Deal, embedded within a broader Korean New Deal (we will abbreviate to KND to distinguish the two). The Korean government was inspired by both the Ocasio-Cortez/Markey proposal for a GND in the US (H. Res. 109) as well as the European Green Deal (see further chapter by Alder and Wargan, this volume), but many have questioned whether the KND represents a substantial shift in Korean policy (S. Lee 2020). This chapter aims to compare the form and content of the KGND and KND and assess how the developments within South Korea line up with the broader evolution of GND discourse that was outlined in the Introduction (Tienhaara and Robinson, this volume).

With that objective in mind, it is important to note at the outset that South Korea has been more closely associated with the “green growth” policy paradigm than any other country in the world. The chief architect of the first KGND – former President Lee Myung-bak – was dubbed “the father of green growth” by the OECD secretary-general in 2011 (Shin 2011). Some have hypothesized that Lee embraced green growth to gain international recognition for Korea and himself as a green leader (Shim 2010; Yun, Cho and von Hippel 2011). Therefore, it is hardly surprising that in addition to developing a five-year development plan around green growth (for overviews, see Jones and Yoo 2010; UNEP 2010; Yun et al. 2011; Kang et al. 2012), he also actively pushed this onto the G20 agenda when the country became the first non-G8 member to host a summit in 2010 (Cho et al. 2014). During Lee’s presidency, Korea also launched the Global Green Growth Institute (GGGI) to share knowledge and promote the development of domestic green growth platforms around the world (predominantly in developing countries; GGGI n.d.). Initially, GGGI was a nonprofit

foundation, but at the Rio+20 Earth summit in 2012, it was converted into an international organization. Korea committed USD 5 million to a new “green new deal fund” within GGGI in May 2021 (Shin 2021).

Despite the rhetoric around green growth, South Korea is an environmental laggard. The country was the seventh-biggest emitter of carbon dioxide in 2018 (IEA 2020a). The Korean economy remains focused on energy-intensive manufacturing industries including electronics, cars, shipbuilding and steel. Coal and oil dominate the country’s energy supply, with a growing share for methane gas, the vast majority of which is imported (IEA 2020b). While the country does not export fossil fuels, it has been a major financier of coal plants abroad, although President Moon has recently committed to ending new finance for coal (H. Lee 2021). Renewables like solar and wind have not been developed at scale. Nuclear power is currently the only significant low-carbon energy source, and it is highly controversial with the Korean public.

At the same time, the country is increasingly experiencing the impacts of climate change. Average temperatures in the country have already risen by 1.4°C, which is higher than the global average, and summers have become longer (Gabbatiss 2020). Typhoons, heavy rains, landslides, and droughts have already cost the country billions of dollars (Moon et al. 2021). A 2019 study by the Pew Research Centre found that more Koreans (86%) view climate change as a major threat to the country than North Korea’s nuclear program (67%) (Poushter and Huang 2019). Local air pollution is also a major health issue, with the average South Korean anticipated to lose 1.4 years of life expectancy because of fine particulate pollution (AQLI 2019). Although some of the pollution is blown in from neighboring countries, domestic coal power generation and automotive emissions also contribute to the problem.

South Korea ratified the Paris Agreement in November 2016, having submitted a nationally determined contribution (NDC) of a reduction of its emissions to 37% below business as usual (BAU) by 2030, which would amount to levels 78% higher than in 1990 or 10% lower than in 2010 (excluding land use, land use change and forestry) (Climate Action Tracker 2020). The form of the NDC (but not the ambition of the emissions reductions) was modified in December 2020 to a 24.4% reduction of the total national GHG emissions in 2017 (709.1 MTCO<sub>2</sub>e<sup>3</sup>) by 2030 (Republic of Korea 2020).

One of the main cross-sectoral policy instruments implemented to achieve emissions reductions is the Korea Emission Trading Scheme (ETS) launched in 2015; the first nationwide mandatory ETS in East Asia and the second-largest carbon market after the EU ETS (Lee and Woo 2020). However, because the vast majority of trading certificates are still provided for free, the ETS has not yet had a substantial impact on emissions (IEA 2020b). Additionally, the Renewable Portfolio Standard, which replaced a previous feed-in tariff scheme in 2012, requires major electric utilities with capacity over 500 MW to increase their new and renewable energy<sup>4</sup> share in the electricity mix to 10% by 2023 (Lee and Woo 2020). The target will be raised to 25% as of October 2021 (Hong 2021).

Both the NDC and the policies in place to achieve it have been classified by Climate Action Tracker (2020) as “highly insufficient.” The government plans to submit a more ambitious NDC in October 2021 in the lead-up to the 26th Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change.

The remainder of this chapter outlines the key elements of the KGND and the major controversies surrounding it and provides a first look at the KND, highlighting some potential areas of concern. We argue that the KND appears to be an improvement on its predecessor. However, it is still early days, and there are some areas, like just transition planning, where not a lot of detail had been provided by the Korean government at the time of writing. We also

suggest that the substantial investments in hydrogen technologies in the KND are risky in both economic and environmental terms. Finally, both Korean green new deals ultimately rest on the flawed assumption that environmental impacts and CO<sub>2</sub> emissions can be decoupled from economic growth at the scale and pace necessary to meeting emissions targets. Admittedly, the same is true for the EU Green Deal and other proposals for GNDs being considered around the world. We conclude with some suggestions of policies that Korea could consider adding to the KND to bring about a more significant transformation of the economy.

### The Korean Green New Deal (2009)<sup>5</sup>

As an export-oriented country heavily focused on medium- and high-technology products, Korea's economy was severely affected by the GFC. In November 2008, a KRW<sup>6</sup> 14-trillion (USD 10.9 billion) package was introduced, focused largely on tax cuts, infrastructure, and support for the construction industry (Nanto 2009). This was followed by a KRW 50-trillion (USD 38.1 billion) "Green New Deal" in January 2009.

In a widely cited report by a research team at HSBC, Korea's green stimulus up to May 2009 was calculated to be USD 30.7 billion (Robins et al. 2009). The report does not mention the first Korean stimulus, although it does mention the stimulus plans of other countries developed in 2008. Consequently, Korea's proportion of green stimulus was reported as 80.5%, leading to claims that the country had the "greenest" stimulus package in the world. Had the earlier stimulus been included (bringing the total stimulus to USD 49 billion), the green percentage would have fallen to 63%, placing Korea on par with the European Union. The controversial centerpiece of the KGND – the Four Major Rivers Project – was allocated almost a third of the total budget (see Table 15.1).

Table 15.1 KGND Budget in Trillions of KRW

| Project          |   | Total Budget |
|------------------|---|--------------|
| Core Projects    | Four Major Rivers Project               | 14.48        |
|                  | Green transportation                    | 9.65         |
|                  | Integrated territory management         | 0.37         |
|                  | Water resource catchment                | 0.94         |
|                  | Green cars and clean energy             | 2.05         |
|                  | Water resource reuse                    | 0.93         |
|                  | Forest protection                       | 2.42         |
|                  | Green Home Green School                 | 8.05         |
|                  | Eco-River                               | 0.48         |
| Related Projects | Disaster risk area management           | 2.50         |
|                  | Clean Korea                             | 0.21         |
|                  | Green waterside area                    | 0.80         |
|                  | Bio-mass energy                         | 1.12         |
|                  | Disaster prevention, forest restoration | 0.73         |
|                  | Public facility LED replacement         | 1.34         |
|                  | Green IT technology                     | 0.11         |
|                  | Other                                   | 3.96         |
| Total            |   | <b>50.15</b> |

Source: Adapted from Tienhaara 2018.

The KGND was eventually incorporated into the National Strategy for Green Growth, which had an additional budget of KRW 3.796 trillion in 2009 (see Table 15.2). KRW 1.3 trillion (34.5% of the total budget) was allocated to green technology development. Nuclear and nuclear fusion technologies received the largest portion of funds (35.8%). Renewable energy technology development only received an 18.5% share of the green technology budget, down from 19.2% in 2008 (Yun 2009).

Expansion of nuclear power became a core feature of green growth in Korea under the Lee administration. By 2010, there were plans for 13 new nuclear power units to be constructed by 2024, which would increase the total number of units to in the country to 34 and increase the share of electricity produced by nuclear power to 49% (IEA 2012). President Lee argued that nuclear power would both improve the country's energy independence and help to mitigate climate change (O'Donnell 2013). However, many in the country have long-held concerns about the issue of storing spent nuclear fuel. Some environmental groups, such as Green Korea United, have also called into question the climate credentials of nuclear power, arguing that emissions from the mining and refining of the uranium fuel source must be considered (O'Donnell 2013).

Renewable energy was largely sidelined in the KGND and the National Strategy for Green Growth. In 2018, Korea had the lowest share of energy from renewable sources in energy supply among all International Energy Agency (IEA) countries (IEA 2020b).

Table 15.2 Low-Carbon Green Growth-Related Budgets in 2008 and 2009 in Billions of KRW

| Category   | 2008             | 2009   | Details                           | 2008 <sup>a</sup> | 2009 <sup>a</sup> | Change <sup>b</sup> |
|--|------------------|--------|-----------------------------------|-------------------|-------------------|---------------------|
| Green technology development                         | 10,812<br>+23.7% | 13,069 | New and renewables                | 2,079 (19.3%)     | 2,424 (18.5%)     | +16.6%              |
|  |                  |        | Nuclear and fusion                | 3,775 (34.9%)     | 4,683 (35.8%)     | +24.1%              |
|  |                  |        | Eco-friendly industry             | 1,324 (12.2%)     | 1,375 (10.5%)     | +3.9%               |
|  |                  |        | 372 (3.4%)                        | 662 (5.1%)        | +78.0%            |                     |
|  |                  |        | 3,262 (30.2%)                     | 3,927 (30.0%)     | +20.4%            |                     |
| Green car and LED Climate change-related             |                  |        |                                   |                   |                   |                     |
| Diffusion of renewables and energy-saving facilities | 11,058<br>+24.1% | 13,820 | New and renewables                | 3,103 28.1(%)     | 4,482 (32.4%)     | +44.4%              |
|  |                  |        | Loan for energy-saving facilities | 4,837 (43.7%)     | 5,337 (38.6%)     | +10.3%              |
|  |                  |        | New mass transit including CNG    | 1,054 (9.5%)      | 2,085 (15.1%)     | +97.8%              |
| Promotion of eco-friendly business                   | 879<br>+3.9%     | 1,408  | Energy recovery from waste        | 32 (3.6%)         | 344 (24.4%)       | +975.0%             |
| Capacity building for climate change response        | 7,895<br>+20.4%  | 9,619  | GHG reduction in agriculture      | 2,200 (27.9%)     | 2,683 (27.9%)     | +22.0%              |
|  |                  |        | International cooperation         | 42 (0.5%)         | 420 (4.4%)        | +900.0%             |
| Total  | 30,644<br>+23.7% | 37,916 |                                   |                   |                   |                     |

Source: National Assembly Budget Office 2008 and 2009.

a Figures in () means the share of budget in each category.

b Change means growth rate of budget from 2008 to 2009.

In addition to the substance of these strategies, there have also been critiques focused on the way in which they were developed. There was no process to consult or engage with civil society about funding decisions (Gunderson and Yun 2017). It was a top-down approach (Bluemling and Yun 2016) or what Han (2015) calls “environmental authoritarianism.” For example, civil society members were not well represented in the Presidential Commission on Green Growth, the top governance entity that initiated the Five-Year Plan for Green Growth (Lee and Yun 2011). The project that most exemplifies this environmental authoritarianism is the disastrous Four Major Rivers Project.

### ***The Four Major Rivers Project***

During his presidential election campaign, Lee Myung-bak – who in addition to being the former mayor of Seoul was also the former CEO of a construction company – proposed a Pan-Korean Grand Waterway involving a series of canals, including one stretching 335.5 miles (540 km) connecting Seoul and Busan (Korea’s two largest cities) (Kim 2012). Lee won the election, but this proposal proved very controversial. Polls suggested that more than 80% of the country’s citizens opposed the project (Kim 2012). In February 2008, college professors across Korea formed the Professors’ Organization for Movement against the Grand Korean Canal (POMAC), the membership of which would eventually swell to over 2,500 academics (Yun 2014). In the summer of 2008, to regain the public’s favor following his incredibly unpopular decision to allow the importation of US beef during the mad cow disease crisis, Lee promised to drop the canal project. Stocks of construction companies across the nation immediately fell (Card 2009).

When the KGND was released in January 2009, Korean critics immediately pointed out that the Four Major Rivers Project was simply the Pan-Korean Grand Waterway under a different name. The government refuted this claim, but a 2013 report from the Board of Audit and Inspection (an arm’s-length government body) suggests that the critics were correct. According to the report, when President Lee publicly abandoned the Pan-Korean Grand Waterway, the Ministry of Land, Transport and Maritime Affairs was secretly ordered to develop an alternative plan to revive the project (Chosunilbo 2013).

The Four Major Rivers Project was initially allocated almost KRW 14.5 trillion (USD 11.3 billion). By the time it was completed in late 2011, costs had ballooned to KRW 22 trillion (USD 20 billion).<sup>7</sup> The project involved dredging 570 billion m<sup>3</sup> of sediment and creating 16 dams across the country’s four largest rivers. Three dams were built on the Han River, eight on the Nakdong River, three on the Geum River, and two on the Yeosang River. It was the first time that Korea had built dams on the main bodies of four major rivers that were sources of drinking water.

The government framed the project primarily in terms of climate change adaptation (protection against flooding) with other specific benefits including increased water storage capacity and improved water quality (Republic of Korea n.d.; Cha et al. 2011; MLTM 2012). The government argued that “repeated flooding and droughts have caused human casualties, ecosystem loss and habitat degradation, property damage and forced displacement of riverine residents” (Cha et al. 2011, 1). However, critics of the project countered that the major rivers in Korea had already been well prepared against floods, and that it is along the tributaries of those rivers where most serious flooding now occurs (Chang et al. 2012; Yun 2014). Critics also questioned the need for increased water storage, as water scarcity is not an issue in South Korea, “a country which has sufficient annual rainfall, a number of mountains, and is well equipped with water supply facilities” (Chang et al. 2012, 157). Experts argued instead that

the problem facing the country was “excessive per capita water consumption” (10.5 gallons [40.02 liters] per person daily, which is two to six times the consumption rate of other developed countries) (Chang et al. 2012, 157). The government’s own water resource planning document from 2006 suggests that even in a worst-case scenario of dramatic droughts and increased demand, water shortfalls would not have been large enough to justify the scale of the Four Major Rivers Project and could have been addressed through much smaller and simpler management systems (J-S. Kim 2013).

The issue of water quality is perhaps the most controversial aspect of the Four Major Rivers Project. The government claimed that by 2012, “the water quality of the mainstream will be improved to an average of level two (Biochemical Oxygen Demand less than 3 ppm)” (Cha et al. 2011, 4). The government seems to have hoped that in addition to reducing the introduction of contaminants through new water treatment facilities, it could also rely on the dictum that “the solution to pollution is dilution.” The Lee administration claimed that enlarging the “water bowl” through dredging and installing dams would improve water quality by diluting pollutants (Nam 2011). However, the National Institute of Environmental Research found that increased water levels during the dry season and decreased rates of water flow would encourage algae growth in the stagnant water and lead to a reduction in water quality (Nam 2011).

In addition to these issues, the NGO Birds Korea (2010) predicted that 50 bird species would be negatively affected by the project and the conservation value of at least one Ramsar-listed wetland would be reduced. In 2012, the World Water Network awarded Korea a “Grey Globe Award” (the award highlights wetlands that are being actively degraded or neglected). The award announcement (World Water Network 2012) noted:

The wetlands are home to many endangered species such as hooded cranes (Globally Vulnerable) whose numbers have declined from 3,000 to 1,000 since the Four Major Rivers Project started in 2009. Established resting sites for white-naped cranes have also been lost, as well as most of the habitats of freshwater clams. The Nakdong Estuary has seen a drop of 75% in its wintering bird populations, despite being nationally designated.

In October 2013, a representative of the main opposition party (the Democratic Party) used an Environment Ministry report to argue that 28 protected species had disappeared from the river ecosystem during the implementation of the project (P. Kim 2013).

In addition to environmental issues, there were several injuries and deaths among laborers on the project, as well as structural flaws in the completed bridges and weirs (Chang et al. 2012). The Board of Audit and Inspection reported in 2013 that the concrete riverbeds built to protect the weirs had subsided or been swept away for 11 out of 16 weirs (Stedman 2013; Lah et al. 2015). Korean economists were concerned that the cost of maintaining the system would burden the country’s recovering economy (Tienhaara 2018). The Board of Audit and Inspection also determined that large-scale corruption and collusion had occurred in the bidding process for construction work on the project (Chosunilbo 2013). Eight contractors involved in the scheme were fined by the South Korean Fair Trade Commission for bid rigging, and in September 2013, the Supreme Prosecutor’s Office in Seoul charged 22 individuals at 11 construction companies with bid rigging (Sleight 2013).

Pundits dispute the number of genuine jobs created by the Four Major Rivers Project as opposed to those that already existed and were simply reclassified as part of the project (Chang et al. 2012; Kim et al. 2012). The government aimed to create as many as 340,000 jobs through the project, but Lah et al. (2015) estimated that only 4,162 jobs were actually

created (including temporary jobs). Concern has also been expressed about the quality of the jobs created (Yun et al. 2011; Chang et al. 2012; Kim et al. 2012). It has been suggested that the government's much smaller investment in renewable energy created higher-quality jobs than the Four Major Rivers Project did (Chang et al. 2012).

It was the construction industry, not the environment or the Korean people, that stood to benefit most from the Four Major Rivers Project, and President Lee had strong ties to that industry as the former CEO of a major construction firm. Han (2015, 823) argues that:

The president and a small group of technocrats dominated the policy-making process and concentrated bureaucratic authority under a development-oriented ministry, which in turn reinforced its symbiotic relationship with the construction industry through project implementation. The Lee administration failed to incorporate policy input from local governments, NGOs, the media, and the public, despite their intense attention and opposition to the project for environmental, economic, and procedural reasons.

Speculation over why Lee pursued this project so relentlessly range from the extremely cynical suggestion that he “owed” the construction industry for their help with his election campaign, to the more forgiving argument that he was simply misguided and truly believed that the project would benefit the country (Tienhaara 2018). Once Lee had left office, the Board of Audit and Inspection conducted three further investigations into the project (an unprecedented number). President Moon made a campaign promise that the weirs would be opened fully and that some would be dismantled, and the government is now doing so at a cost of nearly 90 billion won (USD 75 million) (Kang et al. 2019; MacDonald 2020).

### ***The failure of “green growth”***

As noted above, the KGND and subsequent investments and policies of the Lee administration were heavily focused on the idea of “green growth.” There are two key underlying assumptions of the green growth policy paradigm. The first is that economic growth and environmental pressure can be decoupled (UNEP 2010). In other words, through investments in energy efficiency measures and non-fossil-fuel-based energy, it will be possible for GDP to increase while environmental pressures, such as GHG emissions, decline. A second assumption is that the development of green technologies can act as a new engine for economic growth: i.e., that the economy can grow *through* environmental protection (Jacobs 2013).

A growing literature questions these assumptions, particularly with respect to decoupling. While there is evidence of *relative decoupling* (i.e., when the growth rate of emissions is lower than the rate of economic growth) in some developed countries (Jorgenson and Clark 2012), there is debate about the existence, extent, and prevalence of absolute decoupling (i.e., absolute reductions in emissions despite economic growth), especially when emissions related to trade are considered (Knight and Schor 2014; Cohen et al. 2017; Haberl et al. 2020; Hubacek et al. 2021). Even Nordic countries that have made large strides in mitigation (e.g., Denmark) “cannot be said to have demonstrated genuine green growth in this century” if one accounts for trade-related emissions and a stringent climate target is used as the reference point for “sufficient” decoupling (Tilsted et al. 2021, 7). There has “never been a global pattern of absolute decoupling of CO<sub>2</sub> from economic growth” (Parrique et al. 2019, 24) and, assuming continued economic growth, it is very unlikely that absolute decoupling could occur at the scale and pace necessary to avoid catastrophic climate change (Anderson and Bows 2012; Hickel and Kallis 2019). Compared to mitigation pathways that assume continued economic



growth and unprecedented technological development, Keyßer and Lenzen (2021) show that “degrowth” scenarios, where GDP would decline due to strong mitigation policies, are better suited to keep warming within 1.5°C above preindustrial levels.

As predicted in early critical evaluations (Shim 2010; Yun 2009 and 2010), Korea has provided evidence in practice of the problems with the green growth paradigm (Dale 2015; Bluemling and Yun 2016; Gunderson and Yun 2017). While the growth objective was achieved (GDP rose 16.2% from KRW 1,188,118 billion in 2009 to KRW 1,380,833 billion in 2013, based on 2010 prices) (KEEI 2018) and energy efficiency also improved, absolute decoupling did not occur (Gunderson and Yun 2017). Instead, common measures of environmental pressure *increased* during the rollout of the KGND and National Strategy for Green Growth. Not only did GHG emissions increase 16.6% during the period 2009–2013 (598.0 MTCO<sub>2</sub>eq to 697.4 MTCO<sub>2</sub>eq), but they also *exceeded* BAU emissions (Republic of Korea 2014). Total primary energy supply also increased 14.5% (from 243.5 MTOE<sup>s</sup> to 278.9 MTOE) during this period (Korea Energy Economics Institute 2015).

### The Korean New Deal (2020)

In the run-up to Korea’s parliamentary election on 15 April 2020, the ruling centrist Democratic Party of Korea (DPK), the center-right Party for People’s Livelihoods (PPL), the center-left Justice Party (JP) and the left Green Party Korea (GPK) all made pledges around a “Green New Deal” (S. Lee 2020). DPK’s climate manifesto included a pledge to pass a “Green New Deal Special Act” to steer the country’s transformation to a low-carbon economy with the aim of achieving net-zero carbon emissions by 2050 (Ha 2020). The manifesto explicitly referenced the US GND and EU Green Deal as inspiration. The DPK achieved a landslide victory in 2020 general election, returning President Moon Jae-in to the Blue House and securing the party and its allies 180 seats in the 300-seat National Assembly.

The government released the Korean New Deal (KND) on 14 July 2020. The KND has two main pillars – the Digital New Deal and the Green New Deal – along with several policies to create a “Stronger Safety Net” (e.g., increases to employment insurance and worker compensation). The overall funding package for the KND is KRW 160 trillion (USD 140 billion) with approximately KRW 73.4 trillion (USD 60.9 billion) for “green” investments in the period 2020–2025 (KRW 42.7 trillion of which would come from the treasury and the rest from local governments and the private sector). Table 15.3 outlines how these funds are expected to be allocated. The government anticipates that the KND will create 1.9 million jobs by 2025 of which 659,000 will be “green jobs” (Ministry of Economy and Finance 2020).

The government additionally committed KRW 1.1 trillion to a job training program that would include training 20,000 Koreans in “green-integrated fields.”

As with the KGND, the government has received a great deal of international praise for the KND. The UN Secretary General (2020) called it “exemplary,” and the International Energy Agency (IEA 2020b, 11) described it as “a significant step towards accelerating Korea’s energy transition.” Some voices within the country, particularly those associated with the Green Party, have suggested that the KND is not radically different from the KGND (Bae 2020; Ko 2020; S. Lee 2020) and is largely a “repackaging” of existing plans and policies (Smith and Cha 2020). Lee Yujin (2020) has gone so far as to argue that it is “unworthy” of the green new deal name and “is merely a rather disappointing green stimulus package.”

As we write, much of the KND remains in development and it is too soon to provide a comprehensive assessment of it. Nevertheless, it is promising that there is a clear shift away from funding for coal and nuclear power and a much-needed emphasis on renewable energy

Table 15.3 KND Budget (Green New Deal pillar) in Trillion KRW

| Focus Area                          | Projects   | Total Budget |
|-------------------------------------|--|--------------|
| Green transition of infrastructures | Turning public facilities into zero-energy buildings   | 6.2          |
|                                     | Restoring the terrestrial, marine and urban ecosystems   | 2.5          |
|                                     | Building a management system for clean and safe water  | 3.4          |
| Low-carbon and decentralized energy | Building a smart grid for more efficient energy management   | 2.0          |
|                                     | Promoting renewable energy use and supporting a fair transition  | 9.2          |
| Innovation in green industry        | Expanding the supply of electric and hydrogen vehicles   | 13.1         |
|                                     | Promoting prospective businesses to lead green industry and establishing low-carbon and green industrial complexes | 3.6          |
|                                     | Laying the foundation for green innovation via the R&D and financial sectors                                       | 2.7          |
| Total                               |  | <b>42.7</b>  |

Source: Ministry of Economy and Finance 2020.

development. The Moon government has committed to phase out 30 coal power plants after 30 years of operation by 2034 (Ministry of Industry, Trade and Energy 2020). This is approximately half of the country's coal fleet. Much of the impetus for the coal phase-out has come from regional governments. The province of South Chungcheong – where around half the country's coal plants are located – joined the international Powering Past Coal Alliance (PPCA) in 2018. Six more subnational governments from Korea had joined by May 2021 (PPCA 2021). It is also worth noting that several analyses have indicated that coal power could (and should) be completely phased out much faster than the Moon government's plan (Parra et al. 2020; Ehrenheim et al. 2021). In June 2021, the UK's COP26 Envoy and Canada's Ambassador for Climate Change called on Korea to completely phase out coal by 2030 (Murton and Fuller 2021).

The Moon government has additionally committed to a gradual phase-out of nuclear power generation (IEA 2020b). As of 2021, the country had 24 nuclear power plants operating across the country's relatively small land area, giving it the highest density of nuclear power plants in the world. Nuclear power has become very controversial in the country, especially since the 2011 Fukushima disaster in Japan. The unexpected 5.8 magnitude earthquake in Gyeongju in September 2016, one of the strongest earthquakes in Korean modern history, and an earthquake in Pohang in November 2017 have also magnified public concerns about the safety of nuclear power. Two planned nuclear plants have been cancelled by the Moon government, while two that were already under construction when he was elected have been allowed to proceed after a public engagement process in 2017.

In terms of increasing the supply of renewable energy, the KND is expected to add 12.8 gigawatts to the government's initial midterm goal of increasing solar and wind to 29.9 gigawatts by 2025 (B. Kim 2020). In the allocation of funding for renewables, there is an effort to incorporate some consideration of "justice" in the KND, which has been the hallmark of the US GND discourse but is also increasingly discussed by domestic environmental groups and unions within Korea (Yun and Jung 2017). There is specific mention of community benefit sharing for renewable energy projects and greater support for renewable energy for residents of rural areas and industrial complexes. The KND also highlights that a "fair transition will be ensured for those regions that foresee difficulties coming from a reduced use of coal power and other traditional sources of energy" (Ministry of Economy and Finance 2020, 28), although a detailed plan was not provided (Lee and Woo 2020). Nevertheless,

research suggests that support in the form of wage subsidies and unemployment insurance for displaced workers can play an important role in a just transition from coal to renewables (Garg et al. 2017), and these are policies that the Korean government is adopting or expanding under the “Stronger Safety Net” component of the KND.

In addition to the shift in focus to renewable energy and increased acknowledgement of the distributive effects of the energy transition, the Moon administration has taken a welcome approach to public participation in the development of the KND. In contrast with the “environmental authoritarianism” of the Lee administration, the Moon government has been inclusive and engaged with civil society. The presidential commission on policy and planning has held “hearing and consensus discussion” by region to collect public opinions about KND and explore regional KND projects.

Although these elements suggest that the KND is an improvement over its predecessor in both environmental and social terms, there are some valid concerns about the plan that are worth exploring. One is that hydrogen technologies receive substantial funding under the KND. Another is that the overall strategy remains premised on decoupling environmental impact from growth through technological innovation, i.e., green growth.

### ***Betting big on hydrogen***

The largest allocation of green funding in the KND is for transportation. Transportation is the second-largest energy consuming sector and the second-largest source of emissions in Korea (IEA 2020b). The automobile industry also makes up 12% of total employment in the country. Therefore, the government’s focus on this sector is hardly surprising. However, in addition to subsidizing battery electric vehicles (BEVs) and investing in charging infrastructure, like many governments around the world, South Korea is making substantial investments in hydrogen fuel cell electric vehicles (FCEVs) and hydrogen refueling infrastructure. The KND sets a target to have 200,000 FCEVs on the road by 2025 and to increase the number of hydrogen refueling stations from 37 to 450. The specific type of FCEVs (e.g., passenger vehicles versus trucks and buses) is not specified in the KND. However, the government’s 2019 Hydrogen Economy Roadmap anticipates that passenger vehicles will make up 95% of FCEV production by 2040 (Clifford Chance 2020).

Investing in hydrogen is a risky move in both economic and environmental terms. The idea of hydrogen as a clean energy solution has had several false starts (Van der Graaf et al. 2020). This time may be different, and many argue that hydrogen will play an essential role in decarbonizing economies. However, there are substantial uncertainties and debates about whether this will be a niche role in hard-to-electrify sectors like shipping, aviation and steel, or will instead result in a more encompassing “hydrogen economy” (Evans and Gabbatiss 2020). With respect to passenger vehicles, many experts argue that FCEVs have already lost the race against BEVs (Morris 2020). FCEVs are more expensive than BEVs, although they do currently have some advantages in terms of range. There are commercial vehicles like long-haul heavy payload trucks where a battery electric model is more challenging, and hydrogen may play a more important role (BloombergNEF 2020). Still, companies like Korea’s Hyundai continue to focus on passenger vehicles alongside commercial ones because mass production is required to reduce costs, and “truck volumes can’t come close to volumes of passenger cars” (Park 2020).

Importantly, given the export-focused nature of Korea’s automotive industry, strong support for the technology within Korea will not be enough. The Hydrogen Economy Roadmap envisions Korea becoming a global leader in the market for hydrogen-based technology

in transportation. Of the 6.2 million cars planned for in the Roadmap, only 2.9 million are intended for sale in the domestic market, whereas 3.3 million would be exported. As Stangarone (2021, 510) notes, “much of the plan will rest on South Korea’s ability to expand the acceptance of fuel cell electric vehicles (FCEVs) first in South Korea’s domestic market and in time in markets around the world.” For such a plan to work, governments in key export markets will have to invest in refueling infrastructure. However, public concerns about the safety of hydrogen fueling stations and their siting may limit attempts to expand infrastructure for FCEVs both within Korea and abroad (IEA 2020b, 15).

On the environmental side, it is important to understand that “hydrogen is not an energy source but an energy *carrier*” (Van de Graaf et al. 2020, 2). While hydrogen itself burns cleanly, producing only water vapor, it is currently mainly produced using fossil fuels – either methane gas (“grey” hydrogen) or coal (“black” hydrogen). While there is a lot of hype about the use of carbon capture and storage (CCS) technologies to create “blue” hydrogen, such technology has been deployed at an underwhelming pace. Furthermore, blue hydrogen would only be carbon neutral if methane at the point of extraction was also successfully captured. One study found that even if the release of fugitive methane is kept very low, greenhouse gas emissions from blue hydrogen are still greater than from simply burning natural gas and that, therefore, “the use of blue hydrogen appears difficult to justify on climate grounds” (Howarth and Jacobson 2021, 1).

“Green” hydrogen created through electrolysis powered by renewables is currently negligible but could rapidly become dominant with the right policies and investments. At present, South Korea’s hydrogen needs are supplied from byproducts in the petrochemical process. It is anticipated that increased demand will be met by domestic production using liquefied natural gas (LNG; Stangarone 2021) and hydrogen imports (Anderson 2021). The Hydrogen Economy Roadmap assumes that CCS will be viable to convert domestic grey hydrogen to blue hydrogen and that green hydrogen is not likely to be cost-competitive before 2030 (IEEFA 2020). It is not clear how Korea will achieve the transition from grey to blue to green. As law firm Clifford Chance (2020, 4) has pointed out, the government’s hydrogen strategy

appears to be driven more by the perceived opportunities for economic growth and industrial competitiveness than by climate change objectives. It remains to be seen what concrete steps or plans will be devised for the shift from grey to green hydrogen on the production/supply side.

### ***Still green growth?***

Green growth became an unpopular term in Korea following the Four Major Rivers Project, and President Park’s administration, which followed Lee’s, was very reluctant to use the term even though they are from the same political party (Gunderson and Yun 2017). Nevertheless, a second Five-Year Plan for Green Growth was adopted in 2014 in accordance with the Framework Act on Low Carbon Green Growth, which maintained a focus on improving energy efficiency and “greening” industry and technology (Global Green Growth Institute [GGGI] 2015). A third Five-Year Plan for Green Growth (2019–2023) was adopted after President Moon Jae-in (Democratic Party of Korea) took office in 2017. However, the DPK has been trying to legislate a Framework Act on Carbon Neutrality Implementation to replace the Framework Act on Low Carbon Green Growth. Furthermore, President Moon’s main policy platform did not mention green growth, instead outlining a vision of “A Nation of the People, a Just Republic of Korea.” When speaking at the 2018 Partnering

for Green Growth and Global Goals 2030 (P4G) summit in Denmark, Moon (2018) noted that “Korea has had various successes in reducing greenhouse gas emissions through green growth policies over the past 10 years, all the while maintaining growth,” but otherwise the speech focused much more heavily on “inclusiveness.” At the second P4G held in Seoul in May 2021, Moon did not address green growth in his remarks and instead mainly focused on carbon neutrality and the Green New Deal, with an emphasis again on inclusiveness, as well as public-private partnerships and international cooperation (Kim 2021).

Moon’s rhetorical approach may indicate that the term “green growth” continues to be associated in Korea with Lee’s highly controversial term in office, and the Four Major Rivers Project in particular. However, a larger question is whether the KND still relies on decoupling to achieve carbon emissions reductions as the KGND and other green growth policies have, despite the failure of this approach over the last decade. The answer to this question appears to be yes. The text of the KND suggests that growth remains a predominant concern for the government even if the term “green growth” is not used: “The economic risks from the pandemic have shed light on the need for a growth strategy that also ensures sustainability including environmental and ecological protection” (Ministry of Economy and Finance 2020, 25). Moreover, while the enhancements to the social safety net in the KND are an important first step, more transformative initiatives, such as a job guarantee or Universal Basic Income/Services, would likely be required to ensure that increased employment and improved quality of life for Koreans could be achieved in the absence of GDP growth.

## **Conclusions**

Carbon emissions and other environmental pressures increased following the adoption of the KGND, which took a green growth approach and was plagued by controversies surrounding the Four Major Rivers Project and the expansion of nuclear energy. By prioritizing renewable energy development instead of nuclear energy development, increasing inclusiveness and taking some first steps toward a just transition away from coal power, the KND is socially and environmentally superior to the KGND. Despite these improvements, the Moon government may repeat some of the failings of the Lee administration, including strong support for projects with questionable “green” outcomes and the continued focus on green growth as an overriding strategy. While the latter is hardly surprising – economic growth is one of the imperatives of liberal states (Dryzek et al. 2002) and none have fully embraced a shift away from this as a basis for policy – it does place a limit on our expectations for what the KND can achieve. Of course, other green new deals, such as the EU’s Green Deal, are marked by similar ambiguities; they are peppered with potentially transformative tendencies while simultaneously maintaining a commitment to the power structures and economic processes that drive environmental harm (Ossewaarde and Ossewaarde-Lowtoo 2020; Adler and Wargan, this volume).

Unlike some scholars and activists in Korea, we do not believe that the shortcomings of the KND amount to a complete failure. We adopt the more pragmatic approach taken by several commentators who, while recognizing the limits of GND initiatives that have been developed (see Stoner 2020 on the US), view them as a springboard that can potentially lead to more effective and transformational measures over time (e.g., Foster 2019; Klein 2019; Smith 2020). This is in line with Schwartzman’s (2011) call to avoid resolutely rejecting GND proposals as just another manifestation of green capitalism, and, instead, to view them as a potential starting point to begin transitioning out of the ecologically unsustainable dynamics of the current political-economic order (cf. White 2020).

To make the KND truly transformative, the Moon government should consider further policies that can reduce GHG emissions and increase human well-being. For example, the government could expand energy democracy programs like the energy cooperatives already found in Seoul (Gunderson and Yun 2021). As a more overarching policy, we recommend that Korea abandon Gross Domestic Product (GDP) as the key indicator of the health of the economy. GDP is not a valid measure of human well-being or progress, and the goals of increasing economic growth and reducing GHG emissions at the rate and pace necessary are likely incompatible. There are numerous alternative metrics available and examples, such as New Zealand's "well-being budget," that Korea can learn from. Finally, given that South Koreans have historically worked more hours per week on average than all but one other OECD country (there is even a Korean word – "gwarosa" – for "death by overwork"), adopting a shorter working week (see Schor and Tienhaara, this volume) is also a potentially important approach to improving both climate outcomes and the well-being of Koreans. The government has already made a critical first step in this direction by reducing the maximum working hours from a 68 per week to 40. President Moon noted when the legislation was passed that it was an "important opportunity to move away from a society of overwork and move toward a society of spending time with families" (Kwon and Field 2018). However, it is possible to go further in reducing working hours; some countries, such as Spain, are now considering adopting a 4-day (32-hour) work week (Kassam 2021).

We do not suggest that any of these policy proposals will be easy to achieve in Korea, particularly in the current political climate (local elections in 2021 indicated a swing to the conservative opposition). Nevertheless, over the long term they can help Korean society transition out of its currently unsustainable form into a qualitatively different order organized around meeting human needs and protecting the environment.

## Notes

- 1 The first author was supported by funding from the Canada Research Chairs Program.
- 2 The second and third authors' contributions were supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2017S1A3A2067220).
- 3  $\text{MTCO}_2\text{eq}$  = Metric tons of carbon dioxide equivalent.
- 4 In Korea, the term "renewable energy" is not used but instead "new and renewable energy," which refers to energies that are not traditional fossil fuels (coal, oil, gas) or nuclear energy. New energies include hydrogen, fuel cell, coal liquefied/gasified energy and heavy oil residue, and renewable energies include solar, photovoltaic, biomass, wind, small hydro power, geothermal, ocean energy and waste energy.
- 5 This section and the following one are adapted from content in *Green Keynesianism and the Global Financial Crisis* by Kyla Tienhaara, Copyright 2018. Reproduced by permission of Taylor and Francis Group, LLC, a division of Informa PLC.
- 6 KRW = South Korean won.
- 7 Using an average KRW–USD exchange rate for 2011 of 0.0009.
- 8 MTOE = Millions of tons of oil equivalent.

## References

- Air Quality Life Index (AQLI). 2019. South Korea Fact Sheet. University of Chicago. Available from: [https://aqli.epic.uchicago.edu/wp-content/uploads/2019/05/EPIC\\_SouthKorea\\_FactSheet\\_31319.pdf](https://aqli.epic.uchicago.edu/wp-content/uploads/2019/05/EPIC_SouthKorea_FactSheet_31319.pdf)
- Anderson, J. 2021. Experts Debate US Capacity Market Reform, Need for New Ancillary Service Product. *S&P Global*. Available from: <https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/052821-experts-debate-us-capacity-market-reform-need-for-new-ancillary-service-product>

- Anderson, K. and Bows, A. 2012. A New Paradigm for Climate Change. *Nature Climate Change*. 2(9), 639–640.
- Aşıcı, A.A. and Büniöl, Z. 2012. Green New Deal: A Green Way Out of the Crisis? *Environmental Policy and Governance*. 22(5), 295–306.
- Bae, H. 2020. How Green and New Is Moon's Deal? *Korea Herald*. 9 August.
- Bernard, S., S. Asokan, H. Warrell, and J. Lemer. 2009. "The Greenest Bail-Out?" *The Financial Times*, August 17.
- Birds Korea. 2010. *The Anticipated Impacts of the Four Rivers Project (Republic of Korea) on Waterbirds*. Birds Korea Preliminary Report, Busan: Birds Korea. Available from: <http://birdskorea.org/Habitats/4-Rivers/Downloads/Birds-Korea-4-River-Report-March-12-2010.pdf>
- BloombergNEF. 2020. *Hydrogen Economy Outlook*. Available from: <https://data.bloomberglp.com/professional/sites/24/BNEF-Hydrogen-Economy-Outlook-Key-Messages-30-Mar-2020.pdf>
- Bluemling, B., Yun, S.J. 2016. Giving Green Teeth to the Tiger? A Critique of 'green growth' in South Korea. In G. Dale, M.V. Mathai and J.A. Puppim de Oliveira, eds. *Green Growth: Ideology, Political Economy and the Alternatives*. London: Zed Books. pp. 114–130.
- Card, J. 2009. Korea's Four Rivers Project: Economic Boost or Boondoggle? *Yale Environment 360* [blog]. 21 September. Available from: [http://e360.yale.edu/features/koreas\\_four\\_rivers\\_project\\_economic\\_boost\\_or\\_boondoggle](http://e360.yale.edu/features/koreas_four_rivers_project_economic_boost_or_boondoggle)
- Cha, Y.J., Shim, M.P. and Kim, S.K. 2011. The Four Major Rivers Restoration Project. Paper Presented at the *UN Water International Conference, 3–5 October, Zaragoza, Spain*. Available from: [http://www.un.org/waterforlifedecade/green\\_economy\\_2011/pdf/session\\_8\\_water\\_planning\\_cases\\_korea.pdf](http://www.un.org/waterforlifedecade/green_economy_2011/pdf/session_8_water_planning_cases_korea.pdf)
- Chang, Y.-B., Han, J.-K. and Kim, H.-W. 2012. Green Growth and Green New Deal Policies in the Republic of Korea. *International Journal of Labour Research*. 4(2), 151–171.
- Cho, H., Leitner, J., Lee, J. and S. Heo. 2014. Korean Green Growth: A Paradigm Shift in Sustainability Policy, and its International Implications. *Journal of Korean Law*. 13, 301–333.
- Chosunilbo. 2013. Probe Finds Massive Underhand Dealings in 4 Rivers Project. *Chosunilbo*. 11 July. Available from: [http://english.chosun.com/site/data/html\\_dir/2013/07/11/2013071101465.html](http://english.chosun.com/site/data/html_dir/2013/07/11/2013071101465.html).
- Clifford Chance. 2020. Focus on Hydrogen: Korea's New Energy Roadmap. Available from: <https://www.cliffordchance.com/content/dam/cliffordchance/briefings/2020/10/focus-on-hydrogen-korea-new-energy-roadmap.pdf>
- Climate Action Tracker. 2020. South Korea: Pledges and Targets (30 July Update). Available from: <https://climateactiontracker.org/countries/south-korea/pledges-and-targets/>
- Cohen, G., Jalles, J.T., Loungani, M.P., and Marto, R. 2017. *Emissions and Growth: Trends and Cycles in a Globalized World*. Washington, D.C.: International Monetary Fund.
- Dale, G. 2015. Origins and Delusions of Green Growth. *International Socialist Review*. 97. Available from: <http://isreview.org/issue/97/origins-and-delusions-green-growth>
- Dietz, T., Rosa, E.A. and York, R. 2012. Environmentally Efficient Well-being: Is There a Kuznets Curve? *Applied Geography*. 32(1), 21–28.
- Dryzek, J. et al. 2002. Environmental Transformation of the State: the USA, Norway, Germany and the UK. *Political Studies*. 50, 659–682.
- Easterlin, R.A. 1974. Does Economic Growth Improve the Human Lot? Some Empirical Evidence. In P.A. Dagvid and M.W. Reder, eds. *Nations and Households in Economic Growth*. New York: Academic Press. pp. 89–125.
- Ehrenheim, V., Kim, S., Song, Y. and Kim, J. 2021. End In Sight: How South Korea Can Force Coal Offline by 2028. Carbon Tracker, Chungnam National University and Solutions for Our Climate. Available from: <https://carbontracker.org/reports/end-in-sight/>
- Evans, S. and Gabbatiss, J. 2020. In-depth Q&A: Does the World Need Hydrogen to Solve Climate Change? *Carbon Brief*. Available from: <https://www.carbonbrief.org/in-depth-qa-does-the-world-need-hydrogen-to-solve-climate-change>
- Feindt, P.H. and Cowell, R. 2010. The Recession, Environmental Policy and Ecological Modernization—What's New About the Green New Deal? *International Planning Studies*. 15(3), 191–211.
- Fitzgerald, J.B., Jorgenson, A.K. and Clark, B. 2015. Energy Consumption and Working Hours: A Longitudinal Study of Developed and Developing Nations, 1990–2008. *Environmental Sociology*. 3(1), 213–223.
- Foster, J.B. 2019. A Green New Deal Is the First Step toward an Eco-revolution. *Truthout*. Available from: <https://truthout.org/articles/a-green-new-deal-is-the-first-step-toward-an-eco-revolution/>

- Gabbatiss, J. 2020. The Carbon Brief Profile: South Korea. 6 April. Available from: <https://www.carbonbrief.org/the-carbon-brief-profile-south-korea>
- Galvin, R. and Healy, N. 2020. The Green New Deal in the United States: What it Is and How to Pay for it. *Energy Research & Social Science*. 67, 101529.
- Garg, A., Steckel, J. et al. 2017. Bridging the Gap: Phasing Out Coal. In *Emissions Gap Report 2017*. Nairobi: UN Environment. Available from: [https://wedocs.unep.org/bitstream/handle/20.500.11822/22106/EGR\\_2017\\_ch\\_5.pdf?isAllowed=y&sequence=1](https://wedocs.unep.org/bitstream/handle/20.500.11822/22106/EGR_2017_ch_5.pdf?isAllowed=y&sequence=1)
- Georgescu-Roegen, N. 1971. *The Entropy Law and the Economic Process*. Cambridge, MA: Harvard University Press.
- GGGI 2015. Global Green Growth Institute. 2015. *Korea's Green Growth Experience: Process, Outcomes and Lessons Learned*. Seoul: Global Green Growth Institute.
- Gowan, P. 2018. A Plan to Nationalize Fossil-Fuel Companies. *Jacobin*. Available from: <https://www.jacobinmag.com/2018/03/nationalize-fossil-fuel-companies-climate-change>
- Green Europe Foundation. 2009. A Green New Deal for Europe. Brussels. Available from: [https://epub.wupperinst.org/files/3336/3336\\_Green\\_New\\_Deal.pdf](https://epub.wupperinst.org/files/3336/3336_Green_New_Deal.pdf)
- Gunderson, R. 2019. Work Time Reduction and Economic Democracy as Climate Change Mitigation Strategies: Or Why the Climate Needs a Renewed Labor Movement. *Journal of Environmental Studies and Sciences*. 9(1), 35–44.
- Gunderson, R. and Yun, S-J. 2017. South Korean Green Growth and the Jevons Paradox: An Assessment with Democratic and Degrowth Policy Recommendations. *Journal of Cleaner Production*. 144, 239–247.
- Gunderson, R. and Yun, S-J. 2021. Building Energy Democracy to Mend Ecological and Epistemic Rifts: An Environmental Sociological Examination of Seoul's One Less Nuclear Power Plant Initiative. *Energy Research & Social Science*. 72 (2), 101884.
- Ha, T. 2020. In East Asian first, South Korea Announced Ambitions to Reach Net Zero by 2050. *Eco-Business*. Available from: <https://www.eco-business.com/news/in-east-asian-first-south-korea-announces-ambitions-to-reach-net-zero-by-2050/>
- Halberl, H., Wiedenhofer, D., Virag, D., Kalt, G., Plank, B., Brockway, P., Fishman, T., Hausknost, D., Krausmann, F., Leon-Gruchalski, B. and Mayer, A. 2020. A Systematic Review of the Evidence on Decoupling of GDP, Resource Use and GHG Emissions, Part II: Synthesizing the Insights. *Environmental Research Letters*. 15 (6), 065003.
- Han, H. 2015. Authoritarian Environmentalism Under Democracy: Korea's River Restoration Project. *Environmental Politics*. 24(5), 810–829.
- Han, P. 2010. Sustainable and Green Tourism Korea's Green New Deal and 4 Rivers Restoration Project. *Presentation to the OECD Workshop on Sustainable Development Strategies and Tourism*, June 18. Available from: <https://www.oecd.org/cfe/tourism/45558102.pdf>
- Herman, C. 2015. Green New Deal and the Question of Environmental and Social Justice (No. 31). Global Labour University Working Paper.
- Hickel, J. and Kallis, G. 2019. Is Green Growth Possible? *New Political Economy*. 25(4), 469–486.
- Hong, S. 2021. South Korea Raises Renewable Energy Target to 25pc. *Argus Media*. 19 April. Available from: <https://www.argusmedia.com/en/news/2206528-south-korea-raises-renewable-energy-target-to-25pc>
- Howarth, R. and Jacobson, M. 2021. How Green Is Blue Hydrogen? *Energy Science and Engineering* (early view), 1–12. Available from: <https://doi.org/10.1002/ese3.956>
- Hubacek, K., Chen, X., Feng, K., Wiedmann, T., and Shan, Y. 2021. Evidence of Decoupling Consumption-Based CO<sub>2</sub> Emissions from Economic Growth. *Advances in Applied Energy*. 4, 100074.
- International Energy Agency (IEA). 2012. Energy Policies of IEA Countries: Republic of Korea (2012 Review). Available from: [https://iea.blob.core.windows.net/assets/f95918d7-ed55-44ef-81a7-3609261894db/Korea2012\\_free.pdf](https://iea.blob.core.windows.net/assets/f95918d7-ed55-44ef-81a7-3609261894db/Korea2012_free.pdf)
- International Energy Agency (IEA). 2020a. IEA Atlas of Energy. Available from: <http://energyatlas.iea.org/#/tellmap/1378539487>
- International Energy Agency (IEA). 2020b. Korea Energy Policy Review. Available from: <https://www.iea.org/reports/korea-2020>
- IPCC (Intergovernmental Panel on Climate Change). 2018. Summary for policymakers. In: *Global Warming of 1.5°C*. Geneva: World Meteorological Organization.
- Jackson, T. 2009. *Prosperity Without Growth*. London: Earthscan.



- Jacobs, M. 2013. Green Growth. In R. Falkner, ed. *Handbook of Global Climate and Environmental Policy*. Malden, MA: Wiley-Blackwell. pp. 197–214.
- Johanisova, N. and Wolf, S. 2012. Economic Democracy: A Path for the Future? *Futures*. 44(6), 562–570.
- Jones, R.S. and Yoo, B. 2010. Korea's Green Growth Strategy: Mitigating Climate Change and Developing New Growth Engines. OECD Economics Department Working Papers, No. 798. OECD Publishing.
- Jung, M.-K. 2020. "Korean New Deal" Aims to Revive Economy through Digitalization. *Korea Herald*. 7 May. Available from: <http://www.koreaherald.com/view.php?ud=20200507000889>
- Kallis, G., Kerschner, C. and Martinez-Alier, J. 2012. The Economics of Degrowth. *Ecological Economics*. 84, 172–180. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0921800912003333>
- Kang, C. et al. 2019. Weirs Now Open Remain Mired in Controversy. *Korea JoongAng Daily*. 20 March. Available from: <https://koreajoongangdaily.joins.com/news/article/article.aspx?aid=3060839>
- Kang, S.I., Oh, J.G. and Kim, H. 2012. Korea's Low-Carbon Green Growth Strategy. OECD Development Center, Working Paper No. 310.
- Kassam, A. 2021. Spain to LAUNCH trial of Four-Day Working Week. *The Guardian*. 15 March. Available from: <https://www.theguardian.com/world/2021/mar/15/spain-to-launch-trial-of-four-day-working-week>
- Keyßer, L.T. and Lenzen, M. 2021. 1.5°C Degrowth Scenarios Suggest the Need for New Mitigation Pathways. *Nature Communications*. 12(1), 1–16.
- KEEI (Korea Energy Economics Institute). 2018. *2018 Energy Info. Korea*. Available from: [http://www.keei.re.kr/web\\_keei/en\\_publish.nsf/by\\_allv/CF91294F488178C5492583C800006A0D/\\$-file/EnergyInfo2018.pdf](http://www.keei.re.kr/web_keei/en_publish.nsf/by_allv/CF91294F488178C5492583C800006A0D/$-file/EnergyInfo2018.pdf)
- Kim, B. 2020. Korea Sets 42% Renewable Energy Target by 2034. *The Korea Herald*. 16 December. Available from: <https://ieefa.org/korea-sets-42-renewable-energy-target-by-2034/>
- Kim, J.-S. 2013. The Environmental Fallout of the Four Major Rivers Project. *The Hankyoreh*. 3 August. Available from: [http://www.hani.co.kr/arti/english\\_edition/e\\_national/598190.html](http://www.hani.co.kr/arti/english_edition/e_national/598190.html)
- Kim, J.-W. 2012. Four Major River Project and Environmental Ordeal under the Lee Myung-bak Government in South Korea. In A. Mori, ed. *Democratization, Decentralization, and Environmental Governance in Asia*. Kyoto: Kyoto University Press. pp. 72–85.
- Kim, P. 2013. 28 Endangered Species Gone Due to 4-River Project. *The Korea Observer*. 21 October. Available from: <http://www.koreaobserver.com/dozens-endangered-species-perish-following-river-project-8163/>
- Kim, S. 2021. P4G Summit Opens with Pledge for "inclusive green recovery" from Moon. *Korea JoongAng Daily*. 30 May. Available from: <https://koreajoongangdaily.joins.com/2021/05/30/national/socialAffairs/P4G-Summit-green-recovery-climate-change/20210530193200533.html>
- Klein, N. 2019. *On Fire: The (Burning) Case for a Green New Deal*. New York: Simon and Schuster.
- Knight, K.W., Rosa, E.A. and Schor, J.B. 2013. Could Working Less Reduce Pressures on the Environment? A Cross-National Panel Analysis of OECD Countries, 1970–2007. *Global Environmental Change*. 23(4), 691–700.
- Knight, K.W. and Schor, J.B. 2014. Economic Growth and Climate Change: a Cross-National Analysis of Territorial and Consumption-Based Carbon Emissions in High-Income Countries. *Sustainability*. 6(6), 3722–3731.
- Ko, J. 2020. Environment Minister Defends Green New Deal, Promises Carbon Neutrality. *The Korea Herald*. 22 July.
- Korea Energy Economics Institute. 2015. *2015 Energy Info Korea*. Ulsan.
- Kunze, C. and Becker, S. 2015. Collective Ownership in Renewable Energy and Opportunities for Sustainable Degrowth. *Sustainability Science*. 10(3), 425–437.
- Kwon, J. and Field, A. 2018. South Koreans Are Working Themselves to Death. Can they Get their Lives Back? *CNN*. 5 November. Available from: <https://www.cnn.com/2018/11/04/asia/korea-working-hours-intl/index.html>
- Lah, T.J., Park, Y. and Cho, Y.J. 2015. The Four Major Rivers Restoration Project of South Korea: An Assessment of Its Process, Program, and Political Dimensions. *Journal of Environment & Development*. 24(4), 375–394. Available from: <http://dx.doi.org/10.1177/1070496515598611>
- LaJeunesse, R. 2009. *Work Time Regulation as Sustainable Full Employment Strategy: The Social Effort Bargain*. New York: Routledge.

- Lawn, P.A. 2003. A Theoretical Foundation to Support the Index of Sustainable Economic Welfare (ISEW), Genuine Progress Indicator (GPI), and Other Related indexes. *Ecological Economics*. 44(1), 105–118.
- Lee, H. 2021. South Korea Shuns Coal-Power Financing Amid Rising U.S. Pressure. *Bloomberg*. 22 April. Available from: <https://www.bloomberg.com/news/articles/2021-04-22/south-korea-shuns-coal-power-financing-amid-rising-u-s-pressure>
- Lee, H-J. 2020. Moon's Korean New Deal detailed. *Korea JoongAng Daily*. Available from: <https://koreajoongangdaily.joins.com/2020/06/01/economy/newdeal-digitalnewdeal-greennewdeal/20200601193300201.html>.
- Lee, J-H. and Woo, J. 2020. Green New Deal Policy of South Korea: Policy Innovation for a Sustainability Transition. *Sustainability*. 12(23), 10191. Available from: <http://dx.doi.org/10.3390/su122310191>
- Lee, J-H. and Yun, S-J., 2011. A comparative study of governance in state management: Focusing on the Roh Moo-hyun government and the Lee Myung-bak government. *Development and Society*. 40(2): 289–318.
- Lee, S. 2020. The Substance of a Korean Green New DEAL IS STILL BEING DEFINED. *China Dialogue*. 1 July. Available from: <https://chinadialogue.net/en/climate/the-substance-of-a-korean-green-new-deal-is-still-being-defined/>
- Lee, Y. 2020. South Korea's Reforms Should Not be Called a Green New Deal. *Heinrich Boll Stiftung Blog*. Available from: <https://hk.boell.org/en/2020/09/14/south-koreas-reforms-should-not-be-called-green-new-deal>
- Luke, T.W. 2009. A Green New Deal: Why Green, How New, and What Is the Deal? *Critical Policy Studies*. 3(1), 14–28.
- MacDonald, S. 2020. How Green Is South Korea's Green New Deal? *The Diplomat*. 12 August. Available from: <https://thediplomat.com/2020/08/how-green-is-south-koreas-green-new-deal/>
- Martinez, C. 2017. From Commodification to the Commons: Charting the Pathway for Energy Democracy. In D. Fairchild and A. Weinrub, eds. *Energy Democracy: Advancing Equity in Clean Energy Solutions*. Washington, DC: Island Press. pp. 21–36.
- Mathews, J.A. 2012. Green Growth Strategies – Korean Initiatives. *Futures*. 44, 761–769.
- Mazur, A. and Rosa, E. 1974. Energy and Lifestyle: Cross-National Comparison of Energy Consumption and Quality of Life Indicators. *Science*. 186(4164), 607–610.
- Ministry of Economy and Finance. 2020. *Korean New Deal (English version)*. Available from: <https://english.moef.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=4948>
- Ministry of Industry, Trade and Energy. 2020. *2018 Year Energy Statistics*. [in Korean]
- Ministry of Land, Transport and Maritime Affairs (MLTM). 2012. *Four Rivers Restoration Project*. Seoul.
- Moon, J. 2018. Address by President Moon Jae-in at Partnering for Green Growth and the Global Goals 2030 (P4G) Summit. Available from: <https://english1.president.go.kr/briefingspeeches/speeches/85>
- Moon, T.H., Chae, Y., Lee, D.S. et al. 2021. Analyzing climate change impacts on health, energy, water resources, and biodiversity sectors for effective climate change policy in South Korea. *Scientific Reports*. 11, 18512. <https://doi.org/10.1038/s41598-021-97108-7>
- Morris, J. 2020. Why Hydrogen Will Never be the Future of Electric Cars. *Forbes*. 4 July. Available from: <https://www.forbes.com/sites/jamesmorris/2020/07/04/why-hydrogen-will-never-be-the-future-of-electric-cars/?sh=4411f78c12fa>
- Murton, J. and Fuller, P. 2021. UK and Canada Climate Envoys Call on South Korea to Set a 2030 Coal Phase-Out Date. *Powering Past Coal Alliance*. 16 June. Available from: <https://www.poweringpastcoal.org/news/PPCA-news/uk-and-canada-climate-envoys-call-on-south-korea-to-set-a-2030-coal-phase-out-date>
- Nam, J.-Y. 2011. Experts of Government-Affiliated Institute Say the Impacts of Deteriorated Water Quality Have Removed the Economic Basis Used to Justify the Project. *The Hankyoreh*. 22 March. Available from: [http://english.hani.co.kr/arti/english\\_edition/e\\_national/469236.html](http://english.hani.co.kr/arti/english_edition/e_national/469236.html).
- Nanto, D.K. 2009. *The Global Financial Crisis: Analysis and Policy Implications*. CRS Report for Congress. DIANE Publishing.
- National Assembly Budget Office. 2008. *National Finance of Korea 2008*. Seoul: National Assembly Budget Office. [in Korean]
- National Assembly Budget Office. 2009. *National Finance of Korea 2008*. Seoul: National Assembly Budget Office. [in Korean]

- O'Donnell, J. 2013. Nuclear Power in South Korea's Green Growth Strategy. *Green Growth Quarterly Update III-2013*. Council on Foreign Relations.
- O'Neill, D.W. 2012. Measuring Progress in the Degrowth Transition to a Steady State Economy. *Ecological Economics*. 84, 221–231.
- Ossewaarde, M. and Ossewaarde-Lowtoo, R. 2020. The EU's Green Deal: A Third Alternative to Green Growth and Degrowth? *Sustainability*. 12(23), 9825.
- Park, K. 2020. Hyundai Hydrogen Chief on Why the Company Bet on Fuel Cells. *Bloomberg*. 9 June. Available from: <https://www.bloomberg.com/news/articles/2020-06-09/hyundai-s-hydrogen-chief-on-why-the-auto-giant-bet-on-fuel-cells>
- Parra, P. et al. 2020. Transitioning Towards a Coal-Free Society: Science-Based Coal Phase-Out Pathway for South Korea under the Paris Agreement. *Climate Analytics*. Available from: <https://climateanalytics.org/publications/2020/transitioning-towards-a-coal-free-society-science-based-coal-phase-out-pathway-for-south-korea-under-the-paris-agreement/>
- Parrique T. et al. 2019. *Decoupling Debunked: Evidence and Arguments Against Green Growth as a Sole Strategy for Sustainability*. Brussels: European Environmental Bureau.
- Pollin, R., Garrett-Peltier, H., Heintz, J. and Scharber, H. 2008. *Green Recovery: A Program to Create Good Jobs & Start Building a Low-Carbon Economy*. Political Economy Research Institute, University of Massachusetts at Amherst.
- Poushter, J. and Huang, C. 2019. Climate Change Still Seen as the Top Global Threat, but Cyberattacks a Rising Concern. Pew Research Center. Available from: [https://www.pewresearch.org/global/wp-content/uploads/sites/2/2019/02/Pew-Research-Center\\_Global-Threats-2018-Report\\_2019-02-10.pdf](https://www.pewresearch.org/global/wp-content/uploads/sites/2/2019/02/Pew-Research-Center_Global-Threats-2018-Report_2019-02-10.pdf)
- Powering Past Coal Alliance (PPCA). 2021. South Korea's Cities and Provinces Pave the Way for Faster Coal Phase-Out. 18 May. Available from: <https://www.poweringpastcoal.org/news/member-news/south-koreas-cities-and-provinces-pave-the-way-for-faster-coal-phase-out>
- Recognizing the duty of the Federal Government to create a Green New Deal. H. Res. 109, 116th Congress. 2019. Available from: <https://www.congress.gov/bill/116th-congress/house-resolution/109/text>.
- Redefining Progress. 1995. *Gross Production vs Genuine Progress*. Excerpt from the Genuine Progress Indicator: Summary of Data and Methodology. Redefining Progress, San Francisco.
- Republic of Korea. n.d. *The River Revitalization of Korea*. Seoul (on file with authors).
- Republic of Korea. 2014. *First Biennial Update Report of the Republic of Korea under the United Nations Convention on Climate Change*. Seoul: Greenhouse Gas Inventory & Research Center of Korea #501.
- Republic of Korea. 2020. *Submission under the Paris Agreement: The Republic of Korea's Update of its First Nationally Determined Contribution*. Available from: [https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Republic%20of%20Korea%20First/201230\\_ROK%27s%20Update%20of%20its%20First%20NDC\\_editorial%20change.pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Republic%20of%20Korea%20First/201230_ROK%27s%20Update%20of%20its%20First%20NDC_editorial%20change.pdf)
- Robins, N., Clover, R. and Singh, C. 2009. *Building a Green Recovery*. London: HSBC Global Research. Available from: [https://www.unglobalcompact.org/docs/issues\\_doc/Environment/Building\\_a\\_Green\\_Recovery.pdf](https://www.unglobalcompact.org/docs/issues_doc/Environment/Building_a_Green_Recovery.pdf)
- Rosnick, D. and Weisbrot, M. 2006. *Are Shorter Working Hours Good for the Environment? A Comparison of U.S. and European Energy Consumption*. Washington, DC: Center for Economic and Policy Research.
- Salleh, A. 2010. Green New Deal—or Globalisation Lite? *Arena Magazine*. 105, 15–19.
- Santarius, T. 2012. *Green Growth Unravelling. How Rebound Effects Baffle Sustainability Targets When the Economy Keeps Growing*. Berlin: Wuppertal Institute.
- Schor, J.B. and Jorgenson, A.K. 2019. Is it too Late for Growth? *Review of Radical Political Economics*. 51(2), 320–329.
- Schwartzman, D. 2011. Green New Deal: An Ecosocialist Perspective. *Capitalism Nature Socialism*. 22(3), 49–56.
- Sen, A. 1992. *Commodities and Capabilities*. Oxford: Oxford University Press.
- Shim, D. 2010. Green Growth: South Korea's Panacea? In F. Rudiger, J. Hoare, P. Kollner, and S. Pares, eds. *Korea, 2010—Politics, Economy and Society*. Leiden: Brill. pp. 165–188.
- Shin, H. 2011. Global Forum Touts Green Growth Paradigm. *The Korea Herald*. 20 June. Available from: <http://www.koreaherald.com/view.php?ud=20110620000810>
- Shin, H. 2021. S.Korea Pledges Bigger Cuts to Emissions, \$5 mln for New Green Deal Fund. *Reuters*. 30 May. Available from: <https://www.reuters.com/business/environment/skorea-pledges-bigger-cuts-emissions-5-mln-new-green-deal-fund-2021-05-30/>

- Sleight, C. 2013. Price-Fixing Charges on US\$20.5 Billion Four Rivers Project. *International Construction*, <https://www.khl.com/news/Price-fixing-charges-on-US-20.5-billion-Four-Rivers-project/1088539.article>
- Smith, J. and Cha, S. 2020. Jobs Come First in South Korea's Ambitious "Green New Deal" Climate Plan. *Reuters*. 8 June.
- Smith, R. 2011. Green Capitalism: The God that Failed. *Real-World Economics Review*. 56, 112–144.
- Smith, R. 2020. An Ecosocialist Path to Limiting Global Temperature Rise to 1.5°C. *Real-World Economics Review*. 87, 149–180.
- Stangarone, T. 2021. South Korean efforts to Transition to a Hydrogen Economy. *Clean Technologies and Environmental Policy*. 23, 509–516. Available from: <https://doi.org/10.1007/s10098-020-01936-6>
- Stedman, L. 2013. Audit Claims Extensive Four Rivers Project Problems. *Water 21*. London: IWA Publishing. 22 January. Available from: <https://www.iwapublishing.com/?name=news1448>.
- Stoner, A.M. 2020. Critical Reflections on America's Green New Deal: Capital, Labor, and the Dynamics of Contemporary Social Change. *Capitalism Nature Socialism*. Available from: DOI: 10.1080/10455752.2020.1775860.
- Stuart, D., Gunderson, R. and Petersen, B. 2020. *Climate Change Solutions: Beyond the Capital-climate Contradiction*. Ann Arbor: University of Michigan Press.
- Swampa, M. and Viale, E. 2020. A View of the Green New Deal from Argentina. *Jacobin*. Available from: <https://jacobinmag.com/2020/06/green-new-deal-argentina-gran-pacto>
- Szulecki, K. 2018. Conceptualizing Energy Democracy. *Environmental Politics*. 27(1), 21–41.
- Taylor, M. and Nelsen, A. 2019. Yanis Varoufakis: Green New Deal Can Unite Europe's Progressives. *Guardian*. 22 May. Available from: <https://www.theguardian.com/world/2019/may/22/yanis-varoufakis-green-new-deal-can-unite-europes-progressives>.
- Tienhaara, K. 2018. *Green Keynesianism and the Global Financial Crisis*. London: Routledge.
- Tilsted, J.P., Bjørn, A., Majeau-Bettez, G. and Lund, J.F. 2021. Accounting Matters: Revisiting Claims of Decoupling and Genuine Green Growth in Nordic Countries. *Ecological Economics*. 187, 107101.
- United Nations Development Programme. 2020. *Human Development Index*. Available from: <http://hdr.undp.org/en/content/human-development-index-hdi>.
- UNEP. 2009. *Global Green New Deal Policy Brief*. United Nations Environmental Programme. Available from: <https://unep.ch/etb/publications/Green%20Economy/UNEP%20Policy%20Brief%20Eng.pdf>.
- United Nations Environment Programme. 2010. *Overview of the Republic of Korea's National Strategy for Green Growth*. Available from: [http://www.unep.org/PDF/PressReleases/201004\\_unep\\_national\\_strategy.pdf](http://www.unep.org/PDF/PressReleases/201004_unep_national_strategy.pdf)
- United Nations Secretary General. 2020. *Statement Attributable to the Spokesperson for the Secretary-General – on ROK President Moon Jae-in's Net-Zero Announcement*. Available from: <https://www.un.org/sg/en/content/sg/statement/2020-10-27/statement-attributable-the-spokesperson-for-the-secretary-general-rok-president-moon-jae-s-net-zero-announcement>
- Van de Graaf, T., Overland, I., Scholten, D. and Westphal, K. 2020. The New Oil? The Geopolitics and International Governance of Hydrogen. *Energy, Research & Social Science*. 70, 101667.
- Watts, J. 2020. Could a Green New Deal Turn South Korea from Climate Villain to Model? *Guardian*. 23 May. Available from: <https://www.theguardian.com/world/2020/may/23/could-a-green-new-deal-turn-south-korea-from-climate-villain-to-model>.
- White, D. 2020. Just Transitions/Design for Transitions: Preliminary Notes on a Design Politics for a Green New Deal. *Capitalism Nature Socialism*. 31(2), 20–39.
- World Water Network. 2012. *Wetland Globes, Category: Grey Globe Award Asia*. Available from: [http://www.worldwaternet.org/docs/files/awards\\_2012/4\\_Rivers\\_poster.pdf](http://www.worldwaternet.org/docs/files/awards_2012/4_Rivers_poster.pdf).
- Xu, A. and Lee, J. 2020. President Moon to Quickly Push for "Korean New Deal". *KOREA.net*. Available from: <http://www.korea.net/NewsFocus/policies/view?articleId=185745>
- Yonhap. 2020. S. Korea to Include Green Projects in "New Deal" Plan. *Korea Herald*. 20 May. Available from: <http://www.koreaherald.com/view.php?ud=20200520000815>.
- Yun, S., Cho, M. and von Hippel, D. 2011. The Current Status of Green Growth in Korea: Energy and Urban Security. *The Asia-Pacific Journal*. 9(44), 4.
- Yun, S.-J. 2009. The Ideological Basis and the Reality of Low Carbon, Green Growth. *ECO*. 13(1), 219–266. [in Korean]
- Yun, S.-J. 2010. Not So Green: A Critique of South Korea's Growth Strategy. *Global Asia*. 5(2), 70–74.

- Yun, S.-J. 2014. Experts' Social Responsibility in the Process of Large-Scale Nature-Transforming National Projects: Focusing on the Case of the Four Major Rivers Restoration Project in Korea. *Development and Society*. 43(1), 109–141.
- Yun, S.-J. and Jung, Y.-M. 2017. *Energy Policy at a Crossroads in the Republic of Korea*. Friedrich-Ebert-Stiftung. Available from: <https://library.fes.de/pdf-files/bueros/seoul/14488.pdf>