Korea Green New Deal

Subjects: Political Science

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Various developed nations, including the US (February 2019) and the EU (December 2019), have recently relaunched Green New Deals similar to the climate-oriented economic stimulus policies implemented after the 2008–2009 Great Recession; such green stimulus packages not only raise investments with short-term benefits for economic output and jobs, but also lay the groundwork for long-term innovation and economic development aligned with environmental constraints. The Korean government also considered reintroducing the Korean Green Growth Initiative of 2009 in response to the COVID-19 crisis as a national industrial strategy to promote green innovation and transform the industrial structure of key global industries such as motor vehicles, batteries, and electricity distribution systems; the aim was to make Korea a competitive leader in the future global economic structure. Eventually, the Korean government announced the Green New Deal as one of the three pillars of the Korean New Deal on 14 July 2020, and proposed a total investment of KRW 73.4 trillion (KRW 42.7 trillion from the treasury) over the next five years.

Korean Green New Deal   collaboration   trans-regional R&D strategy   future mobility

nationally funded project data

1. Inherent Purpose of Korean Green New Deal

Companies determine the values of products and/or processes based on research and development (R&D) activities; therefore, technological innovation is treated as one of the main determinants of total factor productivity, profit, and economic growth [1][2][3]. Thus, regional inequality results from variations in the technological and scientific resources required to achieve critical mass and develop sufficient absorptive capacity to participate in the dynamics of global science-led and R&D-based innovation [4][5]. Regional income/wealth inequality has increased substantially and steadily without signs of improvement in many countries [6]. In accordance with the global trend of regional inequality, there is growing regional inequality in the Seoul metropolitan area and Chungcheong provinces in terms of the amount of investment and human resources for technology R&D in Korea. Moreover, public R&D, which should rectify the imbalance in private R&D investment, is also concentrated in Seoul and Daejeon (more than 80% [7]). However, the concentration of core technical personnel in the CR of Korea is even more serious than the imbalance of R&D investment, with the technological workforce continually concentrating in this region over the last 10 years [8][9].

Thus, several of the world's leading innovation economies, such as the US and EU, are moving to establish innovation strategies or policies that reduce inequalities within countries or between countries through Green New

Deals [10][11][12]. The focus of such innovation strategies or policies is to promote the exchange of knowledge and other assets within and beyond regions [13][14][15][16]. Therefore, the involvement of various stakeholders, actor networks, and policy agents in different regions is ensured by establishing communication channels for horizontal and vertical coordination [4][17][18]. Although the Korean Green New Deal was not specifically designed to alleviate the issue of regional inequality in Korea, the central government made a commitment with local governments to implement key innovative projects [19]. Thus, it is important to closely combine the aim of reducing greenhouse gas emissions (from the Korean Green New Deal) with that of reducing deepening regional inequality (from the Regionally Balanced New Deal) by establishing a national collaborative R&D strategy for a trans-regional innovation approach that will accelerate the creation, dissemination, absorption, and application of new scientific and technological knowledge and ensure inter-organizational linkages across regions [20][18]. Such a strategic approach allows regional actors to promote collaborative scientific and technological projects across Korea, which can gather distant partners and provide opportunities to further develop capabilities in their areas of specialization [4].

2. Organizational Structure of the National Strategy

In Korea, a joint governing body for the implementation of the Korean New Deal was established to channel cooperation and discussion between the political community and the government [19]. This body comprises the heads of the three pillars of the Korean New Deal and relevant ministers, including those for the Ministry of Science and ICT (MSIT), the Ministry of Environment (MOE), and the Ministry of Trade, Industry, and Energy (MOTIE). Subsequently, the Ministry of the Interior and Safety (MOIS) and regional mayors were invited to implement the Regionally Balanced New Deal in cooperation with the central government and 17 local governments. As shown in **Figure 1**, this governing body provides overarching information about the current status of national R&D activities across the country in order to establish collaborative projects between central and local governments for reducing regional inequality via a national strategy.

Figure 1. Organizational structure of the national strategy encompassing the Korean New Deal, Digital New Deal, Green New Deal, and Regionally Balanced New Deal.

The government also plans to launch a task force for the promotion and spread of the Korean New Deal and hold strategic meetings. The strategic meeting is an important decision-making organization chaired by the president and consists of joint government ministries, the Korea New Deal Committee, local governments, and private companies. The strategic meeting will be organized once or twice a month to discuss various forms of cooperation, including comprehensive reporting, sharing major project progress, private demand and investment, cooperation with local governments, and system improvement [19]. Although the Korean government established the organizational structure of a national strategy, in practice, any systematic framework to discuss the trans-regional collaborative strategy planning is not provided to the members of the task force.

3. Future Mobility Policies of Korea

Emissions from the transport sector are a major contributor to climate change and account for approximately 20% of global CO_2 emissions, with road transport accounting for three-quarters of all transport emissions [21]. Moreover, CO_2 emissions from road transportation in Korea comprise 14% of all CO_2 emissions in Korea [22]. Under the 2015 Paris Agreement, the Korean government developed a carbon-neutral strategy that would both achieve the relevant target and further diversify transportation fuel types, acknowledging that electrified and hydrogen vehicles can decrease oil imports (Korea is the fifth-largest importer worldwide) and utilize electricity and hydrogen from renewable sources produced in Korea [23][24][25]. Moreover, the Korean government has been strongly invested in supporting the development of new technologies predicted to prevail in future markets.

This is because the automobile industry has a huge influence on the economy in Korea, which is the home of the headquarters and factories of the Hyundai Motor Group (the fifth-largest automobile manufacturing company worldwide) [26][27]. As such, the government implemented the Eco-Friendly Mobility of the Future (hereafter future mobility) project as a key project of the Green New Deal. Under the Green New Deal, the Korean government set up the industrial goal for the future mobility project. More precisely, the project aims to supply 1.13 electric vehicle units, including passenger cars, buses, and trucks by 2025, and install 15,000 quick chargers and 30,000 slow chargers. The project proposes to extend the driving range of electric vehicles from the current 400 km to 600 km by 2025 and shorten the charging speed from 40 min to 15 min. Additionally, 200,000 hydrogen vehicles and 450 charging facilities will be provided by 2025. The project proposes to develop hydrogen cars with 500,000-kilometer durability at a price of KRW 40 million (USD 41,000) by 2025 [19].

Two zero-emission vehicle technologies—battery electric vehicles and fuel cell (electric) vehicles—have emerged as the main pillars of future mobility [28][29]. Although the battery electric vehicle market is currently dominating in several countries such as the US, EU, China, and Korea, industrial and government efforts to spur the market development of fuel cell transport are supported by numerous advantages relative to batteries, including refueling times roughly comparable to gasoline, longer driving ranges, fewer space requirements for hydrogen refueling stations, less performance deterioration from battery aging, and less reliance on lithium and cobalt supply chains [26][29]. Meanwhile, autonomous technologies can improve road safety, increase fuel efficiency and reduce emissions, and improve urban public transportation via multimodal transportation services [30]. Therefore, electric

vehicles are likely to integrate autonomous technologies and would play an important role in promoting zero-emission and sustainable transportation.

In this study, we use the future mobility project as a case study to propose an information framework for implementing a collaborative R&D strategy plan between central and local government linking the Regionally Balanced New Deal and Green New Deal in Korea. The absence of a systematic framework, which is the primary limitation of the previous studies [31][11][32][20][12][16][18][28][33], is overcome by this study.

4. Need for Developing a Systematic Framework for a Collaborative Trans-Regional R&D Strategy Plan

From examining the inherent policy and political implications in "Green (New) Deal" initiatives of the world's largest economies, including the United States in February 2019, the European Union in December 2019, and South Korea in 2020, some scholars [31][11][32][20][12][34] asserted that these initiatives (green economic stimulus packages) should be stipulated as a sustainability transition strategy coupled with the climate and financial policies to accomplish the dual goals of climate change mitigation and regional inequality reduction. Consequently, a principle remark (a normative statement) that these green economic stimulus packages should be public long-term transition programs that set clear sustainability targets in green cars, transport systems, charging station network, etc., but where budgets are devolved to enable localities to design initiatives appropriate to their needs in collaborations with local stakeholders, was put forward.

Meanwhile, since the transport sector accounts for 21% of total emissions, and road transport accounts for three-quarters of transport emissions, road transport accounts for 15% of total CO_2 emissions [21]. Even though COVID-19 restrictions temporally drove down transportation demands, it is expected to grow across the world in the coming decades as the global population increases, incomes rise, and more people can afford cars, trains, and flights [16]. With the advancement and wide acceptance of electric and hydrogen technologies, decarbonization could be attained within a few decades in many regions, including the European Union, United States, China, and Japan [29]. Thus, many scholars investigated automotive industries and transport sectors in major countries to identify the roles/strategies of governments to facilitate the achievement of the greenhouse gas (GHG) emission reduction targets under the Paris Agreement [16][29][35][36].

In particular, only a few previous studies have focused on regional areas in line with the direction of technology policies for easing greenhouse gas emissions in the Korean transport sector under the Paris Agreement [27] or its Green New Deal [28]. Expanding the scope of the country, some studies in Austria [18] and the United Nations [37] require the role of government in developing green sustainable transportation strategies at the regional level, but existing studies have only asserted for the future policy or political implications through the review of three examples of green regional development initiatives or transportation impacts of transport sector during COVID-19 restrictions.

In order to successfully implement these national industrial strategies/stimulus packages, it is required to be aligned with a systematic (investment) framework that can contribute to a continuous collaboration with a range of stakeholders at multiple policy-making, managerial, and administrative levels as well as the engagement of local implementation actors such as local universities, research institutes, autonomous organizations, and a range of local companies [38]. A consensus is that developing a coherent/R&D strategy (planning) should be built on evidence-based situation analysis on particular sectors and technologies, an institutional base for investment monitoring, and process management for inclusive communication among stakeholders [39].

Previous studies [11][32][20][12][16][18][28][33] asserted only the normative statements that planning a collaborative strategy with a trans-regional perspective is important to successfully accomplish these green innovation initiatives and that the existing strategy lacks an explicit framework. Therefore, it is necessary to build a systematic framework for a fine-tuned trans-regional innovation scheme with regional, technological, and organizational dimensions, thereby identifying the reasons for the gap in a regional variation of innovation capabilities and then suggesting appropriate strategies to bridge the gap. The proposed framework is established on the abovementioned consensus on directions for a better, coherent/R&D strategy (planning) to facilitate collaborations with a range of stakeholders via continuous communication.

5. Changes in Sustainable Urban Mobility Modes in the Post-COVID-19 Era

The COVID-19 pandemic had swift and brutal impacts on the operation of the current transportation infrastructure [36][40]. In many nations, safety concerns, anxiety, and stress levels increased in society regarding using public transport after the beginning of the pandemic [40][41]. In the Republic of Korea, experts expected a mobility modal shift of 94.4% from public transport to personal car and only an expected 5.6% shift to bicycles. Almost half (45.2%) of experts expected a shift to a high-carbon mobility mode. Nonetheless, many people still had to use public transport because they did not have alternative modes. Additionally, a resurgence of the COVID-19 pandemic is expected until 2024 and even further [36]. Moreover, during the COVID-19 pandemic, several people changed their perceptions, favoring the use of sustainable mobility modes to protect the climate [41]. Thus, it is required for policy makers to make use of public funds both for improving public transport infrastructure (i.e., Mobility-as-a-Service (MaaS)) and for supporting the technological advancement of green vehicles (i.e., shared autonomous electric and alternative-fuel vehicles) to make our societies highly sustainable (or safe and trusted) in the era of building back with the Paris Agreement and the Sustainable Development Goals (SDGs). These efforts should concentrate on five primary targets—road safety, energy efficiency, sustainable infrastructure, urban access, and reduced fossil fuel subsidies [35][36][40][42]. The direct impact of the COVID-19 pandemic and demographic changes caused by an aging population must be regarded as a basis for the transition toward green and healthy sustainable transport and for increased investment in public transport to match new requirements [37][41].

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