SCIENCE SET
OPEN ACCESS PUBLISHERS

Research Article

Journal of Agricultural, Earth and Environmental Sciences

Sustainability Initiatives of SDGs and Global Stakeholder Governance

Hiroshige Tanaka[1*] and Chiharu Tanaka[2]

[1]*Professor Emeritus, Institute of Economic Research, Chuo University, Japan*
[2]*Senior Manager, Trading Division, Mitsubishi UFJ Asset Management Co, Ltd., Japan*

[*]**Corresponding author:** Hiroshige Tanaka, Institute of Economic Research, Chuo University, Japan.

Submitted: 05 February 2024 **Accepted:** 12 February 2024 **Published:** 19 February 2024

Citation: *Hiroshige Tanaka and Chiharu Tanaka (2024) Sustainability Initiatives of SDGs and Global Stakeholder Governance. J of Agri Earth & Environmental Sciences 3(1), 01-07.*

Abstract

Growing global economies and increasing digital transformation have proceeded to cooperation with many stakeholders in sustainable social schemes. Performances of corporation bring various costs and benefits over many stakeholders in global economies and societies. For example, increasing emission of carbon enhances serious climate change problems on future generation as well as present generation of the global community. Sustainable scheme should obtain an evaluation mechanism for corporation to learn and increase social welfare. This paper provides a sustainable scheme for using social welfare to evaluate many low-carbon initiatives.

The corporations have communicated not only with domestic markets and residents but also directly with foreign stakeholders such as consumers, governments, financial funds and environmental organizations. To proceed cooperation with multi stakeholder sustainable scheme needs to develop both voluntary and legislative initiatives for corporations at the same time. This research originally presents optimal combination of voluntary and legislative initiatives to improve social welfare.

Our theoretical exploration of sustainable social scheme with multiple stakeholders indicates that strategies of Environment Society and Governance (ESG) reduce social welfare losses. This exploration clarifies theoretically that sustainable schemes present an avenue along which to pursue goals among the UN Sustainable Development Goals (SDGs). Main results obtained from this study are the following. First, the theory of multiple stakeholders demonstrates that sustainable initiatives in SDGs reduce social welfare losses, representing an index of social risk. Secondly, altruistic and risk coefficients present important implications for sustainable initiatives in SDGs. Initiatives to raise the risk coefficient by improving legislation and standards are demonstrated to lower global social risks. Thirdly, initiatives to enhance altruistic coefficients for inside and outside stakeholders reduce global social risks. Fourthly, payment initiatives for external stakeholders are expected to mitigate social disruption.

Keywords: Communication, Cooperation, ESG, Innovation, Multiple Stakeholders, Sustainable Global Communities

Introduction

Difficulties posed by climate change demand immediate initiatives to mitigate crises of global warming. Decarbonization, which is a major target to alleviate social crises brought by climate change, requires a global cooperative scheme involving economies and societies. Decarbonization initiatives extend over many fields such as development of renewable energies, efficient systems of transportation, and low carbon emitting industries. The initiatives should be assessed to contribute to the sustainability of global communities.

Expanding global societies have accompanied the innovation of information technologies and have changed economic and social systems. Digital transformation has expanded the influences of consumers and suppliers simultaneously in global markets. Growing global economies require cooperation among many stakeholders to achieve sustainable societies. SDGs are explored by using reporting data set in GRI (Global Reporting Initiatives) [1]. Large corporations in global economies are more likely to use communication method in GRI than small corporations [2]. Corporations have communicated not only with domestic markets and residents but also directly with foreign stakeholders such as consumers, governments, financial funds, and environment organizations. It is appropriate to evaluate many initiatives by social welfare as one integrated index [3]. This paper presents a scheme to evaluate many sustainability initiatives of low-carbon development with social welfare.

Global communities have been demonstrated to achieve a sustainable theoretical framework through the cooperation of multiple stakeholders [4, 5]. Sustainable schemes can be funded by decentralized social systems. As described in this paper, corporations are assumed to include profit-oriented and non-profit organizations. Although enlargement of global economies and innovation of digital technologies promote two-way communication between corporations and stakeholders, economies and societies formed by traditional markets have had to change. Sustainable societies require improvement of the quality of communication schemes. Whereas some stakeholders take benefits from developing digital technologies, other stakeholders only incur social costs such as difficulties posed by climate change, without market transactions. Stakeholders are classified into inside, outside, and external stakeholders to elucidate difficulties confronted by global societies [6, 7]. Because climate change is globally a crucially important issue, this paper presents an exploration of SDGs aimed at improving sustainable schemes with multiple stakeholders. The sustainable scheme is expected to bring many corporations more cooperative with multi stakeholder for various goals. This paper presents evaluation methods how voluntary and legislative initiatives improve sustainability of societies and economies. The exploration specifically assesses the theoretical structures of SDGs and attempts to improve initiatives for each sustainability goal. A study of SDGs 7–11 has explored the states of compliance for the 193 countries [10].

The main results obtained from this study are summarized as explained hereinafter. 1. Sustainable scheme aimed at accomplishing SDGs is explored theoretically using a theory of multiple stakeholders. 2. Initiatives to raise the risk coefficient by improving legislation and standards are demonstrated to lower global social risks. 3. Initiatives to enhance altruistic coefficients $\beta(x)$ and $\gamma(y)$ have been proven to reduce global social risks. 4. Initiatives for sustainability are expected to mitigate social disruption.

This paper is organized as explained below. Section 2 explores a sustainable scheme of decarbonization with complete information related to two points. First, the sustainable scheme posits shared contributions among all stakeholders to reduce carbon. Secondly, payment for each stakeholder is dependent on the marginal evaluation of stakeholders. Section 3 provides a revised sustainable scheme to explore communication under incomplete information. Using the revised sustainable scheme, Section 4 exhibits how legislative rules and standards change initiatives of payment for stakeholders. Section 5 demonstrates that payment initiatives improve social welfare. It is proved for the entire economy that the initiatives contribute to reduction of community inequalities. Section 6 describes a survey of payment initiatives for low-carbon economies. According to investment for decarbonization, countries are classified into three types of stakeholders for reducing carbon emissions. Such countries are explored using a theoretical model of multiple stakeholders: a theoretical exploration of SDGs is obtained by a sustainable scheme of multiple stakeholders. Section 7 states implications obtained during research of green finance.

Tanaka H has produced Sections 1–5 and 7. Tanaka C is primarily responsible for providing Section 6. This paragraph provides a brief reading guide. Cooperation between corporations and multi stakeholders is necessary to achieve sustainable global communities. This paper provides originally indexes to promote cooperation between corporations and various stakeholders. The sustainable initiatives supported by the indexes can reduce social risk in both market and non-market transactions and alleviate problems of social disruption.

Cooperative Scheme with Multiple Stakeholders

In sustainable schemes, information asymmetricity among a principal and agents can lead to social welfare losses and thereby invite social crises. To calculate the social losses in Section 2, the corporation in the cooperative scheme is assumed to share complete information with all stakeholders. To achieve sustainable economic schemes, the corporation is obliged to use production x and payment $t_1,\ldots,t_n$ for stakeholders to control external economies and diseconomies[2]. The corporation is assumed to obtain n stakeholders. Payment for stakeholder i is denoted by a. When the corporation provides global public goods x such as reduction of carbon and production of food, the benefit of x is evaluated by all stakeholders. Because a single corporation is unable to provide whole public goods, x is assumed to be provided privately by many stakeholders [11]. Also, t is defined by $t = \Sigma_{i=1}^{n} t_i$. Stakeholder i evaluates the corporation performance by $V_i(x,t_i)$.

Stakeholders are classified into positive and negative stakeholders as follows. When $\frac{\partial V_i(x,t_i)}{\partial x} \geq 0$ is decreasing, stakeholder i is defined as a positive stakeholder. When $\frac{\partial V_i(x,t_i)}{\partial x} \leq 0$ is increasing, stakeholder i is designated as a negative stakeholder. Marginal payment evaluation of stakeholder i $\frac{\partial V_i(x,t_i)}{\partial t_i}$ is a positive and decreasing function.

External effects of economies are assumed to be indicated by the evaluations of stakeholders. The corporation should maximize the total evaluation of stakeholders as well as net profit $\pi(x)$-t to achieve sustainable communities. These analyses presume that the sustainable corporation maximizes the summation of net profit and evaluation of stakeholders. Section 2 explores the sustainable performance of corporations under complete information. Because the evaluation of stakeholders is determined by the production and payments of stakeholders, a sustainable objective function for the corporation is exhibited mathematically as Equation (1). Although the corporation takes payments to raise evaluation by stakeholders, total payment t is subtracted as a cost as shown in Equation (1).

$$NB = \pi(x) + \sum_{i=1}^{n} V_i(x,t_i) - t. \qquad (1)$$

The corporation determines production and payments to maximize the summation of net profit and social evaluation. The first-order conditions of differentiation are expressed as Equations (2) and (3) below.

$$\frac{\partial V_i(x^*,t_i^*)}{\partial t_i} = 1, \quad i = 1,\ldots,n. \qquad (2)$$

$$\frac{d\pi(x^*)}{dx} = -\sum_{i=1}^{n} \frac{\partial V_i(x^*,t_i^*)}{\partial x}. \qquad (3)$$

1. The UN SDGs state 17 goals and 149 targets for sustainable development toward 2030 [8]. SDGs require the collaborative contribution of Corporate Social Responsibility (CSR) [9].
2. Markets and internal organizations perform allocation of goods and services [12, 13]

Equation (2) expresses that the marginal evaluation of payment with any stakeholder i is equal to unity. Because the benefit of the payment is defined to stakeholder i, Equation (2) shows that the marginal evaluation is equal to the marginal cost expressed by payment. Equation (3) represents that marginal net profit comes to be equal to the net total marginal social cost evaluated by stakeholders. As the contribution to social sustainability extends to many societies and economies, Equation (3) calculates the total net marginal social benefit as equal to zero.

Incomplete Information in Communication Mechanisms and Incentive Schemes

Competition in markets represents a situation in which the selfish motives of producers and consumers raise social welfare losses. Research of CSR aims at a corporation with improved contributions to sustainable economies and societies [14, 15]. Incomplete information in communication among corporations and stakeholders requires reconstruction of the theoretical analysis of sustainability [16, 4]. Actually, CSR is designed to provide efficient cooperative performance for sustainable economies and societies. Many initiatives in SDGs occur in situations of incomplete communication. Because improvement of communications activates and enhances cooperation with stakeholders and corporations, a sustainable scheme must be devised to reduce communication gaps. The theoretical approach of multiple stakeholders explores the sustainable structure of global communities [16-17]. Additional classification of stakeholders is undertaken to consider sustainable communities in the digital industrial revolution [18]. Section 3 replaces Equation (1) with Equation (4) to explore a sustainable scheme of economies and societies.

The digitalization of economies and societies has enlarged groups of stakeholders and has enhanced the relative influences of outside and external stakeholders. The stakeholders of three types hold different connections with the corporation. Inside stakeholders have a firm network of production with the corporation. As production x rises, altruistic coefficient $\beta(x)$ is enhanced. The corporation constructs networks of communication with all stakeholders. Cultural factors influence interaction between the SDGs commitments and organizational performance [20]. The altruistic coefficient is an attempt to investigate organizational features. Stakeholder i who joins communications must provide effect y_i to improve performance. Effort $y = \sum_{i=1}^{n} y_i$ represents the scale of information and developing innovation of information and communication technologies.

When y increases, outside stakeholders are expected to raise opportunities of transactions with the corporation. Effort y to progress innovation promotes communications and raises altruistic propensity γ(y) with outside stakeholders. It is assumed that $y(x) > y(y)$ is obtained for any x and y. External stakeholders cannot have any direct transaction with the corporation. The corporation does not bring an altruistic coefficient for external stakeholders in Equation (4). Moreover, the corporation is obliged to accept social target α_i for every stakeholder i to prevent great social crises. The SDGs are aimed at improving the provision of public goods for health, food, energy, water, ocean, and other fields. In fact, sustainable provision of public goods is explored in Equation (4) and in an earlier study [23]. However, SDGs emphasize equal accessibility to public goods. Particularly, ESG investments and green finance are promoted by strategies presented by the Global Sustainable Investment Alliance [24, 25]. An empirical study has indicated that ESG strategies are expected to move investments toward more sustainable objectives [26]. This paper presents a discussion of how sustainable schemes can be expected to ensure equal participation by all stakeholders[6].

$$NB = \pi(x) + \beta(x)\sum_{i=1}^{n_0}\{V_i(x,t_i) - y_i\} + \gamma(y)\sum_{i=n_0+1}^{n_1}\{V_i(x,t_i) - y_i\} - t - \sum_{i=1}^{n}\varphi_i\{\alpha_i - V_i(x,t_i)\}. \quad (4)$$

The first-order differential conditions of Equation (4) with payments t_i, i=1, n, are presented as (5) – (7).

Because parameters $\alpha_i i$=1,....n, are exhibited politically or conventionally by regulation and standard and others[7], they are used as political instruments to achieve sustainable communities. Because gap α_i-$V_i(x,t_i)$ indicates a social cost, $\frac{d\varphi_i}{d\{\alpha_i - V_i\}}$ is defined as the risk coefficient. The risk coefficient is presumed to be increasing function, $\frac{d\varphi_i}{d\{\alpha_i - V_i\}} > 0$. The part of social cost φ_i brought for stakeholder i is enhanced by raising α_i. The corporation decreases production x and raises payment t_i according to rising social cost φ_i. Considering that the altruistic coefficient features types of stakeholders, political instruments of parameter α_i should be determined under the condition of the altruistic coefficient. The following section provides a cooperative scheme to achieve low carbon emissions with multiple stakeholders.

Sustainability and Decarbonization Initiatives

Section 4 presents a decarbonizing cooperative scheme using a theoretical model of multiple stakeholders. Equations (5)– (7) exhibit that sustainable initiatives are differentiated for stakeholders of three types. Equations (5) and (6) express optimal payments for inside and outside stakeholders as follows. Decarbonization initiatives represent that a high value $\beta(x)$ brings inside stakeholders in the supply chain of conventional industries to improve energy efficiency. Raising the risk coefficient enhances payments of outside stakeholders in emerging industries such as renewable energies and electric car manufacturing. outside stakeholders are presumed to grow y with the digital industrial revolution, which enables develop global economies. Equation (6) presents that raising the altruistic coefficient $\gamma(y)$ enhances the payment of outside stakeholders. Equation (7) exhibits that optimal payments for external stakeholders depend only on risk coefficients. Consequently, changing α_i to raise the risk coefficient is necessary to improve payments of external stakeholders.

According to conditions (5)- (7), t_i^{i*}, t_i^{o*} and t_i^{e*} express optimal payments for inside, outside and external stakeholders. First, the optimal conditions with inside stakeholders are presented as

$$\frac{\partial V_i(x,t_i^{i*})}{\partial t_i} = \frac{1}{\beta(x) + \frac{d\varphi_i}{d\{\alpha_i - V_i\}}\{\alpha_i - V_i\}}, \qquad i = 1, \dots, n_0. \quad (5)$$

Secondly, the optimal conditions with outside stakeholders are written as

$$\frac{\partial V_i(x,t_i^{o*})}{\partial t_i} = \frac{1}{\gamma(y) + \frac{d\varphi_i}{d\{\alpha_i - V_i\}}\{\alpha_i - V_i\}}, \quad i = n_0 + 1, \dots, n_1. \quad (6)$$

3. In earlier studies, SDGs disclosure into Integrated Reporting (IR) has been explored [19]. In actuality, SDGs improve performance of governance, but some corporations adopt SDGs as tools to enhance their reputation and obtain licenses to operate.
4. The research considers how altruism leads to provision of public goods [21].
5. Development of digital technology changes economies and societies extensively but that development entails the division of communities [22].

Thirdly, the optimal conditions with external stakeholders are stated as

$$\frac{\partial V_i(x,t_i^{e*})}{\partial t_i} = \frac{1}{\frac{d\varphi_i}{d\{\alpha_i - V_i\}}\{\alpha_i - V_i\}}, \qquad i = n_1 + 1, \dots, n. \tag{7}$$

Actually, when α_i is identical among three types of stakeholders, altruistic coefficients β(x) and γ(y) form an order of payments as $t_i^{i*} > t_i^{o*} > t_i^{e*}$. Social welfare losses of stakeholders express a descending order with external, outside and inside stakeholders. External stakeholders are severely and adversely affected by climate change difficulties. Improvement of standards to raise the evaluation of external stakeholders lowers their risks posed by climate change.

Social welfare losses represent risks of global crises including climate change related difficulties. The SDGs aim at controlling α_i to reduce social welfare losses for all i. Presumably, initiatives to raise α_i reduce the values of Equations (5)– (7). However, Equation (11) shows that the relative values among the three Equations above are expected to persist before 2050. Rising α_i brings solutions $t_i^{i**} > t_i^{o**} > t_i^{e**}$, in Equations (5)– (7). Results of rising α_i are expressed mathematically by Equations (8)– (10).

$$\frac{\partial V_i(x,t_i^{i*})}{\partial t_i} > \frac{\partial V_i(x,t_i^{i**})}{\partial t_i}, \; i = 1, \dots, n_0. \tag{8}$$

$$\frac{\partial V_i(x,t_i^{o*})}{\partial t_i} > \frac{\partial V_i(x,t_i^{o**})}{\partial t_i}, \; i = n_0 + 1, \dots, n_1. \tag{9}$$

$$\frac{\partial V_i(x,t_i^{e*})}{\partial t_i} > \frac{\partial V_i(x,t_i^{e**})}{\partial t_i}, \quad i = n_1 + 1, \dots, n. \tag{10}$$

$$\frac{\partial V_i(x,t_i^{e**})}{\partial t_i} > \frac{\partial V_i(x,t_i^{o**})}{\partial t_i} > \frac{\partial V_i(x,t_i^{i**})}{\partial t_i} > 1. \tag{11}$$

Theoretical exploration of SDGs is presented as Figure 1 below, which is a modification of Figure 1 given by Tanaka and Tanaka [23]. Initiatives in ESG investment strategy aim to change cost and benefit evaluations of multi stakeholders [31]. Figure 1 explicitly illustrates that altruistic and risk coefficients as the policy tools for sustainable communities could improve all types of stakeholders. The policy reforms for sustainability alleviate problems disruption by raising payments of external stakeholders.

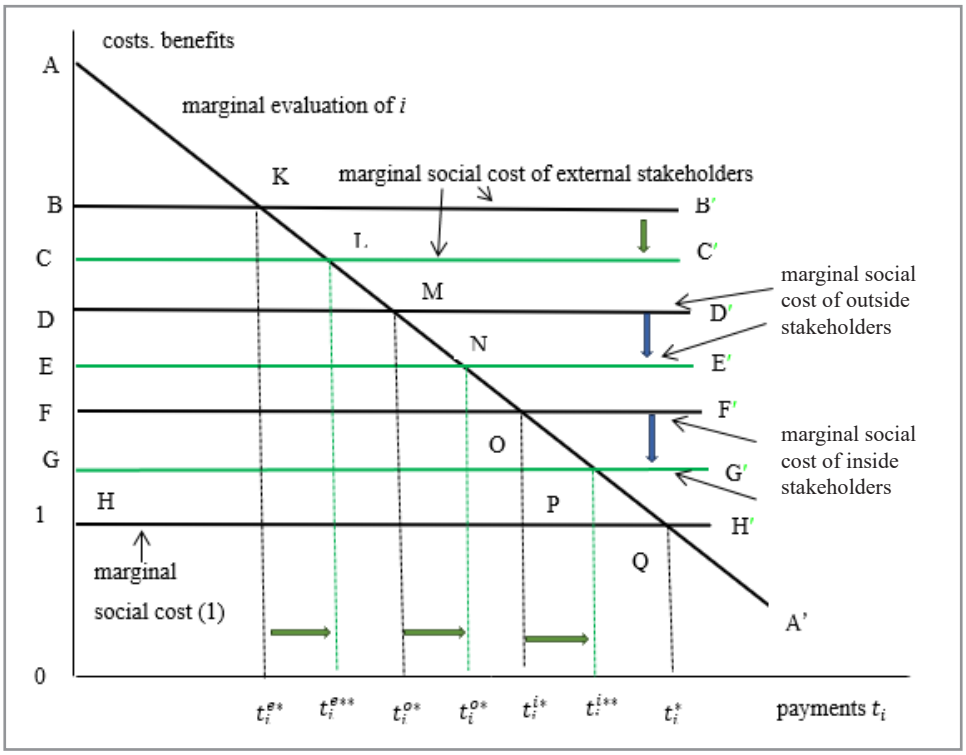

Figure 1: Initiatives of SDGs and Reduction of Social Welfare Losses.

Source: Produced by the author

Social Welfare Losses and Social Disruption

Section 5 presents discussion indicating that initiatives in the SDGs enhance social welfare and alleviate disruption of societies. First, initiatives to raise the risk coefficient by improving legislation and standards are demonstrated to lower global social risks. Figure 1 depicts the optimal conditions (5)– (7). Marginal evaluation of stakeholder i; $\frac{\partial V_i(x,t_i^{i*})}{\partial t_i}$ is exhibited by the downward sloping curve AA′. The right sides of Equations (5)– (7) are presented respectively by curves FF′, DD′, and BB′. The three altruistic coefficients distinctively future marginal social costs, respectively as curves FF′, DD′ and BB′. Reforms to improve legislation and standards raise risk coefficients and lower curves FF′, DD′, and BB′, respectively to GG′, EE′ and CC′. Rising α_i increases the surplus of interior stakeholder i that is expressed by the area of trapezoid FGPO. Inside stakeholder i raises the surplus expressed by the area of trapezoid DENM. External stake-

6. Social inclusion has been discussed in the literature [27, 28].
7. It has been discussed that legislative features bring social wealth and inequality [29].
8. Performance targeted for CSR exerts effects on innovation and reforms organizations [30].
9. Social welfare losses are demonstrated using figures Tanaka and Tanaka. [23].

holder i obtains the increasing surplus expressed by the area of trapezoid BCLK. Summing up, improving the surpluses of the three stakeholders reduces social losses imposed by sustainable initiatives. The discussion presented above leads to the result that sustainability initiatives for each stakeholder contribute to lower social risks of global crises.

Secondly, initiatives to enhance altruistic coefficients $\beta(x)$ and $\gamma(y)$ have been proven to reduce global social risk. Rising altruistic coefficients $\beta(x)$ and $\gamma(y)$ lower marginal social cost curves DD′ and FF′, respectively, to curves EE′ and GG′. Considering the discussion presented above, we conclude that the digital industrial revolution and communication systems reforms reduce social risks of social crises. Because the two altruism coefficients do not change the marginal social cost curve BB′, initiatives related to the altruistic coefficient are ineffective for external stakeholders. For that reason, improving the welfare of external stakeholders is achieved not by a mixed strategy of altruistic and risk coefficients but only by risk coefficients. Sustainable initiatives for external stakeholders are almost entirely guided by an index of risk coefficients.

Thirdly, initiatives for sustainability are expected to mitigate social disruption. Equations (8)– (10) ensure the inequalities (12) from downward sloping curve AA′, as

$$t_i^{e*} < t_i^{e**} < t_i^{o*} < t_i^{o**} < t_i^{i*} < t_i^{i**}. \quad (12)$$

Equation (12) expresses that the initiatives for sustainability raise payments of stakeholders of three types. Initiatives for sustainability contribute completely to improve the income distribution of societies. External stakeholders are presumed to be adversely affected by numerous poverty-related difficulties. The inequality $t_i^{*} - t_i^{e**} < t_i^{*} - t_i^{e*}$ signifies that initiatives for sustainability improve incomes of external stakeholders and alleviate poverty at the bottoms of societies effectively. However, inequalities (12) do not ensure that the relative inequalities among stakeholders shrink. This theoretical approach for multiple stakeholders implies that the disruption of global communities is difficult to resolve.

Exploration of Decarbonization with Multiple Stakeholder Cooperation

Section 6 exhibits empirically that structural change of stakeholder influences global decarbonization. Revolution of digital technologies is expected to raise contribution of outside stakeholders on sustainable societies greater than other stakeholders. This feature seems to appear remarkably in some emerging countries. In those emerging countries corporations should place higher weight for outside stakeholders for initiatives to promote decarbonization than other stakeholders. This section provides an approximate social welfare evaluation of sustainable initiatives from using exploration of multi stakeholder.

At the beginning of Section 6, we present data sources of carbon. Presumably, the reduction of carbon emissions is presented by an increasing function of payment for stakeholders. Payments for raising energy efficiency are used as a proxy variable for carbon reduction. Various initiatives shown by the SDGs use different systems of payment for the decarbonization projects. Figure 2 was produced using data of the Green Investment Group (GIG) which are based on Bloomberg NEF of September 2, 2023. Each country's reductions are derived from avoided emissions in the total amount of estimated annual greenhouse gas (GHG) (ktCO2e) using the GIG methodology from projects with a Carbon Rating of A or higher since 1990. Project stages which are announced, planning begun, under construction, or commissioned (in operation) and so on are expressed identically. It is not investigated in these analyses whether emissions have already been avoided or have not yet been achieved. However, the CO_2 emissions (kt) of each country are calculated by basing them on the figures reported by the World Bank in September 2, 2023, for average emissions during 2000–2020. The CO_2 reduction rate (%) is calculated by dividing the estimated annual GHG avoided emissions ($ktCO_2e$) by the average CO_2 emissions (kt).

In Figure 2, GDP figures for each country are presented by the World Bank for September 2, 2023. The value of GDP is expressed by GDP in current US dollars. According to a long-term survey, average values are calculated for 1990–2022 for which data are available. Countries with 'High GDP' are defined as countries with more than $200 billion annual GDP. For example, Nigeria, the largest economy in Africa, is included in this group. In any case, countries with a GDP of less than $15 billion, where data tend to be extreme, were excluded from evaluation. Excluded countries include Iceland and Zimbabwe. Those countries are regarded as having little overall effect and which tend to engender outliers. Countries with missing data for any of the above are excluded from evaluation. The total number of countries included in these analyses therefore amount to 97.

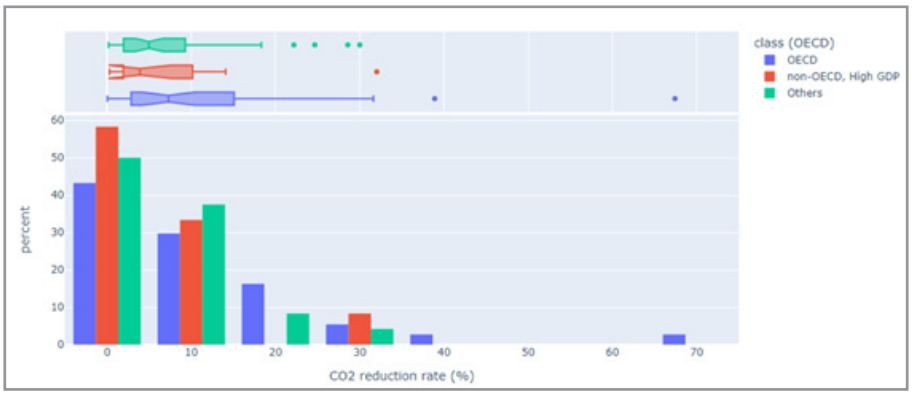

Figure 2: Carbon Emissions and Three Groups of Countries.

Source: Produced by the author

10. https://www.greeninvestmentgroup.com/en/what-we-do/green-analytics.html

In Section 6, countries presented as stakeholders are classified as described hereinafter. The OECD countries are classifiable by interior stakeholders because they can be regarded as establishing many concrete social and economic organizations. 'Non-OECD' and 'High GDP' countries are less involved in world affairs than the OECD countries. In this group, 'High GDP' countries imply a weaker effect on the world. Therefore, they are classified as outside stakeholders. Others are countries that do not belong to either of the two groups above. The countries which have a weak connection with global economies and which tend to take diverse and unique actions are classified as external stakeholders.

Figure 2 depicts histograms within each category of countries by the CO2 reduction rate (%). Because the numbers of countries comprising each class vary significantly, percentiles are used. Clear differences exist between OECD and 'non-OECD and High GDP' in terms of their approaches to decarbonization. Distinction between inside and outside stakeholders in earlier theoretical investigations has revealed empirical results. Non-OECD countries with a large GDP are represented by China and India, which have delayed their declarations of carbon neutrality to 2060 and 2070, respectively, from 2050, for which most economically developed countries have declared their commitments to carbon neutrality. Nevertheless, China is an upward outlier (rate 32%) in this class and is expected to make crucially important contributions to reduction if their projects are realized, including those in progress: about 62% of the total.

However, for Others, it cannot be ensured that these countries are clearly contributing less to decarbonization. Some countries are working actively and pushing up the mean and median. This might be true because some are dependent on trade and have strong connections with world systems (e.g., Morocco and the Philippines). They welcome foreign investments for decarbonization and renewable energy. These countries are included among external stakeholders but mix some features of outside stakeholders. In addition, because the evaluation is based on rates at this time, countries with a small denominator are favored, with average CO2 emissions (kt), i.e., small countries. They can raise their rates more easily. As shown by the box-and-whisker diagram exhibited at the top of the histogram, others have many upward outliers, thereby indicating that they are too diverse an aggregate to be grouped together. Some of them might belong to other classes, such as Outside. A modified classification of them would improve implications of results for reconstructing sustainable schemes of SDGs.

Concluding Remarks

The scheme which corporations promote cooperation with multi stakeholders is expected to improve sustainable solutions. Sustainable initiatives of SDGs propose to use efficiently both voluntary and legislative initiatives. The theoretical exploration of this paper raises effects enforced by both initiatives. Considering that corporations have various relations with many stakeholders, initiatives used by SDGs are expected to effectively enhance cooperation with three types of stakeholders.

Enhancement in altruistic and risk coefficients is possible to improve social welfare for every stakeholder. Theoretical investigations on the two coefficients are applicable for improvement of many initiatives in SDGs. Initiatives of SDGs eventually aim to decline potential transaction costs of the social system . The two coefficients are important factors to estimate transaction costs of sustainable social system.

Green bonds are issued to improve the sustainability of global communities. Issuance of green bonds enhances cooperation with multiple stakeholders. Because some issuances of green bonds facilitate decarbonization projects, the results presented herein are applicable to financial initiatives for low-carbon economies. Explorations of green finance illustrate the theoretical foundation for sustainable initiatives presented by SDGs.

Although SDGs are aimed at improving cooperation for sustainability of global communities, SDG development must overcome important bottleneck problems. By emphasizing achievement of an important target, some initiatives of the SDGs pursue activation of a limited group of stakeholders or alleviation disruption of stakeholders. Additionally, initiatives of decarbonization in SDGs efficiently target stakeholders to achieve goals.

Acknowledgement

This research received no specific grant from a funding agency in the public, commercial, or not-for-profit sector. The views and opinions expressed herein are those of the author and do not necessarily reflect the views of the company, its affiliates, or its employees.

Conflicts of Interest

All authors declare that they have no conflict of interest related to this paper or the study it describes.

References

1. Elalfy A, Weber O, Geobey S (2021) The Sustainable Development Goals (SDGs): A rising tide lifts all boats? Global reporting implications in a post SDGs world. Journal Applied Accounting Research 22: 557-575.
2. Pástor Ľ, Stambaugh RF, Taylor LA (2021) Sustainable investing in equilibrium. Journal of Financial Economics 142: 550-571.
3. Huang H, Mbanyele M, Wang F, Zhang C, Zhao X (2023) Nudging corporate environmental responsibility through green finance? Quasi-natural experimental evidence from China. Journal of Business Research 167: 114-147.
4. Tanaka H (2017) Sustainability of Global Communities and Regional Risk Governance. Asia Pacific Journal of Regional Science 1: 639-653.
5. Tanaka H (2018) Mechanism of Sustainability and Structure of Stakeholders in Regions. Financial Forum 7: 1-12.
6. Tanaka H (2019) Innovation on the Digital Economies and Sustainability of the Global Communities. Annals of Social Sciences & Management Studies 4: 1-10.
7. Tanaka H (2020) Digital Economic and Social Systems to be Featured by Stakeholders. Annals of Social Sciences & Management Studies 5: 86-94.
8. United Nations (2015) Transforming our world: The 2030 Agenda for sustainable development. USA: United Nations.
9. United Nations Global Compact (2015) A global compact for sustainable development business and the SDGs: Acting responsibly and finding opportunities.

11. Tanaka indicates that changing transaction cost of stakeholders presents an evolution of social system [32].

10. Carlsen L (2023) The state of the 'Prosperity' pillar by 2022: A partial ordering-based analysis of the sustainable development goals 7–11. Green Finance 5: 89-101.
11. Roberts RD (1984) A Positive Model of Private Charity and Public Transfer. Journal of Political Economy 92: 136-148.
12. Coase RH (1937) The characteristics of the Firm. Economica 4: 386-405.
13. Williamson OE (1975) Markets and Hierarchies: Analysis and Antitrust Implication. The Free Press.
14. Arrow KJ (1973) Social Responsibility and Economic Efficiency. Public Policy 21: 303-317.
15. Tirole J (2001) Corporate Governance. Econometrica 68: 1-35.
16. Tanaka H (2004) Kigyo no Syakaiteki Sekinin no Keizai Riron (Japanese; Theoretical Analysis for Corporate Social Responsibility). Chikyuu Kankyou Report (Japanese; Global Environmental Policy in Japan) 9: 1-9.
17. Tanaka H (2020) Chinese sustainable framework in the digitalized global communities. International Journal of Economic Policy Studies 14: 327-336.
18. Tanaka H (2023) Medical and Health Services as Global Public Good and Sustainable Community Governance. American Journal of Biomedical Science & Research 2023 18: 593-596.
19. Nicolò G, Zanellato G, Tiron-Tudor A, Polcini PT (2022) Revealing the corporate contribution to Sustainable Development Goals through integrated reporting: A worldwide perspective. Social Responsibility Journal 19: 829-857.
20. Bellostas A, Del Río C, González-Álvarez K, López-Arceiz FJ (2023) Cultural context, organizational performance and Sustainable Development Goals: A pending task. Green Finance 5: 211-239.
21. Andreoni J (1990) Impure Altruism and Donation to Public Goods: A Theory of Warm-Blow Giving. Economic Journal 100:464-477.
22. Baecker RM (2019) Computers and Society: Modern Perspectives. Oxford University Press, Oxford, UK.
23. Tanaka H, Tanaka C (2022) Sustainable Investment Strategies in Multi Stakeholder Communities. Green Finance 4: 329-346.
24. Global Sustainable Investment Alliance (2013) Sustainable Investment Review 2012. apo–nid228346. pdf. Accessed 1-44.
25. Global Sustainable Investment Alliance (2021) Global Sustainable Investment Review 2020 GSIR–20201.pdf (gsi–alliance.org). Accessed 1-33.
26. Sciarelli M, Cosimato S, Landi G, Iandolo F (2021) Socially responsible investment strategies for the transition towards sustainable development: The importance of integrating and communicating ESG. The TQM Journal 33: 39-56.
27. Cassiers I, Maréchal K, Méda D (2018) Post-growth Economics and Society: Exploring the Paths of a Social and Ecological Transition. Routledge, Abingdon UK.
28. Choudrie J, Tsatsou P, Kruria S (2018) Social Inclusion and Usability of ICT–Enable Services. Routledge, Abingdon, UK.
29. Pistor K (2019) The Code of Capital: How the Law Creates Wealth and Inequality. Princeton University, Princeton USA.
30. Anzola-Román P, Garcia-Marco T, Zouaghi F (2023) The Influence of CSR Orientation on Innovative Performance: Is the Effect Conditioned to the Implementation of Organizational Practices? Journal of Business Ethics 1-18.
31. Pedersen LH, Fitzgibbons S, Pomorski L (2021) Responsible investing: The ESG-efficient frontier. Journal of Financial Economics 142: 572-597.
32. Tanaka H (2021) Digital Industrial Revolution and an Index of Transaction Cost. American Journal of Novel Research in Sciences 8: 1-2.