

**The Environmental, Social, and Governance
(ESG) Practices as a
Part of Living Lab Co-Creation
The Case of Public Institutions in South Korea**

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ABSTRACT

Companies worldwide are under pressure from investors, employees, and citizens to actively engage in socially responsible investment practices. Their environmental, social, and governance (ESG) performance plays an important role in tackling global problems, such as climate change and post-pandemic development. Public institutions are receiving increasing attention because of their significant impact on global sustainable development. We present a case in which the ESG activities of public institutions are performed as part of living lab projects. Living labs are citizen-driven open innovation systems based on a co-creation approach. We illustrated 55 empirical cases in which public institutions were matched to living lab projects in Korea. Based on interviews with living lab teams, public institution agents, and competition organizers, we identified five types of support that public institutions could provide to living lab teams. We then evaluated the quality and quantity of support and concluded that the support was effective overall. Public institutions actively participate in living lab projects because these activities are counted toward their ESG performance, and living lab teams receive additional budgets and assistance from public institutions. Coordination between living lab teams and public institutions for optimal matching is the key variable that positively affects the helpfulness of public institutions' support for the teams. This study provides a theoretical framework in which ESG activities and living labs are connected and also shows a new empirical case of ESG activities performed in the context of living lab co-creation.

Keywords: environmental, social, and governance (ESG); living lab; public institution; South Korea; co-creation

Introduction

Corporate actions that contribute to society and generate public good, often referred to as environmental, social, and governance (hereafter, ESG) actions, are becoming a serious concern for corporate leaders, investors, consumers, and various other public and private actors. The ESG framework is a set of investment standards used to evaluate a company's behavior. However, in a broader sense, it is a corporate strategy to tackle various local and global problems and make society more sustainable and resilient. There is growing evidence that companies have played a substantial role in overcoming pandemic crises and achieving carbon neutrality based on their ESG frameworks (Abhayawansa and Adams, 2022; Macchiavello and Siri, 2022).

Recent progress in ESG performances may be due to the increasing role played by public institutions. Public institutions are public sector organizations owned or operated by the government. Their primary role is to provide public services to citizens. As with private companies, public institutions face pressure from their main investors (the government), employees, and citizens to engage more actively in socially responsible investment practices (Argento et al., 2019). Although they are managed as private companies, their ESG performance is of interest to various stakeholders because they provide public services (Andrades et al., 2023). Given that the public sector is usually the largest economic sector in many countries worldwide, public institutions' ESG engagement is particularly important in achieving sustainable and inclusive development.

This study suggests that living labs can be a new form of ESG performance, especially for public institutions. Living labs are citizen-driven (i.e., user-driven) open innovation systems (or processes) based on a co-creation approach. They are a series of problem-solving activities voluntarily organized by citizens (local residents) in cooperation with various types of public and private actors, such as central/local governments, universities, firms, and advocacy groups (Leminen, Westerlund and Nyström, 2012). We illustrate how public institutions in South Korea (hereafter, Korea) perform ESG by participating in locally organized living labs and examine the determinants of effectiveness in their ESG performance. For these purposes, we provide an empirical analysis of living lab projects in Korea. We collected 55 cases in which public institutions were matched to support 27 living lab projects in Korea. Specifically, we show how public institutions assist living lab projects and analyze them in the context of their ESG performance.

We find that public institutions' support for living lab projects is effective overall, and that the coordination between the two matching institutions, public institutions and living lab teams, is the most important factor that affects their helpfulness. The living lab teams typically lack the budget for flexible experimentation. Additionally, they often lack specific knowledge or information about the topics of their living lab projects. Therefore, public institutions' support is helpful. Furthermore, public institutions actively participate in living lab projects because these activities are considered as ESG performance. When the public institutions and living lab teams were matched based on the needs of both sides, the effectiveness of the public institutions' support for the living lab teams increased.

Academic research on ESG has greatly expanded. Previous studies on ESG have focused on various aspects of ESG, such as its impact on firms' financial performances (Gillan et al., 2021; Dhaliwal et al., 2011), reporting (Pareek and Pasumarti, 2021), ESG in COVID-19 (Broadstock et al., 2021), its role in financial development (Ng et al., 2020), and ESG in a specific country case (Dmuchowski et al., 2023). However, in the public sector, ESG is a relatively neglected area of academic interest. Although some studies have focused on public sector ESG activities (Domanović, 2022; Lucia et al., 2020), they are still limited. Similarly, while there have been many studies on the role of living labs in public sector innovation and public value creation (Gascó, 2017; Gago and Rubalcaba, 2020; Hansen and Fuglsang, 2020; Fuglsang et al., 2021; Bentzen et al., 2020; Haug and Mergel 2021), none have attempted to connect living labs to ESG or analyze public institutions' living lab participation as a form of ESG action.

This article illustrates how public institutions in Korea find a way to implement their ESG performance by participating in living lab projects, making at least three contributions to the existing research. First, it adds an important case to the existing studies on the role of living labs in public sector innovation, especially the literature focusing on living labs as an open innovation intermediary (Gascó, 2017). This study shows a case in which the living lab is a framework for public institutions to perform their ESG actions. Second, by connecting ESG and living lab together, this study presents new research in both the ESG and living lab fields. Research on ESG as part of living labs and on living lab as part of ESG performance has been underexplored. Third, in the literature on public sector innovation, ESG, and living lab, empirical analyses of non-Western cases, especially in Korea, are rare. This article examines how ESG actions and living labs are promoted by the government initiatives in Korea and how these processes differ from those in Western countries.

In the next section, theoretical discussions regarding the relationship between living labs and ESG performance and a framework for the analysis are provided. The third section introduces Korean experiences with ESG actions and living labs, focusing on the role of government intervention in these processes. The fourth section presents the cases and research methods. In the fifth section, we analyze the cases and explore the factors that affect the effectiveness of public institutions' support for living lab teams. Finally, the conclusions and directions for further research are presented.

Theoretical Discussions

The Relationship between Environmental, Social, and Governance (ESG) Actions and Living Labs

ESG are the three key non-financial factors (indicators) investors consider when evaluating the sustainability and ethical impact of investment in a company. At the same time, ESG usually refers to a company's activities or performance that contribute to the environment and society and operate with transparent governance. This has become particularly important since the Paris Agreement was adopted in 2015, when the states began to set up and implement their national carbon neutrality plans. To meet the net-zero goal, countries are increasingly imposing ESG reporting requirements for firms. In June 2021, G7 Finance ministers and central bank governors announced their support for mandatory ESG disclosure. In 2021, 25 countries worldwide adopted mandatory ESG disclosure legislation, at least for financial institutions, state-owned enterprises, and large listed companies (Krueger, 2023). In the European Union, large companies must comply with the EU Non-Financial Reporting Directive (NFRD), which requires the disclosure of social and environmental issues (as well as information on board diversity) in annual reports. The Corporate Sustainability Reporting Directive (CSRD), an expanded version of the NFRD, was enacted in January 2023; approximately 50,000 companies (including small and medium-sized enterprises) in the EU are now required to report on sustainability using this new directive from fiscal year 2024.

Living lab is an innovation methodology that enables collaborative learning by users, producers, and researchers in a real-life environment where user needs are central (van Geenhuizen, 2018). In other words, living labs pursue user-driven innovation, in which users (citizens or local residents) are the main beneficiaries of problem-solving and innovation. In addition, for effective problem-solving and innovation, co-creation among various types of participants is essential. Co-creation is defined as a process through which two or more actors from the public and private sectors collaborate voluntarily and in a balanced and reciprocal manner to define common problems and challenges, design new solutions, and implement them in practice (Bentzen et al., 2020). To solve local problems, residents, professors, researchers, governments (central and local), firms, and civil society groups cooperate to design and implement experiments, create prototypes, and apply them to real-world situations (Leminen, 2013). Therefore, by definition, living labs are an arena in which public, private, and people partnerships are created and operated (Gascó, 2017).

There are two approaches to understanding the relationship between ESG actions and living labs. The first is the ESG-centered approach, in which living labs can be a part of ESG actions, as shown in Figure 1. When a company sets up and implements ESG strategies, it can deploy a living lab as a method for improving their ESG performance. Because co-creation is a key component of a living lab, one of the advantages for companies deploying living labs might be that they can cooperate with other actors. A hypothetical example of a living lab as part of an ESG strategy is provided as follows: A company decides to invest a sizable amount of money in reforestation and forest management in developing countries, as its ESG activity particularly focusing on realizing carbon neutrality. If the company organizes a living lab project in which its reforestation activity is co-managed with local residents and implemented to address various local problems during the ESG performance process, this can be a typical case of a living lab as part of ESG action. Of course, in reality, there might be some limitations to this combination between ESG strategy and living labs because a company's ESG performance is reported and evaluated on a result basis and, for the most part, the degree of inclusiveness of the ESG process is not a major concern. In the case of carbon neutrality, for example, companies, investors, consumers, and reporting institutions tend to focus on corporate activities to meet their target as net-zero energy businesses and are less concerned about how they can meet the target.

The second is the living lab-centered approach in which ESG action can be part of a living lab project, as shown in Figure 2. In this case, companies are among the living lab project participants, along with others such as citizens (residents), governments, non-governmental organizations, and universities. Whereas the entire project is a living lab-based problem-solving activity based on the co-creation mechanism, for the specific participating companies, the living lab project outcomes (at least some of them) can be considered their ESG performance results. In other words, as living lab project participants, companies actively cooperate with others to design and implement living lab experiments, and these activities are reported as ESG performance. Companies, whether private or public, usually participate in living lab projects as providers of budgets and technologies for experimentation. However, their roles are not limited to these areas. In many cases, they advise residents, generate creative ideas, and seek business opportunities by using prototypes. To identify a company's ESG activities in the context of the co-creation framework, Figure 3 is a more specific version of Figure 2. Figure 3 also shows the basic framework used in this study to analyze Korean cases.

Figure 1: Living Lab as a Part of ESG Framework

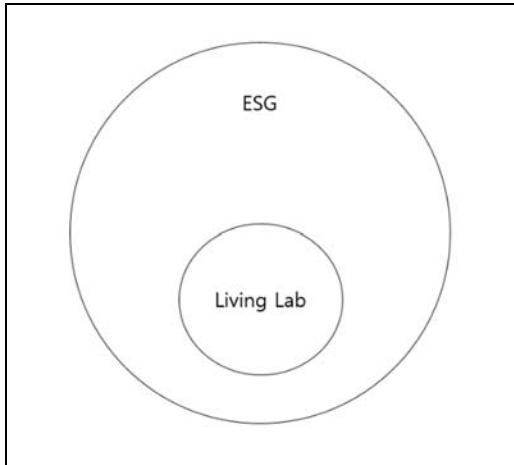


Figure 2: ESG as a Part of a Living Lab

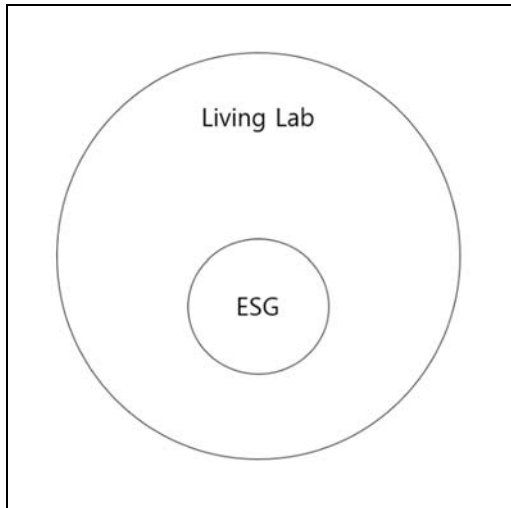
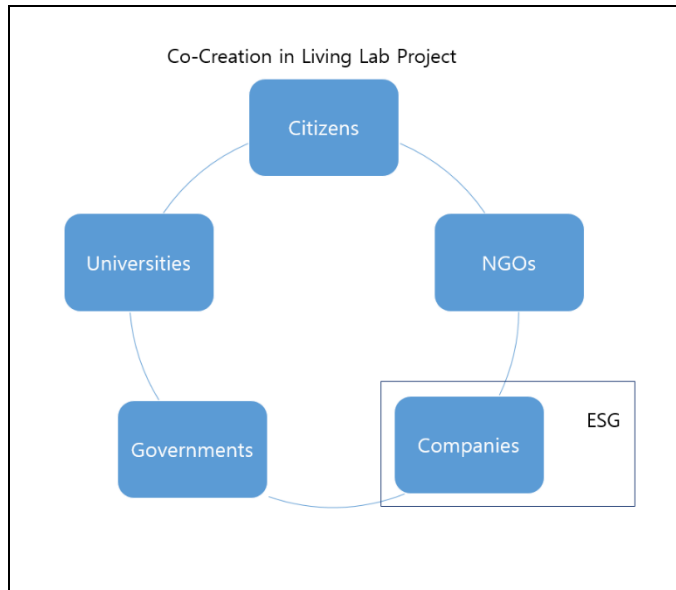


Figure 3: ESG as a Part of a Living Lab (Detailed Version)



Environmental, Social, and Governance (ESG) Action and Living Labs in the Public Sector

Public sector participation in ESG plays a significant role in its global diffusion and deepening. First, in many cases, the public sector is the largest economic sector in a country. It plays a pivotal role in promoting economic growth, or at least a complementary role in supporting private sector development. For instance, China has the largest state-asset system in the world. State-owned enterprises are the economic and political foundations of the Communist Party of China and the Chinese state (Zahid et al., 2023). The public institutions play a critical role in Korea's national economy. In 2019, the budget for public institutions was 1.4 times larger than the national budget (Song and Min 2022). Therefore, ESG action in the public sector has a significant influence on national ESG practices in these countries. Second, as hybrid organizations, public institutions incorporate elements from both social and commercial logic at the core of their identities. They must balance two diverging institutional logics: social goals and financial rewards (Andrades et al., 2023). This means that, in nature, they receive dual expectations from citizens and, therefore, have accountability pressure to contribute to society and create public value (Almqvist et al., 2013; Manes-Rossi et al., 2020). Third, ESG action can be an opportunity for public institutions to reform and thrive. Faced with threats such as budget cuts, rationalization, and the outsourcing of public service production to private contractors, public institutions experience increased pressure to innovate themselves. ESG actions can provide a new opportunity for public sector innovation and development.

Living labs can be an opportunity to improve ESG performance, especially for public institutions. As mentioned above, public institutions are pressured to contribute to society and create public value. Therefore, public institutions' public value creation and public sector innovation activities can be a part of their ESG performance. However, public institutions alone

cannot create an effective public value. The literature indicates that public sector innovation and value creation are now more dependent on the joint processes based on cross-sectional collaboration (Hansen et al., 2021). Thus, if public institutions implement ESG activities using living labs as opportunities, they will benefit from the co-creation of living labs. They cooperate with other participants in the living lab projects to find ways to make social contributions and create public value.

Environmental, Social, and Governance (ESG) and Living Labs in Korea

Environmental, Social, and Governance (ESG) Activities in Korea

For companies in Korea (and probably other non-Western countries), the ESG framework is a global initiative created and promoted by advanced countries in Europe and North America. In other words, ESG practices is a global trend that companies should maintain if they want to remain connected to the global value chain. Similar to the cases of RE100 and Carbon Border Adjustment Mechanism (CBAM), the ESG initiative places international pressure on Korean companies to set up strategies to find ways to meet the global standards of ESG practices. In response to global trends, the Korean government has enhanced ESG rules and regulations to support companies ineffectively performing ESG practices.

Two major groups of actors in Korea promote ESG practices: family owned business conglomerations, called *chaebols*, and public institutions. Chaebols account for a large proportion of listed Korean firms, and their political and social influence on the nation is enormous. While chaebols have been the engines of the nation's rapid and successful economic development, they have received wide criticism and have faced social demands for reformation because of their association with political scandals that cause owner risks. Socially responsible management practices are one of the major agendas of these demands. In response to these demands, chaebols have become increasingly engaged in the activities of social contribution (Yoon et al., 2018; Hwang et al., 2021; Yoon et al., 2021). In Korea, the term "social contribution" is more frequently used than terms such as ESG and corporate social responsibility (CSR). This is because the former emphasizes the notion of firms' moral obligations, especially for chaebols, who need to reform themselves and improve their images.

Another group of actors is public institutions. In Korea, public institutions are officially defined as institutions established and operated with investment, financial contributions, or funding from the government, which are designated annually by the Minister of Economy and Finance. There are three types of public institutions: public enterprises (institutions with self-generating revenue out of total revenue over 85%), quasi-governmental institutions (institutions with self-generating revenue out of total revenue between 50 and 80%, institutions managing the funds of the national government, and others), and non-classified public institutions (all others). As of 2021, the total number of public institutions in Korea was 350, consisting of 36 public enterprises, 96 quasi-governmental institutions, and 118 non-classified public institutions (Song and Min, 2022).

Though small in number, public institutions have a significant influence on Korea's

economy and society because of their asset size. For public enterprises, each asset is equal to or more than 1.5 billion USD. For example, Korea Electric Power Corporation is the largest public enterprise, with sales of 45 billion USD in 2020. It engages in the generation, transmission, transformation, and distribution of power, as well as the development of power sources (Song and Min 2022). Therefore, the government supervises and controls them by evaluating the management performance of public institutions and the public disclosure of their management performance. When former President Moon Jae-In was inaugurated in 2017, the government began to emphasize the role of public institutions in realizing social values and contributing to society by strengthening management performance requirements and expanding the items for public disclosure. As a result, the sub-indicators used to evaluate public institutions' ESG performance have become more specific, which sent a clear signal to public institutions that they had to implement ESG strategies more seriously than before. The government's emphasis on the role of public institutions in ESG initiatives was further stressed when it announced its national vision of 2050 carbon neutralization in December 2020. Since then, the government has kept adding more items and sub-indicators to the management performance and ESG performance, and this revision process has continued even after the Yoon administration was initiated in May 2022. The disclosure of ESG actions will be a legal obligation for almost all Korean firms by 2025 (Lee and Kim 2022; Jun 2023).

Living Labs in Korea

Living labs were introduced to Korea in the early 2010s by the government as a new type of social innovation mechanism. In the initial period, the Ministry of Science and Information and Communication Technology and the Ministry of Trade, Industry, and Energy led the introduction and promotion of living labs in Korea. This means that the government's intention was more towards technological innovation than citizen-led inclusive innovation. However, in the mid-2010s, the Ministry of Interior and Safety, which is responsible for general civil affairs, began to take charge of the living labs.

Unlike European living labs, the design and implementation of living lab projects in Korea are mostly top-down. Among the various participants of living labs, the central government is always the most important, as it is the largest source of funding for living labs in almost all cases. Moreover, most living labs in Korea are planned, designed, and implemented in the form of regularly held open competitions organized and funded by the central government (and partially by local governments). The main goal of living lab competitions is to promote living labs and address local problems such as transportation, housing, aging populations, the environment, health care, education, and gender issues. During the competition, the participating teams present their living lab project plans, and the secretariat members of the competition select a certain number of teams based on their evaluations and offer a certain amount of funding to each team. The teams then implement living lab experiments within a given time period, finalize their projects, and report the results to the government ministries that funded the competition. In Europe, some living labs have been created and directly sponsored by governments. However, living labs in Europe have diverse relationships with governments (Haug and Mergel 2021).

There are both advantages and weaknesses in the Korean top-down style of living labs. The greatest advantage may be the stable and predictable funding provision for living labs which

can enable citizens, companies, universities, and local activists to systematically prepare for the next competition. Consequently, living labs have flourished in Korea over the last 10 years. The Korean Network of Living Labs was created in 2017; subsequently, regional living lab networks have been established in many provinces, cities, and colleges. Hundreds of small and big living lab experiments are conducted every year and the results are utilized to address local problems. However, the main weakness of the top-down style is that the amount of funding, term and usage of expenditure, and duration of the experiment are predetermined by competition organizers (government ministries). These constraints narrow down applicants' choices of themes, areas, and scope of innovation. Applicants should prepare a plan for the living lab in which they can spend the designated budget and complete the experiment within a given time. This means that there might be cases in which applicants focus on a less urgent local problem for which the living lab experiment is highly feasible and manageable. In other words, a living lab is usually designed in a fail-safe manner to successfully implement experiments within a given period. If the experiments fail and the given problem cannot be addressed effectively, it is a serious problem for the team because they must report successful results to the government ministries that funded their experiments.

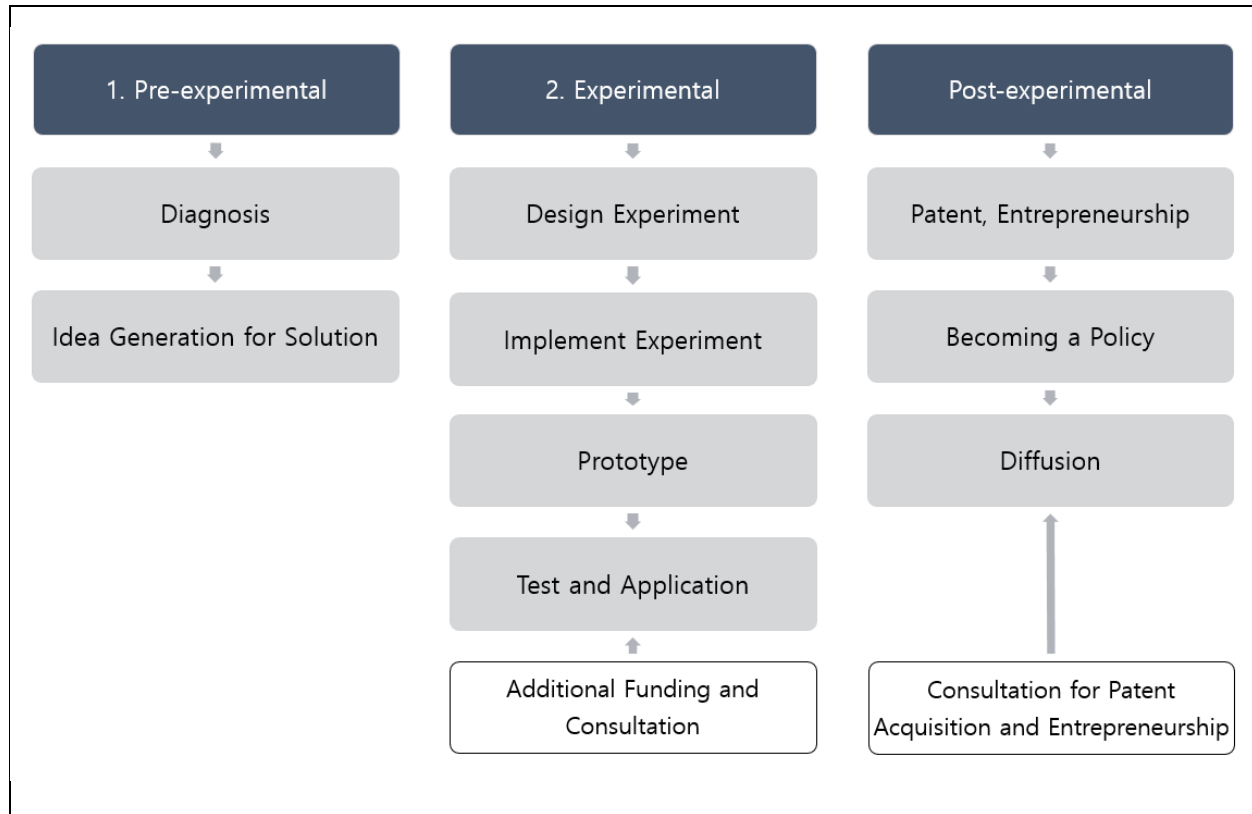
The Cases and the Research Method

The Cases

The cases analyzed in this study are 55 matched cases in 27 living lab projects that were selected in the annual living lab competition held in Gangwon Province from 2020 to 2022. The title of the competition was the Platform for Local Problem Solving in Gangwon Province” (hereafter referred to as the Platform). Although it is a provincial-level contest, the Platform is almost entirely funded by the central government, that is, the Ministry of Interior and Safety. Every year, the Platform selects 8–10 teams and provides them with a budget for experiments, approximately 10,000 USD for each team, and other assistance such as logistical and technical advice. The selected teams were given 100 days to complete their designed living lab experiments. The topics (areas of local problems) that the teams chose were diverse, such as the environment, transportation, health, and poverty. After 100 days, they were required to report the results of the living lab experiment to the Platform staff.

In addition to budget and advice, the Platform provides each team with an opportunity to match the public institutions located in Gangwon Province. The matched public institutions support the teams by providing an additional budget for experiments, giving advice and consultation based on their specialty, and suggesting new ideas. Public institutions participate in living lab projects as matching institutions primarily because these activities can be reported as their ESG performance. Public institutions only play a supportive role in living labs, in the sense that they do not directly participate in the design and implementation of the experiments. However, they are still participants in living lab projects and, in some cases, play a significant role in assisting the matched team in successfully completing the living lab project.

Figure 4. Public institutions' Roles in the Stages of Living Labs



The living lab process was divided into three stages: pre-experimental, experimental, and post-experimental. In the pre-experimental stage, participants designate problems, identify their causes, and seek solutions. In the experimental stage, they design and implement experiments, produce and test prototypes, and apply them to problems. Finally, in the post-experimental stage, they apply for patents or start new businesses based on the innovation outcomes. The latter often becomes a policy and diffuses to other regions and policy areas. Public institutions participate in the experimental and post-experimental stages. For example, during the experimental stage, they provide additional budgets and consultation services. In the post-experimental stage, they provide legal consultations to help the living lab teams apply for patents and start new businesses based on the results of their experiments. This is illustrated in Figure 4.

Table 1 summarizes the cases used in this study. The Platform has been organized annually since it was first held in 2019. In the first Platform, there was no matching system, although some public institutions individually participated after 100 days of the experiments. However, the matching system has been institutionalized since 2020. Therefore, 55 matching cases were selected from the 27 teams selected from 2020–2022.

Table 1: The Cases

| Year | N of Teams | N of Public Institutions | N of Matched Public Institutions | N of Matches |
|-------|------------|--------------------------|----------------------------------|--------------|
| 2020 | 7 | 14 | 12 | 13 |
| 2021 | 10 | 17 | 14 | 22 |
| 2022 | 10 | 17 | 13 | 20 |
| Total | 27 | - | - | 55 |

The Secretariat of the Platform contacts the public institutions, mostly located in Gangwon Province, and invites them to the Platform. Public institutions send agents, usually those in charge of corporate social responsibility/ESG in each public institution, to the Platform with the expectation that participation in living lab projects can enhance their ESG performance. Once the teams are selected, their proposals for living lab experiments are submitted to the public institution agents. Agents then express their intentions to be matched with specific team(s) to the Secretariat, and the Secretariat makes the final matching decisions. The number of participating public institutions was 14 in 2020 but increased to 17 in the two subsequent years. However, not all the participating public institutions were matched. For example, in 2020, 12 of 14 institutions were matched. In addition, because one public institution can be matched to multiple living lab teams, the number of matches is greater than that of the matched public institutions. Therefore, the total number of matches for the three years was 55.

The Research Method

We qualitatively analyzed 55 cases in the 27 living lab projects using the following three steps:

First, we specifically investigated the types of support the matched public institutions provided to the living lab teams in 55 cases by referring to the annual reports and conducting semi-structured interviews with the participants of living lab projects, agents of public institutions, and the general manager of the Platform. The general manager supervises the overall living lab project and the matching process. The general manager that we interviewed had taken the position since 2019 and had the best knowledge and information regarding the detailed processes of living lab projects and the specific roles of matched public institutions in all 27 living lab cases. Since we were unable to contact four living lab teams (out of 27) and six agents of public institutions (out of 21), we relied mostly on the general manager's memos and opinions for these un-interviewed cases.

Second, we evaluated the matching public institutions' contributions regarding both quality and quantity by asking team members to evaluate the effectiveness of the matched public institutions' support using three ordinal scales. We asked for the same evaluation from the general manager. We then compared the two sets of results and made a final assessment of the quality and quantity of the performance of the matched public institutions. After we reached conclusions in our evaluation, we explored possible factor(s) that affect the effectiveness of public institutions' support for living lab teams. For this purpose, we relied on the interview results.

Third, the factors explored above were reconfirmed by investigating all 11 grade A cases in detail. We used the "most different system design" in which we could control for the differences among the cases, while one similarity became the independent variable. We also examined additional factors that affected the outcomes.

The Analysis

Types of Support

Based on the information gathered from both the archival work and interviews, we classified the public institutions' support for the living lab teams into five categories, as shown in Table 2. The ranking represents the significance of the support judged again from the opinions of the interviewees (team representatives and the general manager), with ranking 1 being the most significant support.

The first and most important activity of the matched public institutions is financial support. In general, living lab teams do not have a financial deficit because the Secretariat assigns a budget according to the size and characteristics of the experiments. However, the problem is the constraint when teams spend their budgets. As they use government funding, there are rigid guidelines that narrow the purposes of expenditure. Additional funding from public institutions can address this problem because it is more flexible than the original budget. The second is the various types of consultation provided by the matched public institutions. Since public institutions are large public organizations responsible for specific policy areas, such as health, transportation, tourism, and forest management, their consulting plays a critical role in increasing the feasibility of the experiments. In some cases, public institutions provide legal advice to living lab teams to help them overcome legal and bureaucratic hurdles. The third factor is personnel support. Individuals in matched public institutions often participate as interviewees in living lab team interviews for survey research. Additionally, they test the prototypes or provide opinions on the prototypes or solutions. The fourth factor is logistical support. The public institutions provide various types of equipment and sometimes offer spaces and locations for the activities of the living lab teams. The fifth category is public relations. Public institutions advertise living lab team activities or participate in advocacy campaigns for awareness and education.

Table 2: Types and Examples of Public Institution Activities

| Ranking | Types of Support | Examples |
|---------|--------------------|---|
| 1 | Financial Support | Providing additional budget for the experiments, ranging from 1,000–6,000 USD in each observation |
| 2 | Consultation | Providing advice within specific policy areas (health, transportation, environment, tourism) |
| 3 | Personnel Support | Personnel participation in the living lab team’s survey interview as interviewees, and other types of support |
| 4 | Logistical Support | Providing equipment, space, and location for experiments and other activities |
| 5 | Public Relations | Organizing or participating in campaigns for awareness and education |

Evaluation of Support

We interviewed the participating living lab team members (team leader or one of the team members in each team) approximately six months after the completed experiment process following the closing ceremony (where teams report and share their results). This is because we should observe matched public institutions’ activities not only in the experimental stage but also in the post-experimental stage. Our questions were as follows: (1) How much did the matched public institutions help your living lab team during and after the experiment? Choose one among A, B, and C, where A is excellent, B is positive overall, and C is negative; (2) What are your reasons for answering the above question as such? and (3) In your opinion, what are the most important factor(s) affecting the effectiveness of the matched public institution’s assistance in the living lab? We then asked the same questions to the general manager and concluded our evaluations based on these two sets of answers.

We first decided which cases would be graded as A and C. For these two groups, we compared the two sets of answers and made final conclusions focusing on the overlapping evaluations. For group A, the team representatives selected 11 matched cases, and the general manager selected the same 11 cases and one more case. Therefore, we concluded the overlapping 11 cases as group A. Similarly, for group C, the team representatives selected 10, and the general manager selected 11. We concluded that eight overlapping cases could be evaluated as group C. Second, we concluded that the remaining cases could be graded as group B. The level of consistency between the two sets of answers was relatively high, primarily because the teams and general managers constantly communicated during and after the experiments, and we gave them only three ordinal scales. Because we focused on groups A and C to find the possible reasons for effective support, we think that this is a valid method for that purpose.

Table 3 summarizes the evaluation results. Eleven cases were evaluated as A, eight cases are evaluated as C, and the remaining 36 cases are automatically classified as B. Since 47 out of 55 cases were evaluated as excellent or positive, we conclude that the matched public institutions’ support was overall effective in assisting living lab teams. Based on our survey results, we found that coordination by the general manager is a necessary condition for this

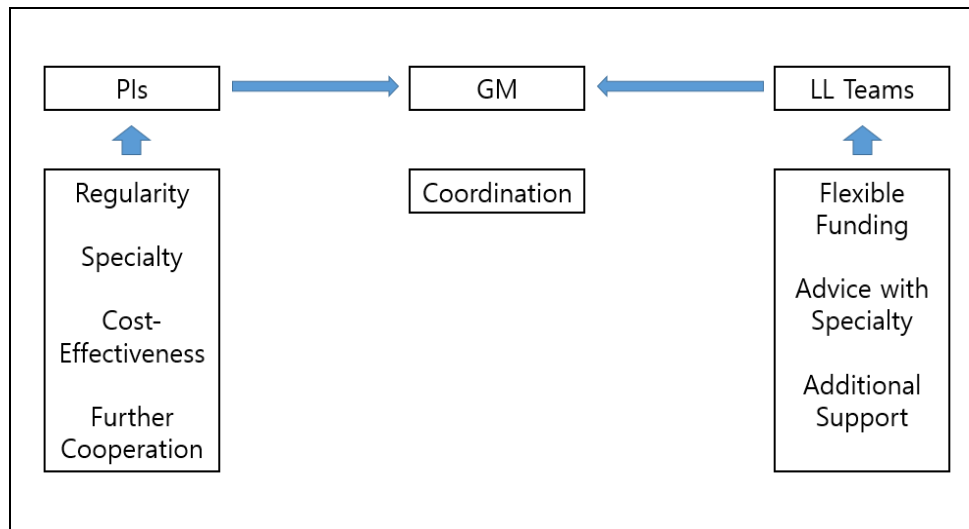
overall effectiveness. Coordination means that the general manager assigns public institutions to living lab projects considering the needs of both sides and the specialties that public institutions can provide to the living lab teams. This is possible because the general manager has a deep understanding of each living lab team's situation and each participating public institution's specialty. As mentioned in the previous section, the Secretariat (mostly the general manager) makes the matching judgment based on each public institution's intention. If a public institution wants to be matched with a living lab team that has nothing to do with the public institution's specialty, the general manager becomes involved and urges the public institution to find another partner. Although the general manager and Secretariat try their best to achieve effective matching, there are cases in which coordination is not possible. Group C was mostly composed of these cases.

Table 3: Evaluation

| | A | B | C | Total |
|-------|----|----|---|-------|
| 2020 | 3 | 9 | 1 | 13 |
| 2021 | 4 | 15 | 3 | 22 |
| 2022 | 4 | 12 | 4 | 20 |
| Total | 11 | 36 | 8 | 55 |

Figure 5 illustrates more clearly the motivations of both sides which are coordinated by the general manager. According to our interviews with public institutions' agents, for them, participating in living lab projects is a significant opportunity for their ESG performance for four reasons. First, since the Platform is held annually on a regular basis, public institutions can save the time and energy spent to find where to go and what to do for their next ESG activities. Second, public institutions can assist living lab teams effectively because their activities are based on their specialty. For example, one living lab team focused on the issue that people tend not to wear a helmet when they use an electronic kickboard. The matched public institution was the Korean Road & Transportation Corporation, which was responsible for the government policies regarding this matter. Therefore, it was able to provide the team with legal advice and detailed information regarding the government regulations on it. Third, for public institutions, participating in living lab projects is a cost-effective way to implement their ESG activities. Because public institutions are involved in living lab projects that are already designed by team members, they can play an additional role and do not have to plan a new project. Fourth, participating in living lab projects is creative work for public institutions. Because living lab projects are based on experiments, public institutions can be involved in a new experiment when the original one fails, or when the living lab team plans a new experiment in the post-experimental stage. Similarly, the living lab teams also have expectations and motivations for the matching. Living lab teams can have a new and flexible funding source and get advice from public institutions with specialties. They can also expect some additional support from public institutions when they decide to continue their projects in the post-experimental stage. These motivations are shown in Figure 5.

Figure 5: Motivations of Public Institutions and Living Lab Teams for Matching



GM means general manager.

The 11 Best Cases

A detailed evaluation of the 11 cases in group A is shown in Table 4. Eleven matched cases were obtained from six living lab projects. They showed a significant difference, at least regarding the following four aspects: First, the problems and topics of the six living lab teams were diverse. They included health, environment, education, minorities, and elderly people. Second, the nature and design of the experiments were different in the six living lab projects, ranging from simply renovating a house to coming up with creative ideas for recycling coffee grounds. In the case of teenagers’ psychological instability, the solution is based on cooperation among residents to share the problem and seek social therapy such as group dancing. Third, the size (in terms of budget and number of employees) and specialties of the public institutions were diverse. For example, the budget ranges from 3 million USD (Gangwon Social Economy Support Center) to 3.6 billion USD (Korea Health Insurance Review and Assessment Service). Fourth, the public institutions’ roles were diverse. Financial support was provided in almost all cases. However, there were some differences in each case regarding the support type. Even single public institutions supported two teams differently. For Cases 6 and 10, the public institution, Korea Health Insurance Review and Assessment Service, was involved in both living lab projects, and the types of support offered were different. In Case 6, which involves the recycling of coffee grounds, the public institution’s support was centered on personnel, logistical, and financial support. The public institution employees volunteered to gather coffee grounds, and the public institution provided space for coffee ground stock-ups. However, in Case 10, involving the creation of a symptom board for foreign patients, the public institution could provide legal and medical advice based on its specialty, in addition to financial support.

Despite these differences, all 11 cases were classified as Grade A. This means that one of the similarities, the role of general manager’s coordination for the “right (optimal) matching,” can explain why their support was effective. In terms of “the most different system design” (Przeworski and Teune, 1970), the 11 cases have many differences that are alternative

hypotheses. If these alternative hypotheses are controlled for, we can focus on one of the cases' similarities, the general manager coordination, as an independent variable to explain the effectiveness of public institutions' support.

Table 4: Summary of the 11 Cases of A Grade

| No. | Problems/Experiment | Topic | Matched Public Institutions | Public Institution Roles | |
|-----|--|--------------------------------------|--|--------------------------|-------|
| | | | | E* | 1** |
| 1 | Inconvenient senior house (club) designed in the traditional way | Health (Elderly People) | Gangwondo Development Corporation | E* | 1** |
| | | | | Post-E | |
| 2 | Renovate the house and see if it improves seniors' knee pain problem | | Korea Veterans Health Service | E | 1,2 |
| | | | | Post-E | |
| 3 | Increasing amount of wasted plastic containers due to rapid increase of delivery food usage Set up a container reuse system and see if this reduces the amount of waste and at the same time increases sales in local dining business | Environment | Mine Reclamation Corporation | E | 1 |
| | | | | Post-E | |
| 4 | Psychological instability problems of teenagers | Education | Community Media Foundation in Gangwon | E | 1,2 |
| | | | | Post-E | |
| 5 | Build up a community center to share problems with local people and specialists | | Gangwondo Development Corporation | E | 1,4 |
| | | | | Post-E | |
| 6 | Increase in the amount of coffee grounds Reuse and recycle coffee grounds in various ways | Environment | Korea Health Insurance Review and Assessment Service | E | 1,3,4 |
| | | | | Post-E | 3,4 |
| 7 | | | Korea Tourism Corporation | E | 1,5 |
| | | | | Post-E | 4,5 |
| 8 | Seniors have difficulties in finding jobs + Increase in the plastic waste due to the food delivery | Jobless Elderly People / Environment | Gangwon Land Foundation for Social Contribution | E | 1,2 |
| | | | | Post-E | |
| 9 | Seniors create a start-up for container reuse and distribution | | Gangwon Social Economy Supporting Center | E | 2,4,5 |
| | | | | Post-E | |

| No. | Problems/Experiment | Topic | Matched Public Institutions | Public Institution Roles | |
|-----|--|-----------------------|--|--------------------------|-----|
| | | | | | |
| 10 | Foreign residents find difficulties when they visit local pharmacy due to language barrier | Minorities/ Health | Korea Health Insurance Review and Assessment Service | E | 1,2 |
| | | | | Post-E | 1,2 |
| 11 | Create a board in which patients can designate the types and severity of their symptoms by pointing out specific part(s) on the body picture and selecting a number in the scale | | National Health Insurance Service | E | 1,2 |
| | | | | Post-E | 1,2 |

* E = Experimental Stage, Post-E = Post-Experimental Stage

** Numbers are the five types of support in Table 2

Although we suggest general manager coordination as the main factor that explains the effectiveness of public institutions' support for living lab teams, a more detailed analysis of the 11 cases makes us consider some additional factors. Once we assume that the general manager's coordination works well, the roles of the two other actors, the living lab teams and the public institution agents, can affect the results. First, among the 11 cases in Table 4, public institutions' support was limited to the experimental stage in seven cases. However, it also worked in the post-experimental stage in four cases. There were more cases in Group B in which the public institutions helped the teams in both stages. This is simply because the teams were willing to continue or develop their experiments even when the 100-days experiment was completed. Therefore, in this context, the willingness of living lab teams affects public institutions' decisions to continue their involvement in living lab projects in the post-experimental stage. Second, even though the general manager matches the two sides according to their needs, there might inevitably be some cases in which matching is not based on the needs of the two sides. In Figure 4, the Mine Reclamation Corporation is matched to the project of developing a container recycling center, and the Korea Tourism Corporation is matched to the coffee ground recycling team. However, in these cases, the public institutions' support could be effective depending on the role of the public institution agents. Although the topics of the living lab teams are not related to the specialties of the matched public institutions, the agents can generate creative ideas to provide meaningful support to the living lab teams. For example, the Korea Tourism Corporation organized an environmental campaign in famous tourism locations to advertise the project and raise environmental awareness.

Conclusion

This article presents cases in which ESG actions were performed as part of living lab projects in Korea, with a particular focus on public institutions. Although previous studies have produced various knowledge on ESG performance and living labs, none have attempted to analyze either ESG performance as a part of a living lab project or the living lab as a part of ESG performance. We suggest a framework in which companies' ESG activities (especially those of

public institutions) are performed as part of living lab projects. Empirically, we present 55 cases of matching between public institutions and living lab teams and investigate how public institutions can participate in living lab projects and support living lab teams. We found that coordination for optimal matching was the most important factor positively affecting the effectiveness of public institutions' support for living lab teams. Optimal matching means that the matching decision is based on the needs and motivations of both parties. This study makes three major contributions to the literature. First, theoretically, it suggests a framework in which ESG performance is connected to living labs. Second, we add a new empirical case to the existing ESG and living lab literature. Third, we provide an empirical analysis of the Korean living lab and ESG performance cases.

Although we illustrate a new case of ESG performance in this article, further research is needed to develop the insights and implications provided in this article. First, we must conduct a long-term investigation to determine whether this is a new model of ESG performance and an effective cooperative mechanism for existing living lab implementation. As pressure from the government to increase ESG performance becomes stronger in Korea, public institutions will continue to actively participate in living lab competitions and find more opportunities to increase their ESG performance. We must continue collecting cases of ESG action as part of living labs in Korea and analyze them more systematically in the future. Moreover, we must conduct both quantitative and qualitative evaluations by conducting a more detailed empirical analysis. Finally, although we might argue that these activities can provide momentum for public sector innovation, we should examine their impact on public institutions' innovation in the future.

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