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Contested net-zero target setting in a transitioning country: The case of South Korea

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ABSTRACT

Many countries have set net-zero targets to achieve the Paris Agreement's goals. However, we do not know why and how transitioning countries have set net-zero targets, given the narratives of economic growth persistent in them. We address this gap by examining the 2050 carbon neutrality target setting in South Korea and assessing its potential to foster transitioning to a carbon neutral society. We draw from Historical Institutionalism to examine the political process of the carbon neutrality agenda setting and from 20 semi-structured interviews and policy documents as material. We find that net-zero target setting was possible due to strong presidential drive with a turnover in majoritarian politics. However, the agenda setting was controversial with limited public engagement. Although the net-zero target seems radical, the institutions change incrementally due to path-dependency in a developmental state. We demonstrate that South Korea is not likely to transition to a low-carbon society in the foreseeable future as the Paris Agreement demands. The pathway is subject to political swings due to its incumbent political economy and low social acceptance. We suggest caution with net-zero declarations in countries that embrace development as they can amount to mere local political action rather than leading to genuine institutionalization.

1. Introduction

The global community agreed to limit the increase in the global average temperature to well below 2 °C and pursue efforts to limit the temperature increase to 1.5 °C in the Paris Agreement (2015). The IPCC Special Report on the impacts of global warming of 1.5 °C (2018) suggested that net-zero emissions can "halt anthropogenic global warming on multi-decadal time scales" (A.2.2). It also suggested nations to decrease emissions by 45% from 2010 to 2030 to reach net-zero around 2050 to meet the 1.5 °C goal. Net-zero or carbon neutrality is achieved "when anthropogenic CO2 emissions are balanced globally by anthropogenic CO2 removals over a specified period" (IPCC, 2018, p. 24).

Net-zero pathways involve mitigation efforts, trading in carbon markets and the use of removal technologies like Carbon Capture Utilization and Storage (CCUS) and nature-based solutions (Levin et al., 2020). 74 Parties of the Paris Agreement have either legislated or declared a net-zero emissions target (2021).[1] Leading economies like the EU, the US, China and Japan all declared net-zero in 2020. Hepburn et al. (2020) stress that COVID-19 crisis could give a critical opportunity to trigger dramatic progress in climate action. As a visible example, the European Green Deal was established in 2019: it includes a net-zero target by 2050 for efforts to overcome

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[1] Climate Watch https://www.climatewatchdata.org/net-zero-tracker

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economic downturn and climate emergency. Despite the global "wave of net-zero" (Höhne et al., 2021) predictions on reaching the Paris goal are skeptical. Many argue that the existing pledges and measures are not sufficient to deal with the scope and timing of climate emergency (Deutch, 2020; Geiges et al., 2020; Höhne et al., 2021).

Net-zero target setting demands close examination at the national level. Rogelj et al. (2021) indicate that the "details behind net-zero labels differ enormously", and stress the importance of consistency, clarity, and accuracy in setting the greenhouse gas (GHG) targets under the Paris regime. van Soest et al. (2021) used an Integrated Assessment Model (IAM) to examine the EU and nine other major emitting countries and found that measures such as land use and negative emission technologies determine the prospects for achieving carbon neutrality and emphasized the need for clear definitions and political agreements on such measures. Relying on negative technology and using offsets can aggravate uncertainty around reaching the Paris goals, and net-zero requires a robust framework with social and environmental integrity (Fankhauser et al., 2021).

Setting net-zero target is a political process. Quantifying routes and suggesting mitigation pathways is a political intervention that can limit the spectrum of linked choices (Beck and Mahony, 2017). Political feasibility of net-zero depends on the geographic and socio-economic contexts (Jewell and Cherp, 2020). Millot et al. (2020) examined how France and Sweden are transitioning towards carbon neutrality and how they differ in terms of costs and achievability due to different choices made in public policy and energy governance since the 1970 s. However, the social, economic and political context of setting national net-zero targets is not well understood outside the EU.

Bataille (2020) suggested that carbon neutrality should have different implications for developed, transitioning and less developed countries due to their different historical responsibility, resources and projected growth of energy demand. Deutch (2020) considers that net-zero by 2050 is unlikely for many growing and emerging economies. Yet there is hardly any literature on how in-transition and developing countries are constructing net-zero and how realistic their plans are for achieving this goal. We seek to address this gap by: (1) examining how South Korea (hereafter Korea) set its 2050 carbon neutrality target; and (2) evaluating whether the carbon neutrality agenda is likely to become institutionalized and transform Korea into a low-carbon society.

2. Background

Korea is one of the countries that have set a carbon neutrality target by 2050 alongside adopting a Green New Deal in late 2020. The target was legislated in law in 2021. Korea was a developing country in the 1960 s, became a member of the OECD in 1996, and officially changed its status to a developed country in the United Nations Conference on Trade and Development (UNCTAD) in July, 2021. According to the World Bank, Korea's Gross Domestic Product grew rapidly by an average of 7.3% annually between 1960 and 2020, and its GNI increased from $67 in the early 1950 s to over $30,000 per capita in 2020.[2] Korea has an energy-intensive and export-driven economy. Due to its rapid development, its GHG emissions more than doubled between 1990 and 2013, one of the fastest GHG emission growth rates of the OECD countries (OECD, 2017). Korea emitted 709.1 MtCO2 of GHGs in 2017, and is the 11th largest emitter globally (The Government of Korea, 2020b). Although its emissions are stabilizing, they have not decoupled from the GDP growth yet. The case of Korean climate policy can shed light on efforts of transitioning countries to mitigate GHG emissions under the Paris regime, which face tensions between economic growth and GHG emission mitigation.

Some scholars have examined how Korean climate policy developed in the Kyoto period. Han (2015) suggested that Korea sought to be a pioneer in the global environmental arenas by adopting the Low Carbon Green Growth (LCGG) agenda of President Lee Myung-bak (term 2008–2013). LCGG envisioned win-win relationship between environmental concerns and economic growth, and Korea positioned itself as a bridge between developing and developed countries. In the Kyoto period, Korea implemented somewhat ambitious climate policies and became the first non-Annex 1 country to adopt mandatory emissions reporting and management followed by the adoption of a national Emissions Trading Scheme (ETS). However, the literature has not examined how the country is responding to the climate emergency challenge in the Paris period.

We first examine how Korea became to adopt the 2050 carbon neutrality goal. We then suggest that the carbon neutrality agenda is not likely to lead to institutionalization: Korea's climate policy is evolving only incrementally because of the lingering political economy of the developmental state and the lack of social buy-in. With the term institutions we refer to formal and informal rules and procedures, routines, norms and conventions (Hall & Taylor, 1996). We employ Historical Institutionalism (HI) (Hall, 1993; Hall & Taylor, 1996; Thelen, 1999) to understand how Korea adopted the carbon neutrality target, and explain how the resistant relationship between the government bureaucrats and the energy and key industrial sectors is hindering institutional change. Lockwood et al. (2017) suggest that HI offers insights into issues such as energy transition and can be used as an analytical tool for understanding institutional dynamics of transformation. Yet the theoretical framework has seldom been used to examine the evolution of climate policy at a national level.

Historical Institutionalism explains how institutions emerge from and are embedded in concrete temporal processes (Thelen, 1999). It accounts for both stability and change of institutions through "path dependency". Institutions continue to evolve in ways that are path dependent, while the continuity is punctuated by "critical junctures" when institutions change significantly, branching out from the historical path to a new one (Collier & Collier 1991; Hall & Taylor, 1996). The key actors' choices during a critical juncture are consequential, leading to institutional patterns that endure over time (Mahoney, 2001). Therefore, attention is needed to the politics of path-dependency and political conflict of actors when examining institutional change (Peters et al., 2005). By analyzing the

[2] The World Bank https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=KR

political maneuvering of actors involved in Korea's 2050 net-zero target setting, we investigate whether the net-zero agenda is a choice point or a "cleavage" that triggers a critical juncture for institutional change (Collier & Collier 1991). We evaluated to what extent the agenda setting momentum is leading to a transformation that dislodges older institutional patterns.

Korea's LCGG initiative of the Lee Myong-bak Administration (term 2008–2013) has been considered "environmental developmentalism" (Kim, 2016), "developmental environmentalism" (Sunhyuk Kim & Thurbon, 2015; Sung Young SungYoung Kim & Thurbon, 2015) and "authoritarian environmentalism" (Han, 2015) that reflects the legacy of the developmental state of the 1960–1970 s. Korea achieved remarkable industrial development in the period and the authoritarian government of President Park Chung-Hee (term 1961–1979) used good economic performance as the primary means for establishing the legitimacy of the regime (Koo, 1987). Developmental State is a model of centralized government in East Asia which manages the market and steers industrialization through strong state interventions (Johnson, 1987; Woo-Cumings, 1999; Yeung, 2014). Korean developmental state bureaucrats financed and guided "Chaebols" for export-oriented economic growth from the 1960 s. Chaebols are large Korean conglomerates managed by a single family which were key actors in Korea's developmental history (Johnson, 1987). Kim (2016) employed the notion of "path dependence" to highlight the close ties between the bureaucrats and private sector which contributed to "environmental developmentalism" during the LCGG initiative. The political economy of climate policy can be seen as a legacy of developmentalism, pursuing "green" as a new growth engine to bolster development supported by high degree of bureaucratic centralization (Kim, 2016; Sunhyuk Kim & Thurbon, 2015; Sung Young SungYoung Kim & Thurbon, 2015; Lee & Yun, 2011; Watson, 2012).

Minns (2001) marked the decline in developmentalism and eroding state autonomy and suggested that the Korean developmental state has become reoriented after the democratization and financial crisis in the 1980–1990 s Kalinowski (2021) argued that Korean path dependency of the developmental state has made a twist to enhanced green industrial policies owing to the international climate change agreements. Our findings corroborate and extend the line of reasoning by demonstrating a distinct path dependency in Korean climate policy in the Paris period. Path-dependency involves both stability and change of institutions bounded by social and political structures (Thelen, 1999). We evidence both stability and change aspects of the path-dependency. The institutional structure of strong presidential state model with majoritarian politics enabled to set 2050 net-zero agenda. But the path dependency to embrace development and limited public engagement persists and restricts transformation. We argue that although the carbon neutrality agenda seems radical, Korean climate policy evolves incrementally despite changed political circumstances and climate emergency. In the next section we explain the methods used. In Section 4, we first demonstrate how the 2050 carbon neutrality agenda was set through the strong presidential majoritarian politics (4.1) and then illustrate how the agenda was contested by multiple policy actors (4.2). The reasoning for the resistance for change is explained in 4.3, and we point out how carbon markets were used as a silver bullet to deal with the contestations in 4.4. In Section 5 we discuss our findings and academic contribution and conclude.

3. Methods

We used expert interviews and policy documents as key materials to analyse themes in discourses of actors involved in the 2050 carbon neutrality target setting. HI considers institutions a legacy of concrete historical processes: institutions emerge and change as a result of historical conflicts and constellations (Thelen, 1999). HI scholars also acknowledge that ideas of agents have explanatory power in relation to institutional change (Hall, 1993). We seek to understand the change and resistance of institutions through ideas or discourse of actors. A discourse is an "ensemble of ideas, conceptions, and categorizations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities" (Hajer, 1995, p. 44). We considered that the discourse of policy actors such as the president and government representatives, and their relationships with the industry and civil society can explain how institutions emerge and evolve.

We focused on 2050 net-zero target setting in the period between 2020 and 2021. Policy documents were first analysed to identify key actors and their discursive activities. We reviewed more than 130 legal documents, government and national assembly reports, seminar reports, position letters relating to the Korean climate policy such as the Korea Green Deal, Long-term low greenhouse gas Emission Development Strategies (LEDS) and the 2050 Carbon Neutrality Strategy. Grey literature of think-tanks and NGOs and academic literature were also collated and analysed. We observed a public consultation event for the 2050 LEDS held in 17 October 2021[3] and a public hearing expert seminar in 19 November 2021[4]: both were recorded and made available and accessible to the public via Youtube. The speeches of various stakeholders were transcribed for analysis.

In addition, twenty expert interviews were conducted in Korea between August 2020 and September 2021. The participants were identified as part of the document analysis on the basis of their visibility and influence, and referral sampling was used to identify further participants. Ten face-to-face interviews were conducted in Seoul. Another ten interviews were conducted over video conference calls. The interviewees included experts from the government and public institutes (6), Non-Governmental Organizations (NGOs) and civil society (5), consultancies (4), academia (2), industry (1), Non-Profit Organizations (NPOs) for business (1) and media (1). The interviews were semi-structured with open-ended questions and they lasted 30–60 min. Participants were informed about the purpose, methods and possible uses of research, and an informed consent was obtained before the interviews. Institutional ethical clearance was obtained for the research before the data collection commenced. During the interviews we ensured that the participants' anonymity and confidentiality were maintained. In the results, we indicate the position and sectors of the interviewees in quotes; and

[3] https://www.youtube.com/watch?v=HN1sUU543lU
[4] https://www.youtube.com/watch?v=iR0S7IyG0uM

reveal the position and organization for policy actor speeches observed from the public events.

4. Results

4.1. 2050 carbon neutrality agenda setting

Korea ratified the Paris Agreement in 2016, highlighting its role as a leader in climate policy. Korea considered the recommendations of the IPCC special report on 1.5°C (2018) partly because the report was finalized in Songdo, Korea and a Korean researcher Dr. Lee Heosung became the chair of the IPCC in 2015 (Choi, 2020). Public awareness of climate change has grown as extreme weather has become more severe and frequent. Annual average temperature has increased 1.8℃ and precipitation risen 160 mm in Korea in the past 100 years (The Government of Korea, 2020b). Fine Particulate Matter (PM) pollution has raised demands for clean air and safe environment (Chung & Kim, 2018). Health impacts of PM originating from fossil fuels have rapidly become a concern since 2013 (Kang & Kim, 2014). Chung and Kim (2018) consider PM a climate change problem in Korea. As public concern about climate change and air pollution grew, climate policy became an item on political agenda.

> *Before we had to search for people to make news, we nagged media to write about the issue [Climate Change], we had to appeal to the members of the National Assembly to raise the problem. We had to persuade them to do so. But now we just sit here and the public sentiment is naturally established. Now I think climate change discourse has gained a significant place. (Representative, NGO)*

President Park Geun-hye (term 2012–2017) of the conservative party was dismissed in March 2017 for misuse of power and for taking bribes from large corporations like Samsung and Lotte (Turner et al., 2018). President Moon Jae-in of the democratic party was elected in May, 2017 (term 2017–2022). He pushed for a comprehensive plan to address the PM problem, expansion of renewable energy and reduction of nuclear energy onto the national priority agenda. Energy Transition was central for the administration (Researcher, Government Institute). The administration updated the 8th National Energy Supply Plan (2017) by repealing the plan to build new nuclear power plants, stopping the life span expansion of existing nuclear plants, and closing of old coal power plants. It set the goal of increasing renewable energy to 20% of the total by 2030 (Ministry Of Trade, Industry and Energy, 2017). Nuclear energy generation will decrease from 30.3% (2017) to 23.9% (2030), coal power generation decrease from 45.4% (2017) to 36.1% (2030), while the renewable energy generation will increase from 6.2% (2017) to 20% (2030).

> *Political leadership is a very big factor [for change]. This is significant in our country. How the president thinks is a very big factor. (Director, Government)*

Korean Presidency is a single term of five years, while the national assembly election is held every four years. Political power is shared by the president and the 300 member unicameral multi-party national assembly. When President Moon was elected, the national assembly had 132 conservatives and 128 democrats. The change of the majority party increases uncertainty in the policy agenda (Manyin et al., 2016). The democratic party obtained victory in the national assembly elections in April 2020, and the left-wing political parties together gained more than 180 seats out of 300.

> *This means that they have the power that cannot be against…The filibuster is not possible. We have a system that is made to adjust agenda when there is severe dissonance in the national assembly, but it is no use now. (Director, National Assembly).*

The democratic party had pledged the Green New Deal in the national assembly election in 2020. Its main agenda for energy and climate change policy was to legislate a 2050 net-zero target, adopt a carbon tax, stop coal financing and phasing out coal-fired power plants (Korean Democratic Party, 2020). After the election victory, the president pushed the Korean New Deal agenda to lock in their patrician power before the lame-duck, the final period of his office.

> *The lame-duck starts in 2021, and there will be burden for the president to implement a policy when he loses his momentum…So multiple legislation is in progress, and the policy that needs the National Assembly's support such as net-zero target and environmental policies have all started legislation in 2020. (Director, National Assembly)*

Due to the economic downturn during the COVID-19 Pandemic, the role of the state was highlighted in addressing the national crisis. From disease control to economic recovery, the narrative stressed the government's role in finding a solution for the climate crisis (Hepburn et al., 2020). The New Deal was proposed as the solution for economic downturn, and the green new deal was included to the package to deal with the climate crisis (Boyle et al., 2021; OECD, 2021). Even before the pandemic, the Green New Deal had become a trend in the West (Boyle et al., 2021; Chung, 2020): the US democratic party had proposed such a deal in 2018, Senator Sanders had proposed a New Deal in his presidential pledge in 2019, and Jeremy Corbyn of the British Labour party pledged to launch a "green industrial revolution". The EU adopted the European Green Deal in 2019.

In the presidential address celebrating the third year of the administration in May 10th of 2020, President Moon said that the government will adopt Korean New Deal to help recover the economy from the COVID-19 crisis. In a meeting two days later, the cabinet members started to discuss incorporating the "Green New Deal" into the agenda. In May 15th, relevant ministries gathered to report to the president of the possibility of implementing the Green New Deal. The government officially presented the plan to adopt the Korean New Deal in July 14th, 2020. The Korean New Deal aimed to overcome the economic downturn by fostering structural transformation through digitalization and green economy. The deal of 73.4 trillion KRW is estimated to create 660,000 jobs and to transform Korea into a low-carbon economy and society through technological innovation, energy market change, and public participation (The Government of Korea, 2020a).

But when the Korean New Deal was published in July 2020, the 2050 carbon neutrality target was not part of it. It only mentioned that Korea will "strive for a net-zero goal" through the Green New Deal without set timeline or detailed pathway. The statement was criticized because of its hesitance to declare an explicit net-zero target as the IPCC suggests. This is because the LEDS was to be submitted to UNFCCC by end of 2020, and the 2050 target and strategy were not yet agreed as the mitigation pathway scenarios were still undergoing consultations and debates (Yun, 2021).

4.2. Contested carbon neutrality

The draft scenarios for the 2050 target and associated mitigation pathways were developed by the National Research Council in 2020. After consultations with 100 experts from research, civil society, industry and youth groups between March 2019 and February 2020, five pathway scenarios were suggested (Lee et al., 2020). The scenarios ranged from the most ambitious 75% emission reduction compared to the 2017 levels reaching 179 MtCO2, to the least ambitious 40% reduction scenario reaching 426 MtCO2 by 2050. The first scenario incorporated foreseeable social and technical innovation, and the fifth scenario was not considered to be compatible with the goal of limiting global warming of 2 degrees (Lee et al., 2020). A more ambitious net-zero scenario was also discussed in expert consultations, but it was considered too expensive and uncertain as a national target. The research concluded in July 2020 that the discussion on radical transformation should be continued and expanded (Lee et al., 2020).

Before submitting the LEDS to the UNFCCC in 2020, the government established the "2050 LEDS Forum" of 69 experts representing power generation, industry, transport, construction, NGOs and youth groups to discuss the 2050 target and its vision again (The Government of Korea, 2020b). The forum was advised by 22 government divisions and relevant government research institutes. The government announced that it consulted experts five times during July 2020 for the strategy. In addition, an online survey was conducted with over 3000 members of the general public during June-July 2020. The majority of them (58.9%) viewed that economic and social impacts should be considered in the setting the 2050 goals (The Government of Korea, 2020b).

> *Net-zero was discussed as NGOs have requested during LEDS discussions. Experts in the Korea Environment Institute which advises Ministry of Environment said it is possible. It is hard for me to conclude as I have not researched but I see that net-zero is not possible by 2050. (Professor1, Academia)*

Ministry of Environment organized a public online consultation in October 17, 2020 with about 300 participants. Experts from power sector, industry, transportation, building, waste, agriculture and carbon sinks presented the draft government strategy for the 2050 pathway, followed by expert panel discussion and questions from the audience. While the Korean Environment Institute (KEI) expert explained that it is possible and feasible to reach a net-zero target by 2050 through energy transformation, The Korean Energy Economy Institute (KEEI), the national institute that supports MOTIE asserted that carbon neutrality is infeasible and un-realistic for the Korean power sector.

> *According to our analysis we need 335GW of [electricity] facility capacity in 2050 even when we reduce our electricity demand at maximum. In order to build 335GW capacity we need to consume a vast area of our land [for solar panels]. According to our analysis this area amounts to about seven times large as city of Seoul.We estimate that we need to spend 300 trillion won by 2050. For transmission and distribution, we need ten times much investment compared to now. This will lead to raise in electricity price. (Senior Researcher, KEEI)*

The 2050 net-zero target was also contested by industry. A researcher from the Korea Institute for Industrial Economics and Trade (KIET), another national institute that advises MOTIE, claimed that energy efficiency of Korean industry is already at the highest global standard: thus raising the ambition for emission reduction is too costly.

> *Korea's manufacture industry is 5^{th} or 6^{th} largest in the world. It has one of the strongest industry sectors if we consider the size and the geography. We need to consider this fact. Also we need to consider that we export more than 60% of our products…The reason we have large industry emission is due to this industrial structure. (Director, KIET)*

A youth representative asserted that government and the energy and industry sectors are complacent and the voice of public was not incorporated into the national strategy setting for 2050.

> *However, I attended the pre-session meeting of presenters and discussants and heard that net-zero target is not agreed among the government so it is a taboo word. The reason was that MOTIE and Ministry of Strategy and Finance (MOSF) don't agree with the net-zero target. (Researcher, NGO)*

The government held two public events during October and November of 2020 on LEDS, but they were considered expert presentations rather than a public participation events.

> *After the public consultation in mid-October, there will be a public hearing in November. I wonder this short period provides sufficient time for deliberation. I wonder if the public watching this internet video for 5 h have fully expressed their opinions. We need to look back on the LEDS governance process and the future plans should systemically provide the social consensus process for just transition. (Researcher, NGO)*

Although the LEDS forum reported that 81% of the 300 participants agreed on the 2050 net-zero target (The Government of Korea, 2020b), many interviewees mentioned that the general public might have different views. The NGO representatives and civil society participated in the debate, but it is unclear whether their views represent that of the general public. Koreans are aware of the dangers of

climate change but they do not consider it their immediate problem so are not willing to shoulder the burden of climate action. Tsai (2016) highlights that Koreans take low energy tariff for granted and are not willing to pay more for energy transition.

> *There are industry's opinions but that is not the only problem. It is a political problem… The general public are like that. Nobody likes raising electricity price. They [the government] cannot persuade the public for that… As I see it, the public takes climate change seriously but they don't think it is their own problem but they think the government should solve it. (Professor2, Academia)*

> *When we do the public survey, they say we need to stop climate crisis. But when asked to pay more for energy they don't. That is difficult. LEDS lacks this fundamental discussion. (Senior Researcher, Government Institute)*

The public consultation indicates how the presidential agenda is contested by MOTIE and energy and industry institutes. It also showed that the strategy did not canvass and incorporate public opinion. Still, the Moon administration suggested the carbon neutrality target giving more power to MOE, while a struggle persisted between MOE and MOTIE.

> *It is significantly different when MOTIE is in the lead and when MOE is in the lead amongst the government. Especially now the civil society has gained power. (Director, Industry)*

The carbon neutrality target and the 2050 pathway were adopted under strong presidential leadership with supporting network of government (MOE) and affiliated experts from the national institutes and environmental NGOs that gained power after President Moon took his office. (Researcher, Government Institute). Meanwhile, NGOs and civil society made policy proposals to the political parties of the national assembly, held joint seminars on net-zero with assembly members of the democratic party which supported the agenda. They also undertook public campaigns and conducted surveys to educate the public about climate emergency through press and media (Expert, NGO).

> *The major political party has will. The Democratic party is pushing hard, and the bureaucrats [MOTIE] are resisting. But, it's democratic society and they should take it when the national assembly legislates [net-zero target]. (Expert, NGO)*

A window of opportunity opened up when other countries started to adopt net-zero targets in 2020. Korean political agenda is influenced by its strategic and economic partners like the US (Manyin et al., 2016), and it competes with neighbouring countries Japan and China (Hahm & Heo, 2019). Industry also became more accepting of the transitioning to low carbon economy as the international atmosphere changed (Professor1, Academia).

> *The window of opportunity depends on external factors. Because our industrial competitiveness will be affected when we do not respond to the international change. I think RE 100 and the thought that renewable energy use could be a hindrance for trade, the fact that there is such movement in Europe should have affected our industries. The industry sector must have discussed about the needs to respond to the pressure. (Director, National Assembly)*

After the EU and UK adopted 2050 net-zero targets in 2019, the deadline approached to submit NDCs and LEDS to the UNFCCC in the end of 2020. Asian countries like China declared net-zero target by 2060 in September 2020, followed by Japan setting net-zero target by 2050 in October 2020. Biden was elected the new president of the United States in November 2020 and pledged to re-join the Paris Agreement with an ambition to reach net-zero by 2050.

> *We are not alone in this action. China, Japan, the US and the EU they all did it. Maybe the economic scale of the countries that declared net-zero should be around 80% globally. So this is the flow. It has become a flow. (Director, Government)*

The LEDS forum outcome of the net-zero target by 2050 was submitted for approval by the Green Growth Committee and the Cabinet Council. The carbon neutrality target was declared in October 28th, 2020 in a presidential address, and multi-ministerial meetings were held to confirm the details of the net-zero pathway. The Prime Minister presented the national strategy for reaching carbon neutrality in December 7th. The revised NDC and LEDS with 2050 net-zero target were submitted to the UNFCCC in December 30th, 2020. The 2050 Korea Vision statement in the national strategy reflects the relationship between net-zero declaration and the Korean New Deal.

> *The Republic of Korea moves towards the goal of carbon neutrality by 2050. The Korean New Deal will serve as a stepping-stone to reach carbon neutrality by 2050. Korea will lead by example to help the international community jointly make efforts to reach carbon neutrality by 2050. (*The Government of Korea, 2020b*, p.46)*

The Korean Green New Deal showcases Korea as a responsible co-solver of the climate crisis and emphasises its international leadership (Lee & Woo, 2020). To lock-in the net-zero target, "The law on Carbon Neutrality and Green Growth to Respond to Climate Crisis" was legislated in September 24th, 2021 making Korea the 14th nation to legislate a carbon neutrality agenda. The Korean net-zero declaration shows how the president and the central government continue to be the dominant forces in South Korean policy making. The presidential and majoritarian political structure supported by strong central government enabled the swift adoption of the Green New Deal and carbon neutrality agenda when the external environment changed. In the next section we explain why the carbon neutrality is not socially agreed to shed light on to what extent it is institutionalized.

4.3. Resisting power of the bureaucrats – legacy of the developmental state

Historical Institutionalism helps understand the change and stability of the Korean climate policy and related institutions. We

demonstrated that the 2050 carbon neutrality target was possible due to the institutional setting around the strong state, where the president and the government set the agenda. But path-dependency also hinders transformative change in climate change policy. Even when a new president assumes power over the agenda setting, a strong relationship persists between the government bureaucrats (MOTIE) and the energy and industrial sectors resisting change. The lingering ties and their power stem from the developmental state.

Korea has a strong central state supported by efficient bureaucracy (Kwon & Yi, 2009). A merit-based bureaucratic system has existed for over 600 years, with a long Confucian influence. Success in examinations has been the only criterion for becoming a government official, and the best young talent is recruited. The government bureaucrats spearheaded industrialization since the 1960 s with high degree of efficiency and discipline, and the legacy of the developmental state persists (Koo, 1987). SungYoung Kim and Han (2015) and Sunhyuk Kim and Han (2015) consider Korean bureaucracy to have institutional autonomy and civil servants to have high social status: the society considers them a solution to problems.

> *It is big government. Koreans still demand active government interventions. The government spending is still significantly high portion of GDP. When you think about this the public demands more proactive role from the government. (Director, National Assembly)*

The persistent power of bureaucracy means that stronger ministries can dictate the rules of the game to protect their interests. This causes conflicts between government ministries when a new institutional agenda emerges, particularly when the president changes. Park and Joo (2010) explain that Korean civil servants usually work in one ministry until retirement, and seniority is the only factor for promotion so the collectivism results in a tendency to not cooperate with other ministerial organizations. For instance, MOTIE and MOE often have conflicts over economic growth and environmental concerns in the climate policy agenda.

The industry interests and competitiveness are important concerns. A strong relationship persists between government bureaucrats and industry as economic development has been based on state financing of large corporations known as Chaebols. After the Korean War (1950), the government promoted rapid industrialization through planning and establishment of heavy industries dependent on export. The large Chaebols have become international brands such as Samsung, Hyundai and LG. Korean government still supports the industry when its annual economic growth rate is high 5% and manufacturing accounts for 39% of the GDP (The Government of Korea, 2020b).

Korean industry includes energy intense manufacturing of steel, petrochemicals, automobiles and semi-conductors. Korea imports 94% of its energy (2017) as it does not have its own energy resources. Energy security is a high concern as the nation is isolated from the continent's power grid due to military confrontation with North Korea (Chung & Kim, 2018). Since 1961, the Korea Electric Power Corporation (KEPCO) has been state-owned, and the electricity tariffs and investment planning have been under government control (Lee & Ahn, 2006). The government plays a critical role in economic planning and energy supply. KEPCO was partially privatized by reforms, however the government still holds over half of the equity. MOTIE guarantees stable energy supply to the industry from coal (43.1%) and nuclear (26.8%) energy sources (The Government of Korea, 2020b).

> *MOTIE is in charge of energy security, because Korea had to fully depend on energy imports…Now after the industrial development, we still have manufacturing sectors like semi-conductors at the center of the industrial structure. These industries have to bear great amount of loss when the energy supply is stopped, so stable energy supply is one of the biggest challenge we cannot give up. (Director, National Assembly)*

The Moon administration chose energy transition to renewable sources as a strategy for the net-zero pathway. However, the expansion of renewable energy has been challenging due to the close relationship between government bureaucrats (MOTIE) and industry. The contestation over renewable energy expansion is about its costs and the argument that it cannot guarantee stable energy supply crucial for the national economy.

One of the interviewees implicated the relationship between MOTIE and energy sector as "Energy Mafia" (Director, Consultancy). Korea attempted energy transformation through liberalization in late 1990 s after the Asian economic crisis during President Kim Dae-joong's presidency (term 1998–2003). However, the reform failed after a political struggle between politicians who insisted on the reform and the bureaucratic power stemming from the tight relationship between MOTIE and energy sector (Tsai, 2016). Korean power market is still monopolized by KEPCO which subsidises electric companies to generate, transmit and distribute energy for the nation.

> *KEPCO and Korea Power Exchange (KPX) they are all related to MOTIE, and they are MOTIE Mafia or Energy mafia…These amazingly powerful people. It's been over 30 years and this field is in their palms. (Director, Consultancy)*

Despite strong resistance by bureaucrats and energy and industry sectors, the Moon administration declared the 2050 net-zero target when the window of opportunity opened. Korean carbon neutrality target indicates how the president and the majority party can exercise power over decision making. However, the government is not free from rigid incumbent energy structure and institutions. Korea still faces a long-term challenge of transitioning to a low carbon society. Despite the Moon administration attempts to reduce coal and nuclear power generation and to replace them with renewable energy, the progress remains slow and incremental.

> *I am very sorry to say this but there are only words, and we are not touching the real challenge. It is only a feast of words. (Senior Researcher, Government Institute)*

The National Energy Plan (2019) includes plans to reduce nuclear and coal power plants by not building new plants and by closing the oldest ones. The 9th National Energy Supply Plan (2020) indicates that nuclear and coal energy decline to 25% and 19.9% of national energy supply, while renewable energy increases to 20.8% in 2030. By the publication of the NDC (2020), Korea had updated the 2030 target to reduce emissions by 24.4% compared to 2017 level of 709.1 MtCO2. The expected emissions in 2030 are predicted to

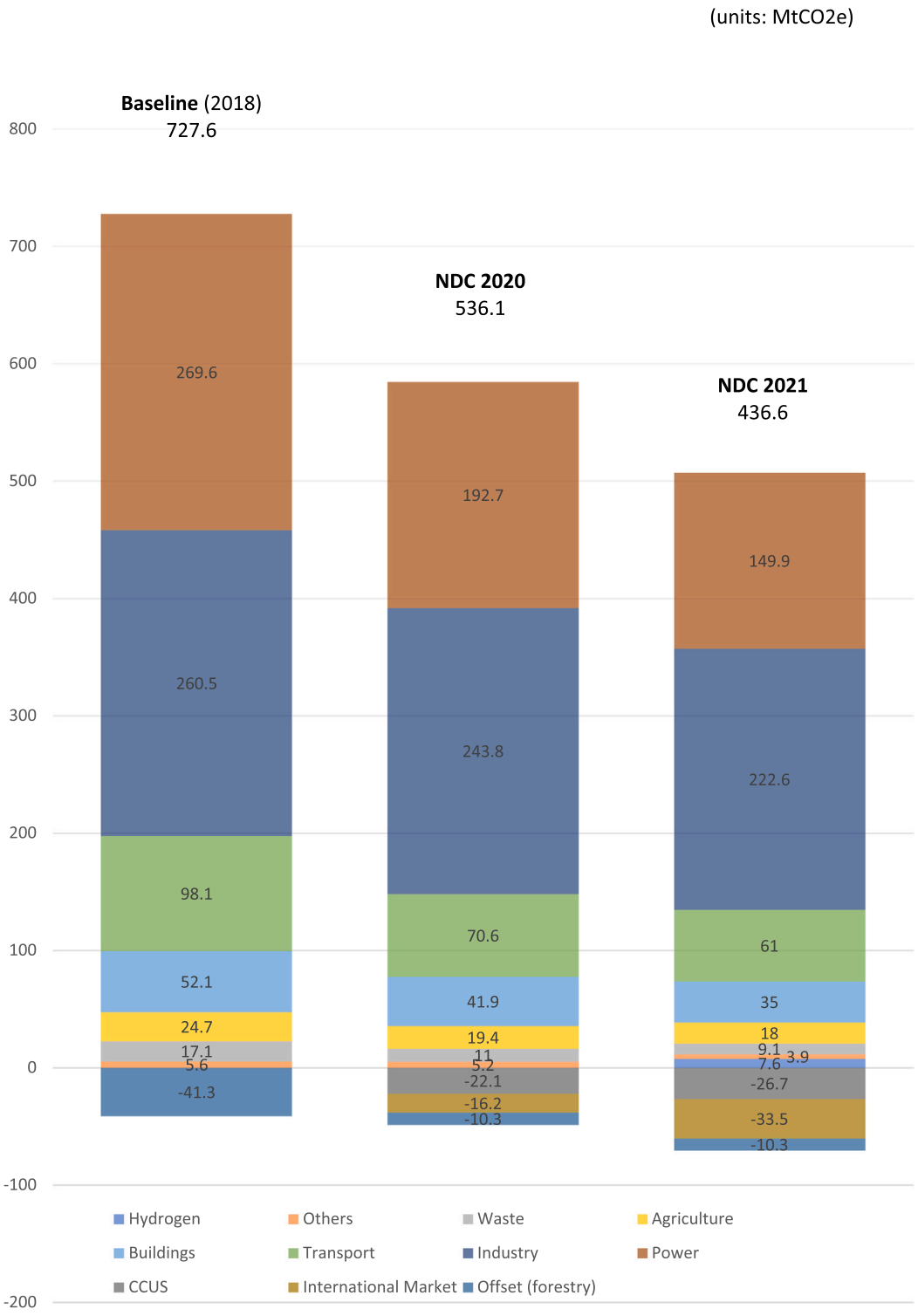

Fig. 1. South Korea's 2030 mitigation target after research of the presidential Committee on Carbon Neutrality 2050 (Committee on Carbon Neutrality, 2021).

be 536 MtCO2, and their attainment requires international carbon market and forestry offsets of 38.7MtCO2. Next we explain how Korean climate policy and carbon neutral pathway was compromised due to the resistance by the bureaucrats and industry actors.

4.4. Silver bullets of carbon market and technology to solve over-ambition

Korea has used carbon markets as a silver bullet and hopes that technologies such as CCUS will aid emission reduction. Korea planned to use carbon markets to achieve a 30% reduction compared to BAU to reach 543MtCO2 in 2020 under the LCGG agenda (2009). It implemented a national ETS to balance the conflict between industrial growth and greenhouse gas mitigation.

Korea continues to favor a market mechanism in the Paris period. In June 2015, president Park Guen-hye (term 2013–2017) planned to visit the US to meet president Obama before the COP21, and the agenda included climate action. The end of June was the deadline to submit INDCs. Then Korean government had a challenge in setting the 2030 target due to conflicts between the MOTIE and energy and industry sectors coalition on one hand, and the MOE-civil society coalition on the other hand. The Obama Administration increased pressure to raise ambition, followed by the British government and the EU delegation claiming Korea's 2030 ambition to be too low (Choi, 2020). To solve the conflict between industry and civil society, Korean government used international carbon market for a compromise. Korea set the target to reduce 37.4% compared to BAU to reach 534 MtCO2 by 2030 in the INDC (2015) (Choi, 2020). However, market mechanism was to deliver 11.3% of this, and domestic mitigation 25.7%, just marginally more than the previous 2020 goal.

After President Moon took office in 2017, the government updated the mitigation roadmap and the INDC target. But instead of establishing a new mitigation roadmap, the government made incremental steps to reduce the role of international credits in achieving the same target, and raising the portion of domestic reduction from 25.7% to 32.5% for achieving the goal (Ministry Of Environment, 2018). The government did not revise the 2030 target of 37% reduction compared to BAU. The remaining 4.5% which amounts to 38.3 MtCO2 was expected to be reduced through international carbon markets and forest offsets. The civil society asserted that the government should not rely on international carbon markets and should abandon the BAU target setting. Eight NGOs argued that without international carbon markets and offsets, 2030 domestic mitigation target to reach 623MtCO2 is higher than the 2020 target to reach 543MtCO2, evidencing inconsistency creating international mistrust (Civil Societies, 2018).

Korea is a strong advocate of the Article 6 of the Paris Agreement on market mechanisms (Choi, 2020), and added removal technology as solution to achieve ambitious net-zero target. The updated 2030 mitigation goal in the NDC (2020) was to reduce 24.4% compared to 2017 levels (amounting to 26.3% reduction compared to 2018). To reach the goal, 48.6 MtCO2 is offset through international carbon markets, forestry offsets and technologies like CCUS. Yet the civil society and international organizations have anticipated that Korea's 2030 target will not enable net-zero emissions by 2050 (Eom et al., 2021). Fuentes Hutfilter et al. (2020) considered that Korea should reduce emissions by 59% in 2030 compared to 2017 levels to reach the Paris ambition. In the global scale, Geiges et al. (2020) found that incremental improvements in reduction targets are not sufficient to achieve 1.5 degrees limit, which requires 2030 emissions to be halved from the current NDCs.

After the carbon neutrality target declaration in October 2020, the government set a multi-divisional task force for another 2030 target revision and adopted the goal of "at least 35% reduction compared to 2018 levels" in the Carbon Neutrality Law in September 2021. At the same time, the Presidential committee on 2050 carbon neutrality was established to discuss renewed 2050 mitigation pathway with enhanced expert discussions and public participation (Committee on Carbon Neutrality, 2021).

Net-zero requires immediate and massive technological and social change, including clean energy, offsets and removal technologies (International Energy Agency, 2021). However, Korea has made incremental changes in raising the climate ambition. We conclude that it has not diverged from the path-dependency of developmental state, as it tries to find ways to mitigate GHGs without systemic change in the incumbent energy and industry structure. Korea is not abandoning its energy intense industrial structure to maintain its economic stability, nor engaging in the transformation of its energy system. The presidential committee on 2050 carbon neutrality suggested a strategy to mitigate emissions through the reduction of methane, enhanced use of international carbon markets and forests offsets, and increasing CCUS from 48.6 MtCO2 to 70.5 MtCO2 in 2021 (Fig. 1).

5. Discussion and conclusion

South Korea's climate policy is evolving in a path dependent way without radical energy or industrial transformation. When the window of opportunity opened for the setting of the 2050 carbon neutrality target, the mitigation pathway changed only incrementally due to Korea's political economy and lack of social acceptance. We found that the strong relationship between bureaucrats and energy and industry sectors lingers from the time of the developmental state, hindering the transition to a low-carbon society. As strong incumbent policy networks prevail, Korea is unlikely to quickly transform its economic structure of high energy intensity and export-oriented industry.

Korean conservative and democratic parties have made climate policy a priority and used the market mechanism to solve the conflict between economic growth and greenhouse gas reduction. For instance, the Lee administration (term 2008–2013) adopted LCGG agenda (2009) and used an ETS as a tool to mitigate domestic emissions. President Lee intended to boost the economy after the financial crisis of 2008 while addressing international pressure for climate action (Heo, 2015). Climate policy was adopted when the strong presidential drive was supported by the conservative party that had a slight majority of seats in the National Assembly.

The Moon administration (2017–2022) and the democratic party put carbon neutrality target on the national agenda to deal with the economic recovery from the COVID-19 pandemic and to address the Paris Agreement. Adoption of the 2050 net-zero target just like that of the past LCGG agenda was based on majority partisan politics. The resemblance raises the question whether Korean climate

policy has changed radically to combat climate change between the two periods. The pressure and urgency have increased but economic recovery still informs climate policy adoption (Lee & Woo, 2020). We found that government bureaucrats and energy and industry sectors are still holding onto the past narratives of development, and the carbon market and technology continue to be the silver bullets helping to avoid the transformation of institutional structure and the energy system.

The case study also highlights how net-zero target setting was political, manifesting long-held preference to follow partisan interests without genuine policy discussion. Adoption of the Green New Deal and the carbon neutrality target in 2020 is a political overpromise of the Moon administration to sustain the discursive power of the democrats, and to lock in their values before the lameduck. The 2050 carbon neutrality target was easy to declare because it is distant in time (Representative, NGO) but the mitigation pathway and the Green New Deal lacked detail when adopted so are unconvincing of their achievability (Director, NGO). Scholars have stressed the need to strategise long-term low carbon pathway because of lock-in of the path dependent energy systems (Sachs et al., 2016; Unruh, 2000; Riahi et al., 2015). The Korean Green Deal and its carbon neutrality target do not lead to a low carbon pathway without discussion on the transformation of the energy system and industrial structure (Representative, NGO).

Transformation to a carbon neutral society does not happen if the public is not willing to make a trade-off between economic growth and the environment (Chung & Kim, 2018; Delivering Net Zero, 2021). Public participation in Korean climate policy has improved only incrementally from the Kyoto to the Paris period. Previous studies on LCGG found that there was lack of deliberative policy process with strong government drive to not incorporate public opinion in the setting of the 2020 greenhouse gas ambition (Han, 2015; Heo, 2015; Kim, 2016; Lee & Yun, 2011). Korean civil society has since the democratization in the 1980 s started to affect environmental policy making (Heo, 2013), however it has not become institutionalized up to the Lee Administration.

Our case demonstrates that the tendency continued when the president and majority party changed. Although there had been attempts to incorporate NGO and civil society voices under President Moon, it is uncertain whether they fully reflect the views of the general public and public participation remains limited. Some NGOs and civil society leaders have gained power, but it does not translate into public deliberation and legitimization. Chung and Kim (2018) consider that Korea had weak deliberative democratic processes for determining future energy pathways during Moon tenancy.

> *After Moon government, how may I say, we [civil society] lost initiative to the government. We [civil society] lost the drive because we think "now it's the democratic party ruling, so of course they would do their job right". However, in fact nothing actually changed after President Moon took office. (Director, NGO)*

Fankhauser et al. (2021) suggested attributes for a net-zero framework in climate action. Our analysis finds that Korea's net-zero target setting did not robustly align with their suggested attributes: front-loaded reduction; comprehensive reduction with societal support; cautious use of CO2 removal; and effective regulation of carbon offsets. We highlighted the social and political dimensions of net-zero setting and explained how they likely mean a slow incremental change with low social acceptance, and reasoned why the agenda had to rely on carbon markets and removal as a compromise.

The temporal specificity of our case study may introduce some limitations to our analysis. We only captured the agenda setting stage of net-zero target setting, and the path is likely to swing due to the changing political and economic contexts in the future. With new presidential election in 2022, it is difficult to predict the dynamics between the new president and the majority party until 2024 when the national assembly elections take place. There is "uncertainty of the policy: when the administration change it abruptly changes from no to yes" (Professor 2, Academia).

However, examining the agenda setting moment is important given the urgency of climate emergency, which is the core of the net-zero goals. The moment characterized by contingency is the key element of the critical juncture that may have an important impact that endures over time (Mahoney, 2001; Capoccia & Kelemen, 2007). Yet, we conclude that the Korean 2050 net-zero agenda setting process was not leading to a critical juncture to foster a substantial change in institutions that would produce distinct trajectories into low carbon transformation. Cumings (1987) considers that Korea exhibits a "history of economic dynamism mixed with spasmodic social reaction". Korea has a history of strong social movements and rebellion at times of regime change through the process of democratization which coincided with industrialization. Yet, climate emergency has not sparked genuine social reaction that is needed for institutionalization.

To conclude, even if South Korea set the carbon neutrality target under the pressure of climate emergency and change of political circumstances, the legacy of developmental state engrained in the political economy hinders transition to a low carbon society. The path dependency of the strong state is demonstrated by the political leadership of the president, and we explained how the incumbent policy network of government bureaucrats and energy and industry sectors resisted the transformation. The case also demonstrated that the carbon neutrality agenda has low social legitimacy and is prone to political swings. We highlight that the politics of path dependency involves both stability and change through interaction between the institutional structure and policy actors. The incumbent energy structure is maintained owing to the actors that still embrace development, while change was attempted by other actors within the institutional structure.

We suggest caution with national net-zero target declarations under the Paris framework as they can amount to mere local political posturing rather than to a genuine institutionalization for transition towards a low-carbon society. This is particularly relevant in countries that are in transition or still developing as they face the tensions between ambitious climate action and economic development priorities. Future research is needed to find out how carbon neutrality goals and climate policy can become socially legitimate, so as to overcome conflicts with the incumbent energy policy networks and to become institutionalized for transformation towards low carbon economy and society.

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