

## Article

# Measurement of the Importance of 11 Sustainable Development Criteria: How Do the Important Criteria Differ among Four Asian Countries and Shift as the Economy Develops?

Tomohiro Tasaki \* , Ryo Tajima  and Yasuko Kameyama 

National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba 305-8506, Ibaraki, Japan; tajima.ryo@nies.go.jp (R.T.); ykame@nies.go.jp (Y.K.)

\* Correspondence: tasaki.tomohiro@nies.go.jp

**Abstract:** Understanding the criteria underlying development in a country is crucial to formulating developmental plans. However, it is not always clear which criteria are more important than others in different countries and at different times. The relationship between developmental criteria and the stage of economic development is also unclear in many countries. Therefore, we devised an indirect stated preference approach for the measurement of the importance of developmental criteria and employed it in four Asian countries—Japan, South Korea, Thailand, and Vietnam—to measure the importance of sustainable development (SD) criteria perceived by the general public. Specifically, we evaluated the importance of 58 national goals linked to 1 of 11 SD criteria. Security, efficiency, accessibility, capability, and environmental capacity were perceived as relatively important by respondents in all four countries. The respondents perceived that the currently important criteria would be important in the future as well. The order of the importance in each country differed. For example, environmental capacity was ranked lower, and inclusiveness was ranked higher as the gross domestic product of a country increased. Thai and Vietnamese respondents had similar perceptions and, overall, tended to have higher levels of importance than South Korean and Japanese respondents, who also had similar perceptions of importance.

**Keywords:** sustainability criteria; national target; country development stage; indirect stated preference; sustainable development goals (SDGs)



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## 1. Introduction

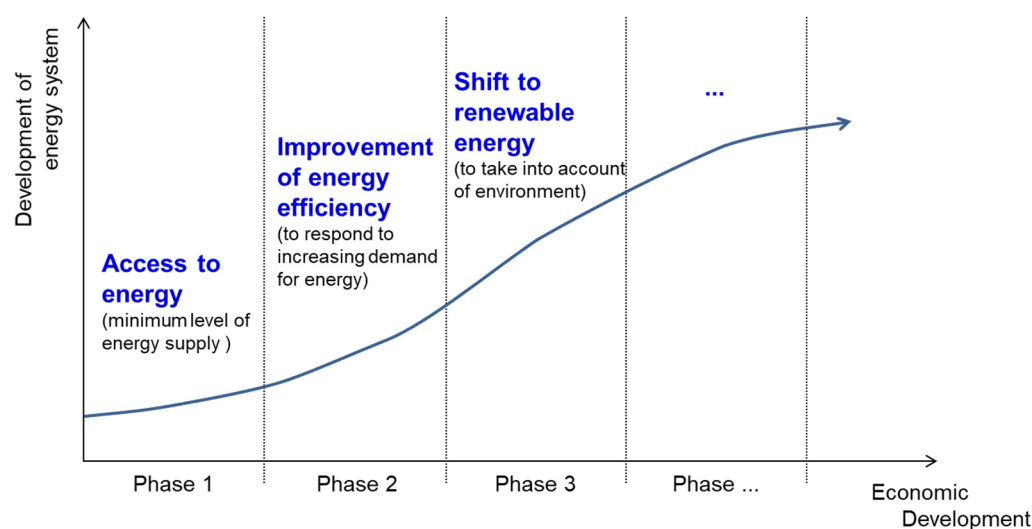
The United Nations General Assembly adopted 17 Sustainable Development Goals (SDGs) with 169 targets in 2015 [1]. The SDGs are a universal agenda taking various aspects in development into account and applying them to both developing and developed countries in the post-2015 period. Each government is supposed to set its own national targets contributing to the achievement of SDGs on the global level. However, how to determine these national targets is left up to each country to decide, and supporting methodologies are not necessarily sufficient even though there is some movement to develop SDG indicators that monitor countries' progress toward sustainable development [2–4]. For example, Hák et al. [5] pointed out that there is still little agreement or consensus on criteria for evaluating indicators, such as correctness of underlying assumptions and concepts, relevance of various phenomena for sustainable development, and data quality. Fukuda-Parr and McNeill [6] asserted that the SDGs are vehicles—or instruments—that convey norms and that the criteria for SDG indicator selection should be based more on norms and less on data availability. Allen et al. [7] reviewed 80 models that have the potential to support national development planning within the context of the SDGs; however, the selection of a model based on the specific circumstances or needs of a country was not discussed.

Having criteria underlying the development of each country is crucial for countries to formulate the direction of their development. The ideas of social development and human

development have been discussed since the 1960s to avoid the negative consequences of economy-centered development. For example, the UN mentioned “qualitative and structural changes in the society must go hand in hand with rapid economic growth” in 1970 [8]. The United Nations Conference on Environment and Development (UNCED), known as the Earth Summit, which was held in 1992, agreed on the principles that human beings are at the center of concern for sustainable development (Principle 1) and environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it (Principle 4) [9]. These principles urged countries to change the direction of their development. Furthermore, the SDGs, adopted in 2015, encompass concrete criteria for development. For instance, SDG 7 (“ensure access to affordable, reliable, sustainable and modern energy for all”) encompasses the developmental criteria of accessibility, security, inclusiveness, and environmental capacity. Accessibility as a national minimum is no longer an important criterion for developed countries, but the use of renewable energy (i.e., the criterion of environmental sustainability) has become more important, as stated by SDG target 7.2. For SDG 12 (“ensure sustainable consumption and production patterns”), SDG target 12.1 mentions implementing “the 10-Year Framework of Programmes taking into account the development and capabilities of developing countries.”, and SDG target 12.2 is to “achieve the sustainable management and efficient use of natural resources”. Capability and efficiency are thus included in the criteria for sustainable development.

Understanding such criteria is very important, especially when a country enters into another stage of development and fails to introduce new criteria into its public policy. For a hypothetical example, energy systems criteria could develop as shown in Figure 1, from accessibility in the 1st phase to efficiency in the 2nd phase and further and to advanced criteria in subsequent phases of development. Understanding the importance of such criteria is also critical to properly reflect citizens’ opinions of national policy. So far, Rostow [10] delineated five stages of economic development, and Hotta et al. [11] asserted the evolution and three versions of sustainable consumption and production policies. Meadowcroft and Fiorino [12] illustrated a conceptual innovation process of environmental policies toward sustainability; for example, it shifted from pollution to sustainable development and climate change as well as from the polluter pay principle to decoupling over the last few decades. These examples indicate that development criteria could and should change according to the phases of development. Even so, identifying which criteria are the most important remains unclear. Interestingly, Khoshnava et al. [13] analyzed 23 criteria related to SDGs and the green economy to identify the most effective ones, and Su et al. [14] analyzed 22 criteria of sustainable supply chain management. However, these criteria were not the *criteria* this study refers to; rather, they were policy or management *goals*.

We therefore aimed to measure the importance of criteria for the sustainable development (hereinafter, referred to as “SD criteria”) of countries. We also attempted to compare the importance levels among four Asian countries at different stages of economic development to gain insights on the evolution of SD criteria with the following research questions: (1) Which SD criteria change their importance as the economy develops and how? (2) What SD criteria retain their importance regardless of economic development? (3) Do non-economic factors have influences on the perception of the importance of SD criteria? For research question 1, we conducted a cross-sectional survey of four countries at different levels of economic development (1a) and surveyed the future importance of SD criteria as well (1b). The intended difference between 1a and 1b is that 1a addresses the perceptions of respondents at different levels of economic development while the 1b addresses the perception of respondents at a certain level of economic development for different times periods.



**Figure 1.** Hypothetical shift of the most important criteria of developing energy systems in each phase of economic development of a country.

## 2. Materials and Methods

### 2.1. Sustainable Development Criteria

To determine the SD criteria to be analyzed in this study, we reviewed the literature in the field of sustainable development [15–34], documents about principles and criteria used by a variety of certification programs [35–51], and the 169 SDG targets. We found that the following 11 SD criteria were embedded in these references, at the least: accessibility, capability, convenience, efficiency, environmental capacity, inclusiveness, resilience and stability (“resilience” in short), security, self-sufficiency, social justice, and variety of choice (“variety”, in short). We therefore used these 11 SD criteria in our analysis. The working definitions of the criteria used in this survey are given in Table 1.

**Table 1.** Working definitions of the 11 sustainable development criteria.

| Criterion                | Definition                                                                                                                                                                                      |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accessibility            | The quality of being able to attain and use that which provides for various human needs.                                                                                                        |
| Capability               | The extent of human ability to achieve sustainable development.                                                                                                                                 |
| Convenience              | The quality of being able to easily or suitably fulfill needs.                                                                                                                                  |
| Efficiency               | Ratio of output to a given input.                                                                                                                                                               |
| Environmental capacity   | The property of the natural environment to sustain and accommodate human activities such as the exploitation of natural resources and the emission of environmental pollutants.                 |
| Inclusiveness            | The quality of not excluding any race, gender, religion, culture, etc.; understanding the perspectives and contributions of all people; and striving to incorporate diverse needs into society. |
| Resilience and Stability | The capacity of a system to absorb and/or adapt to disturbances, and even change the system itself in some cases, so that the system maintains its basic function and structure.                |
| Security                 | The quality of being free from danger or threat.                                                                                                                                                |
| Self-sufficiency         | The state of needing no external support to satisfy human needs, such as food and energy.                                                                                                       |
| Social Justice           | The state where basic human rights are not violated, and benefits and costs are equitably allocated.                                                                                            |
| Variety of Choice        | The extent of abundance of options and goods such that people can choose among them.                                                                                                            |

### 2.2. Indirect Stated Preference Approach

We devised an indirect stated preference approach for the measurement of the importance of SD criteria because it would be difficult for ordinary people to give direct answers about the importance of the 11 criteria (i.e., use a direct stated preference approach). Instead, we prepared 58 national goals covering 6 domains that directly and exclusively link to one of the 11 SD criteria. An example for energy is shown in Figure 2. The 58 goals in

this study were created by the authors by combining the six domains and the eleven SD criteria (see Table A1 in Appendix A for all of the national goals used in this study). The six domains used in this study were energy, economy, health, ecosystem, education, and food. They were chosen because of their importance as national sustainable development indicators [28].

| National goals                                     | Domain: Energy | Criteria               |
|----------------------------------------------------|----------------|------------------------|
| Minimum level of stable energy supply is assured.  |                | Security               |
| Energy is used in the most efficient way.          |                | Efficiency             |
| Energy can be used conveniently, whenever needed.  |                | Convenience            |
| Energy is supplied from within the country.        |                | Self-sufficiency       |
| Price of energy not too expensive.                 |                | Accessibility          |
| Energy being used without harming the environment. |                | Environmental capacity |

**Figure 2.** Examples of pairs of national goals and criteria used in the indirect stated preference approach of this study.

We asked the respondents to rate the importance of each of the 58 goals with a 10-point Likert scale (from very important to not important at all). We also asked them to rate the importance of the goal in the future relative to that of the present (hereinafter, referred to as “relative future importance”) with a 3-point Likert scale (becomes more important (+1), importance will not change (0), becomes less important (−1); the statement used in the survey was “How do you think the importance of the goals will change in the future? Please answer assuming a period up to 20 years from now”). We calculated the average importance ( $I$ ) of the national goals linked to the same criterion ( $C$ ) of respondents  $j$ ,  $I_{C,j}$ , by using Equation (1):

$$I_{C,j} = \frac{\sum (i_{g \in C,j})}{n_{g \in C}} \quad (1)$$

A country may have an urgent and severe problem in a certain domain, which could result in that domain scoring higher than the others in that country and also higher than its importance in other countries. To counterbalance this effect, we calculated the standardized importance of the criterion,  $S_{C,j}$ , by using Equation (2), which standardizes the importance of each goal with the average importance of goals in the same domain ( $d$ ) for each respondent, given by Equation (3):

$$S_{C,j} = \frac{\sum (i_{g \in C,j} / I_{d,j})}{n_{g \in C}} \quad (2)$$

$$I_{d,j} = \frac{\sum (i_{g \in d,j})}{n_{g \in d}} \quad (3)$$

Here,  $i_{g \in C,j}$  is the importance of national goal  $g$  with criterion  $C$  as reported by the respondents  $j$ ,  $n_{g \in C}$  is the number of goals with the same criterion  $C$ , and  $n_{g \in d}$  is the number of goals in domain  $d$ .

The importance and standardized importance of SD criterion  $C$  in each country were then calculated by Equations (4) and (5), respectively:

$$I_C = \frac{\sum_j I_{C,j}}{n_j} \quad (4)$$

and

$$S_C = \frac{\sum_j S_{C,j}}{n_j} \quad (5)$$

Here,  $n_j$  is the number of respondents in each country.

We calculated the relative future importance and the standardized relative future importance of each SD criterion C for each country in the say way.

### 2.3. Survey and Analysis

An online questionnaire survey was conducted from 2013 to 2015 in four Asian countries: Japan, South Korea, Thailand, and Vietnam, which are at different levels of economic development (see GDP per capita in Table 2). The respondents were the monitors of two survey companies, Cross Marketing in Japan and Cross Marketing Asia, who were 20 years of age or older. There were 500 respondents for each country, except for Japan, which had 1408. Quota sampling was applied for each country, with eight equal quotas for the combinations of the two sexes and the ages of the participants who were in their 20s, 30s, 40s, and over 50 (See Table A2 in Appendix B for the profiles of the respondents). Questions were prepared in Japanese and in English and were then translated from English to Korean, Thai, and Vietnamese. After the survey, we calculated the current/future importance of the above-mentioned 11 SD criteria perceived by members of the general public of the four Asian countries.

**Table 2.** Standardized importance ranks of the 11 SD criteria in Japan, South Korea, Thailand, and Vietnam. Criteria ranked in top five for at least one country are presented. Per capita gross domestic product (GDP, PPP based) in 2014 is also shown.

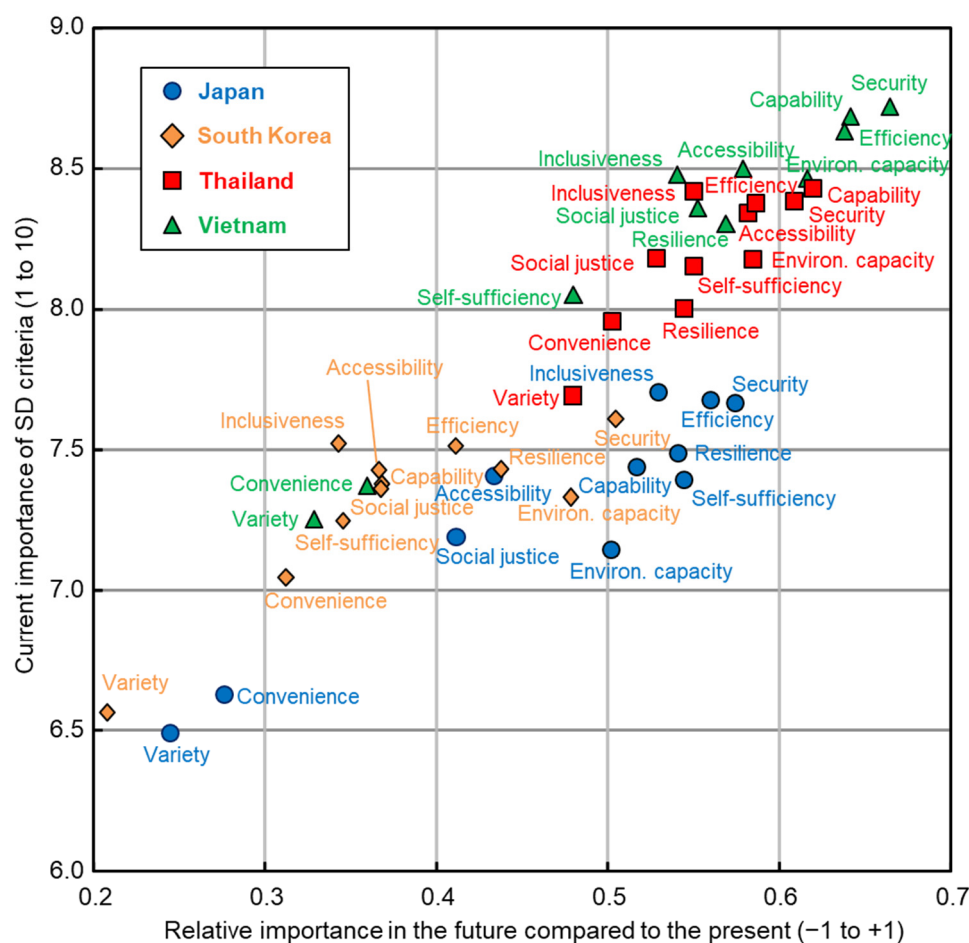
| Rank       | Japan         | South Korea   | Thailand      | Vietnam       |
|------------|---------------|---------------|---------------|---------------|
| 1          | Security      | Security      | Security      | Security      |
| 2          | Efficiency    | Efficiency    | Env. capacity | Env. capacity |
| 3          | Resilience    | Env. capacity | Efficiency    | Efficiency    |
| 4          | Inclusiveness | Resilience    | Capability    | Capability    |
| 5          | Capability    | Accessibility | Accessibility | Accessibility |
| 6          | Accessibility | Inclusiveness | Inclusiveness | Resilience    |
| 7          |               | Capability    |               | Inclusiveness |
| 8          |               |               | Resilience    |               |
| 9          | Env. capacity |               |               |               |
| GDP/capita | \$37,390      | \$35,277      | \$14,354      | \$5,635       |

## 3. Results and Discussion

### 3.1. Current and Future Importance of SD Criteria

The calculated current and relative future importance values of the 11 SD criteria as perceived by members of the general public are presented in Figure 3.

The current and future results were positively correlated ( $r^2 = 0.766$ ), meaning that the respondents in all four Asian countries perceived that the more important a criterion was at present, the more important it will become in the future (20 years). No criterion was perceived to become less important (i.e., all of the future values are positive), but differences in the degree of change in terms of future importance changed the rank between the present and the future. This means that the future importance rank of the criteria located relatively far to the right in Figure 3 can become more important than those located to the left, even if the ones on the left are higher. For example, compare security and self-sufficiency in Japan with inclusiveness and accessibility, respectively.



**Figure 3.** Current and relative future importance values for the 11 SD criteria in Japan, South Korea, Thailand, and Vietnam.

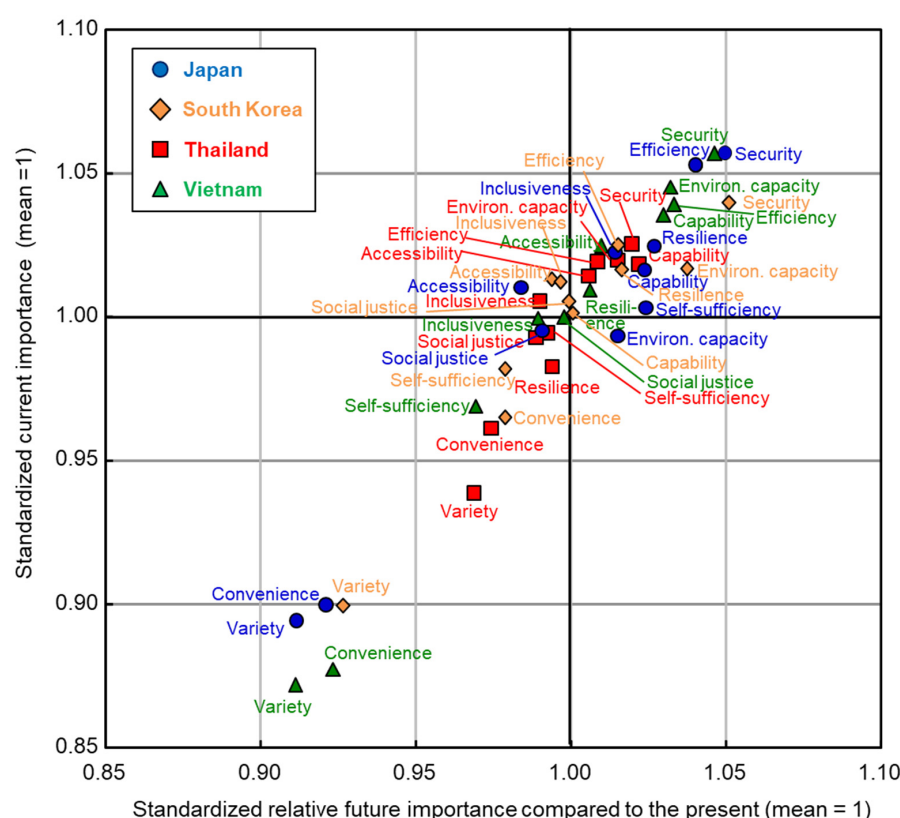
Overall, Thai and Vietnamese respondents tended to evaluate the importance of the SD criteria higher than the South Korean and Japanese respondents. Previous studies (e.g., [52–54]) have argued that these kinds of differences may be rooted in the different response styles of people in these countries. That is, respondents in some countries tend to select middle answers, whereas others choose extreme answers. The former style is called the middle response style, and the latter is called the extreme response style. According to a literature review by Harzing [52], Japanese and Korean respondents tend to have a middle response style. This will be discussed in more detail in Section 3.4.

We identified criteria that could be considered to have the same level of importance between pairs of the four countries by using a *t*-test (see Table A3 in Appendix C). Most of the importance values were significantly different, but the current importance of the six criteria and the future importance of one criterion between Japan and South Korea were not significantly different. In addition, the current importance of four criteria and the future importance of five criteria between Thailand and Vietnam were also not significantly different. In other words, respondents in Japan/South Korea and those in Thailand/Vietnam had relatively similar perceptions on the importance of SD criteria.

### 3.2. Standardized Importance of SD Criteria

The results of standardized importance are presented in Figure 4. The relationship between the current and relative future importance values was stronger ( $r^2 = 0.917$ ) than it was in the unstandardized results shown in Figure 3. This indicates that measurement by standardized importance is less influenced by the countries' specific circumstances in terms of domains and respondent styles. People may think of the importance of national goals

based on the importance of a domain of concern first and then differentiate the importance of each goal based on criteria (i.e., the perception of domains is more influential). This type of two-phased consideration could be employed by people intentionally or unintentionally. To determine whether the domain or criteria is more similar, we applied cluster analysis to the current importance of the SD criteria for each country. The results (Figure A1 in Appendix D) showed that many clusters included goals in the same domains but did not include many goals within the same criteria. More study is needed on this topic.



**Figure 4.** Standardized current and relative future importance values of 11 SD criteria in Japan, South Korea, Thailand, and Vietnam.

We split Figure 4 into four quadrants by drawing a line through the value of one on each axis. Security, efficiency, and environmental capacity are the prominent SD criteria in the first (upper right) quadrant. These criteria are currently important relative to the others and the respondents anticipated that they would become even more important in the future. In contrast, convenience and variety were prominent in the third (lower left) quadrant, meaning that they are both currently less important and the respondents determined that they would become relatively less important in the future.

These are important findings in light of the objectives of this study. However, the question arises: do market prices properly reflect the importance placed on these SD criteria? In general, the results in Figure 4 do not appear to consistently align with actual market prices. Rare products and convenient products tend to be valued higher, but these criteria were located in the third (lower importance) quadrant. Security and efficiency are valued in the market but perhaps not to the extent that Figure 4 shows. In addition, environmental capacity is often externalized by market mechanisms. Thus, the relative importance of the SD criteria found in this study may differ from that inferred from current market prices. As is well known, market mechanisms place prices on products and services based on exchange values. In contrast, our methodology measures the inherent values of the SD criteria. The relationship between the inherent importance and market pricing of the SD criteria is an interesting topic for future study.

Only a few SD criteria were located in the second (upper left) and fourth (lower right) quadrants. Accessibility and inclusiveness were perceived to be relatively important at the present but less so in the future in some cases; for example, Japanese and South Korean respondents evaluated accessibility in this manner. These countries are developed and have higher levels of accessibility to a variety of infrastructure and public services, which can be taken for granted. Thus, it is not surprising that accessibility was located in the second quadrant. The Japanese respondents evaluated environmental capacity as relatively less important at the present but that it would become more important in the future. People's attention in Japan has shifted from local environmental pollution, which can draw strong attention, to global environmental issues, which can be harder to grasp on a personal level and may cause respondents to rank them as being of relatively lower importance. Worsening global warming has been found to draw the most attention among various environmental issues in Japan [55,56], which may also explain this result.

### 3.3. Differences in the Ranks of Importance of SD Criteria

Here, we focus on the order of the standardized importance of the 11 criteria of each country and compare the ranks among countries for research questions 1 and 2. Harzing [52] concluded that ranking is generally a superior method for working with scores obtained from Likert scales and also thought that ranking can better avoid the issue of different response styles. Table 2 shows a summary of the ranking results. Among the 11 criteria, security, efficiency, accessibility, capability, and environmental capacity were commonly perceived as relatively important by respondents from all four countries; however, the ranks differed by country.

For example, environmental capacity was ranked lower, and inclusiveness was ranked higher as the per capita gross domestic product (GDP) (converted based on purchasing power parity [PPP]) increased. Environmental capacity and capability were seen as more important in Thailand and Vietnam, whereas resilience was more important in Japan and South Korea. Severe environmental pollution, such as PM<sub>2.5</sub> air pollution (particulate matter < 2.5 µm in diameter) in Thailand and Vietnam [57], could influence the respondents' evaluations. Accessibility was ranked higher than resilience in Thailand and Vietnam but lower in Japan and South Korea. This probably relates to insufficient basic infrastructure and public services in Thailand and Vietnam, whereas the infrastructure issues have shifted from initial provision to maintenance in the other two countries. The rank of capability was higher than that of inclusiveness in Thailand and Vietnam but was lower in Japan and South Korea. This may imply that the Japanese and South Korean respondents believe that individual efforts are no longer sufficient and that society should care for vulnerable people.

### 3.4. Influences of Non-Economic Factors

Not only economic factors but also non-economic factors might affect the importance of certain SD criteria for a country. Several studies have paid much attention to the cultures of different countries, and we hereby discuss the possibility of influences of such factors on the perception of the importance of the SD criteria (research question 3).

The World Value survey led by Inglehart and Welzel [58] and the survey by Hofstede et al. [59] are famous examples because they covered many countries. The latest results of the World Value Survey [60] present a new version of the so-called Inglehart–Welzel cultural map, which has two major axes of cross-cultural variation—traditional values versus secular-rational values (the vertical axis) and survival values versus self-expression values (the horizontal axis). This new map shows that Japan and South Korea are located in secular areas (in the vertical axis), whereas Thailand and Vietnam are located in between secular and traditional. All four countries are located near the center of the horizontal axis, indicating moderate self-expression values. The difference between the Japan/South Korea pair and the Thailand/Vietnam pair may be attributed to differences in secular-rational values, or they may just reflect the degree of economic development

as shown by the per capita GDP differences in Table 2. The latest data from the Hofstede group's survey [61] are summarized in Table 3. The two abovementioned pairs apparently differ in uncertainty avoidance and long-term orientation. These two cultural tendencies could result in high ranks for resilience in Japan and South Korea. In contrast, Thailand and Vietnam had high ranks for capability, which can be interpreted that, at least in the short term, they place more importance on the capability to solve current issues.

**Table 3.** Hofstede's six indices of national culture and their values in 2015 for Japan, South Korea, Thailand, and Vietnam.

|                     | Index Value (0–100) |               |             |                       |                       |            |
|---------------------|---------------------|---------------|-------------|-----------------------|-----------------------|------------|
|                     | Power Distance      | Individualism | Masculinity | Uncertainty Avoidance | Long-Term Orientation | Indulgence |
| Japan               | 54                  | 46            | 95          | 92                    | 88                    | 42         |
| South Korea         | 60                  | 18            | 39          | 85                    | 100                   | 29         |
| Thailand            | 64                  | 20            | 34          | 64                    | 32                    | 45         |
| Vietnam             | 70                  | 20            | 40          | 30                    | 57                    | 35         |
| Avg. (A)            | 62                  | 26            | 52          | 68                    | 69                    | 38         |
| World average (B)   | 59                  | 45            | 49          | 67                    | 45                    | 45         |
| Difference, (A)–(B) | 3                   | –19           | 3           | 0                     | 24                    | –7         |

<sup>1</sup> Data retrieved from Geerthofstede.com [61]; the averages and differences were calculated by the authors.

Harzing [52] conducted a regression analysis between response styles and Hofstede's cultural values and found that people with a high power distance (a tendency to accept an unequal distribution of power) and individualism tended not to have a middle response style ( $p < 0.01$ ). Power distance explains the results of our survey on the importance of national goals—Thai and Vietnamese respondents tended to rate the importance of national goals higher—however, those with a high level of individualism do not. Other factors such as the perceived seriousness of the issues and/or a strong motivation for improvement in each country's context could play an influential role in the responses.

#### 4. Conclusions

We measured the importance of 11 SD criteria as perceived by the general public in Japan, South Korea, Thailand, and Vietnam. The 11 SD criteria were accessibility, capability, convenience, efficiency, environmental capacity, diversity and choice, inclusiveness, resilience and stability, security, self-sufficiency, and social justice. We used an indirect stated preference approach and employed 58 questions in 6 domains.

The main findings and the answers to the three research questions are as follows:

- Among the 11 SD criteria, security, efficiency, and accessibility were commonly perceived as relatively important in the four Asian countries. Security and efficiency retain their importance regardless of economic development (research question 2);
- The respondents in each country, i.e., in a certain development phase, perceived that the currently important criteria would also be important in the future. This suggests that SD criteria are considered to apply in a similar manner regardless of time unless the phase of development changes (research question 1b);
- Japan and South Korea had relatively similar perceptions on the importance of the SD criteria, as did Thailand and Vietnam. The Thai and Vietnamese respondents tended to have higher importance values than the South Korean and Japanese respondents overall; this difference could be partly attributed to differences in the power distance values (acceptance of an unequal power distribution) between these countries (research question 3). Additional analysis is necessary to identify important factors related to this phenomenon;
- We inferred that people may first think of the importance of national goals based on the importance of a domain of concern and then differentiate the importance of each

goal based on the SD criteria. Perception of the importance of the domains may be more influential than that of the criteria;

- The order (rank) of importance of the 11 SD criteria differed by country to a certain extent, which may be related to the economic development of the countries. For example, environmental capacity was ranked lower, and was ranked inclusiveness higher in the countries with a higher per capita GDP (research question 1a).

The main academic contributions of this study perceived by the authors are the development of the method for measuring the importance of SD criteria and the results of attempting the measurement. As many studies at their initial stages have, this study has some limitations. First, this study focused on six domains, but there are others. Second, there were only four target countries. Expanding the scope and number of countries remains as a future research task. The same survey applying to a country at a different time also remains as a future task. A third limitation is that we did not identify what the explanatory variables of the predictors of the importance of SD criteria of general public are. To do so, in-depth analyses of the results are needed. The fourth limitation is the number of SD criteria. Establishing a more complete set of SD criteria and the questions that should be used to elucidate relevant responses also remains as a future research task. Finally, although we devised and employed an indirect stated preference approach in this study, the development of different approaches to measure the importance of SD criteria and to compare the results among the different methodologies should allow us to produce more reliable results in the future.

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**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

**Table A1.** Fifty-eight statements about national goals in six domains and their corresponding sustainable development (SD) criteria.

|        | National Goals                                                                                            | Corresponding SD Criteria |
|--------|-----------------------------------------------------------------------------------------------------------|---------------------------|
| Energy | A stable supply of required minimum energy for daily living, etc., is secured.                            | Accessibility             |
|        | Energy is used efficiently without any waste.                                                             | Efficiency                |
|        | Energy can be used freely whenever people want to.                                                        | Convenience               |
|        | Energy sources that are managed to reduce accidents are used.                                             | Security                  |
|        | Renewable energy (e.g., natural energy and biomass energy) is used within sustainable limits.             | Environmental capacity    |
|        | People are self-sufficient in supplying energy within my country, local communities, and/or households.   | Self sufficiency          |
|        | The price for using energy is low.                                                                        | Accessibility             |
|        | Energy is used in a way to avoid causing environmental problems such as global warming and air pollution. | Environmental capacity    |
|        | Energy that can be supplied consistently even in an emergency is used.                                    | Resilience & Stability    |
|        | People are allowed to choose an energy source out of various options.                                     | Variety of choice         |

Table A1. Cont.

|           | National Goals                                                                                                                                                                                    | Corresponding SD Criteria |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Economy   | Daily necessities are priced low.                                                                                                                                                                 | Accessibility             |
|           | The economy is highly productive.                                                                                                                                                                 | Efficiency                |
|           | The distribution of wealth is fair.                                                                                                                                                               | Social Justice            |
|           | Stable employment opportunities are secured for people.                                                                                                                                           | Security                  |
|           | Various products and services are available, and people can choose according to their own preference.                                                                                             | Variety of choice         |
|           | There is a balance between the real economy and the financial economy (nominal economy).                                                                                                          | Resilience & Stability    |
|           | The economy is booming.                                                                                                                                                                           | Capability                |
|           | Economic activities are not too dependent on other countries.                                                                                                                                     | Self sufficiency          |
|           | My country is striving for a green economy (economy that is in balance with the environment).                                                                                                     | Environmental capacity    |
|           | My country is not exacerbating social issues in other countries (e.g., not doing business with operators that are infringing the rights of local residents and workers in other countries, etc.). | Social Justice            |
| Health    | Medical institutions are available not far from home.                                                                                                                                             | Accessibility             |
|           | Public finance will not collapse as a result of the government providing healthcare security to the people.                                                                                       | Efficiency                |
|           | People can choose a better medical service by paying an additional fee.                                                                                                                           | Variety of choice         |
|           | Education or information for maintaining health is commonly available.                                                                                                                            | Capability                |
|           | Everyone can receive medical services equally regardless of being rich or poor.                                                                                                                   | Social Justice            |
|           | Services for maintaining health will become common so that the number of people who need medical care declines.                                                                                   | Resilience & Stability    |
|           | The quality of the environment such as air and water is maintained to prevent health problems.                                                                                                    | Security                  |
|           | Sports facilities are enhanced in order to promote health.                                                                                                                                        | Accessibility             |
|           | People are becoming responsible for their own health and their make best effort to manage their health.                                                                                           | Self sufficiency          |
| Ecosystem | There is green (nature) in an easily accessible area close to home.                                                                                                                               | Accessibility             |
|           | Public finance will not collapse as a result of the government stepping up their effort in nature conservation.                                                                                   | Efficiency                |
|           | Activities such as bass fishing involved in personal hobbies will continue to be available in the future.                                                                                         | Variety of choice         |
|           | Education or information to help protect the ecosystem is commonly available.                                                                                                                     | Capability                |
|           | People who contribute to nature conservation do not incur a loss (e.g., the government to buyout the forests that have been conserved, etc.).                                                     | Social Justice            |
|           | Untouched natural areas remain in my country. Measures such as restricted access are implemented as needed.                                                                                       | Resilience & Stability    |
|           | The lives of animals such as monkeys, wild boar, and deer are respected even if they devastate the land and people do not easily resort to extermination.                                         | Social Justice            |
|           | The genes of endangered species are preserved so that genetic information is not lost even if they become extinct.                                                                                | Security                  |
|           | My country provides funds to the international community in order to protect ecosystems overseas.                                                                                                 | Environmental capacity    |
|           | Capturing species such as bluefin tuna and eel that have been observed to be declining in number is prohibited until population recovery has been confirmed.                                      | Environmental capacity    |

Table A1. Cont.

|           | National Goals                                                                                                                                    | Corresponding SD Criteria |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Education | There is an elementary school within walking distance for children.                                                                               | Accessibility             |
|           | People can go to college and graduate school regardless of the level of their economic resources.                                                 | Inclusiveness             |
|           | Gifted and motivated individuals can receive more advanced education.                                                                             | Efficiency                |
|           | There are no truants due to bullying, etc.                                                                                                        | Social Justice            |
|           | People can access high-quality classes and lectures without being restricted by time or place.                                                    | Convenience               |
|           | Opportunities for learning and self-improvement are guaranteed over a lifetime.                                                                   | Accessibility             |
|           | The level of basic academic skills in my country is high compared to other countries.                                                             | Efficiency                |
|           | People have skills such as speaking English to be internationally successful.                                                                     | Capability                |
|           | People are capable of understanding complex issues and applying knowledge and skills that are useful in resolving those issues.                   | Capability                |
|           | People understand and try to accept others with differences by demonstrating compassion for others, etc.                                          | Inclusiveness             |
| Food      | Groceries are inexpensive, accounting for a small percentage of the total household expenditure.                                                  | Accessibility             |
|           | Food contamination with toxic and hazardous substances is prevented and safe/secure food products such as chemical-free vegetables are available. | Security                  |
|           | People can maintain good nutrition regardless of gender, age, income, etc.                                                                        | Accessibility             |
|           | There is little food waste such as leftovers and expired food, and the environmental impact of food production and disposal is minimal.           | Efficiency                |
|           | Food items are also available to poor people.                                                                                                     | Social Justice            |
|           | My country no longer relies on other countries for food supply.                                                                                   | Self sufficiency          |
|           | There are opportunities to enjoy a variety of foods, from high-end foodstuffs and fine dining to B-class gourmet food in my country and overseas. | Variety of choice         |
|           | Convenient food products and services that do not require the effort of cooking are available.                                                    | Convenience               |
|           | People can eat what they want whenever they want regardless of the season.                                                                        | Convenience               |

## Appendix B

Table A2. Profile of the respondents in the four-country survey.

| (a) Japanese respondents. |      |      |      |        |      |       |      |
|---------------------------|------|------|------|--------|------|-------|------|
| Income (JPY million)      | %    | Age  | %    | Sex    | %    | Area  | %    |
| 10.00 and over            | 3.6  | 20s  | 25   | Male   | 50   | Urban | 88.8 |
| 7.00–9.99                 | 16.4 | 30s  | 25   | Female | 50   | Rural | 11.2 |
| 5.00–6.99                 | 23.0 | 40s  | 25   |        |      | Other | 0    |
| 3.00–4.99                 | 31.8 | 50s+ | 25   |        |      |       |      |
| 2.00–2.99                 | 13.5 |      |      |        |      |       |      |
| 1.99 and below            | 11.7 |      |      |        |      |       |      |
| n                         | 1150 |      | 1408 |        | 1408 |       | 1408 |

Table A2. Cont.

| (b) South Korean respondents. |      |      |     |        |     |       |      |
|-------------------------------|------|------|-----|--------|-----|-------|------|
| Income (KRW million)          | %    | Age  | %   | Sex    | %   | Area  | %    |
| 7.50 and over                 | 9.8  | 20s  | 25  | Male   | 50  | Urban | 85.0 |
| 5.00–7.49                     | 23.0 | 30s  | 25  | Female | 50  | Rural | 15.0 |
| 4.00–4.99                     | 12.6 | 40s  | 25  |        |     | Other | 0    |
| 3.00–3.99                     | 19.2 | 50s+ | 25  |        |     |       |      |
| 2.00–2.99                     | 22.6 |      |     |        |     |       |      |
| 1.99 and below                | 12.8 |      |     |        |     |       |      |
| n                             | 500  |      | 500 |        | 500 |       | 500  |
| (c) Thai respondents.         |      |      |     |        |     |       |      |
| Income (TBH thousand)         | %    | Age  | %   | Sex    | %   | Area  | %    |
| 70.00 and over                | 22.8 | 20s  | 25  | Male   | 50  | Urban | 83.0 |
| 50.00–69.99                   | 21.4 | 30s  | 25  | Female | 50  | Rural | 14.4 |
| 40.00–49.99                   | 20.2 | 40s  | 25  |        |     | Other | 2.6  |
| 18.00–39.99                   | 26.8 | 50s+ | 25  |        |     |       |      |
| 7.50–17.99                    | 8.8  |      |     |        |     |       |      |
| 7.49 and below                | 0.0  |      |     |        |     |       |      |
| n                             | 500  |      | 500 |        | 500 |       | 500  |
| (d) Vietnamese respondents.   |      |      |     |        |     |       |      |
| Income (VND million)          | %    | Age  | %   | Sex    | %   | Area  | %    |
| 30.00 and over                | 11.8 | 20s  | 25  | Male   | 50  | Urban | 67.4 |
| 15.00–29.99                   | 32.6 | 30s  | 25  | Female | 50  | Rural | 18.6 |
| 7.50–14.99                    | 34.2 | 40s  | 25  |        |     | Other | 14.0 |
| 4.50–7.49                     | 15.6 | 50s+ | 25  |        |     |       |      |
| 3.00–4.49                     | 5.8  |      |     |        |     |       |      |
| 2.99 and below                | 0.0  |      |     |        |     |       |      |
| n                             | 500  |      | 500 |        | 500 |       | 500  |

## Appendix C

**Table A3.** Responses that were not significantly different between pairs of the four Asian countries (*t*-test,  $p < 0.05$ ). Criteria in the same cells were not statistically different between the listed pair of countries. “None” indicates that no criteria were not significantly different.

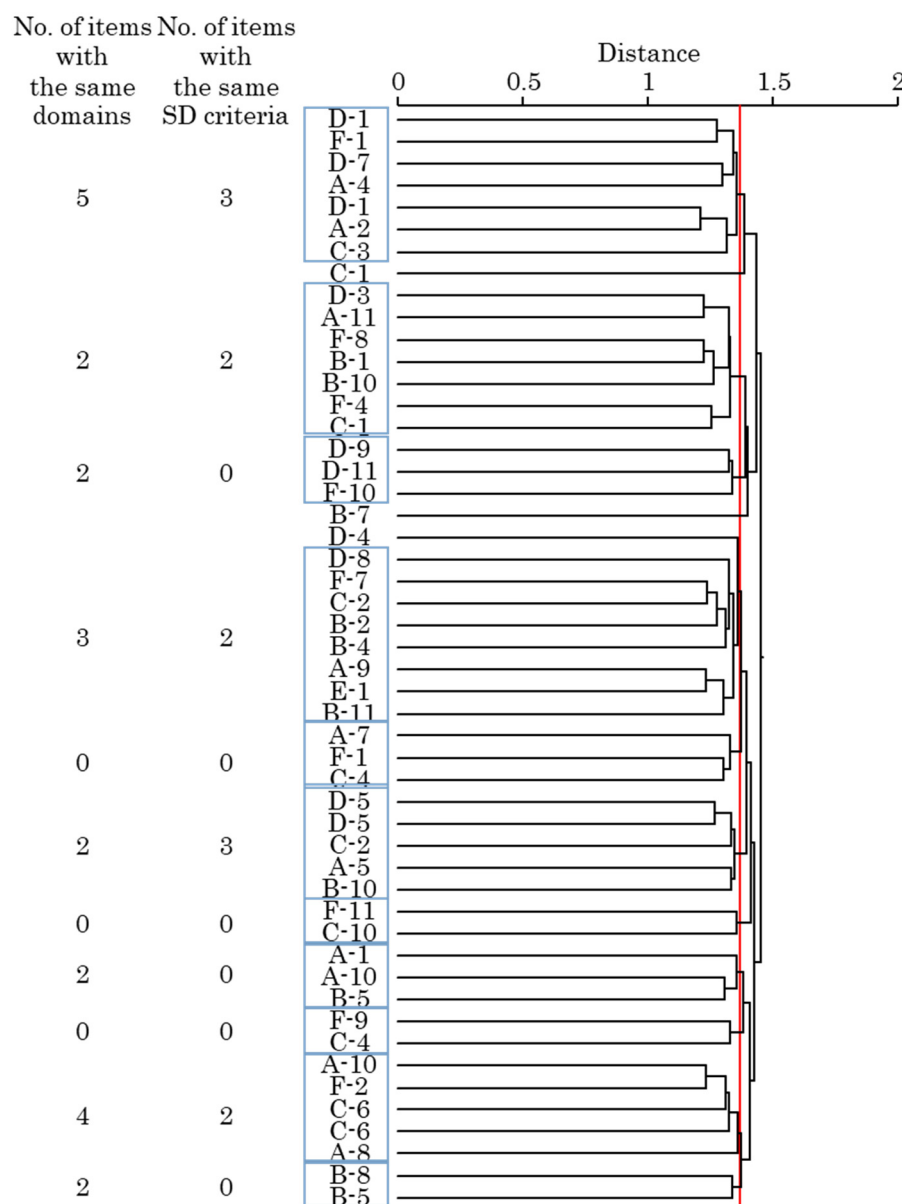
| .                 | Current Importance                                                                                           | Relative Future Importance                                                                                      |
|-------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Japan–South Korea | Accessibility<br>Capability<br>Resilience and Stability<br>Security<br>Self-sufficiency<br>Variety of choice | Convenience                                                                                                     |
| Thailand–Vietnam  | Accessibility<br>Inclusiveness<br>Self-sufficiency<br>Social justice                                         | Accessibility<br>Capability<br>Environ. Capacity<br>Inclusiveness<br>Resilience and Stability<br>Social justice |

**Table A3.** *Cont.*

| .                    | Current Importance | Relative Future Importance                                                              |
|----------------------|--------------------|-----------------------------------------------------------------------------------------|
| Japan–Thailand       | None               | Efficiency<br>Inclusiveness<br>Resilience and Stability<br>Security<br>Self-sufficiency |
| Japan–Vietnam        | None               | Inclusiveness<br>Resilience and Stability                                               |
| South Korea–Thailand | None               | None                                                                                    |
| South Korea–Vietnam  | None               | None                                                                                    |

## Appendix D

Each respondent indicated the importance of the 58 national goals (combinations of six domains and 11 SD criteria) in the survey using a 10-point scale. We applied cluster analysis to the responses of the importance to check which domains or SD criteria tend to fall in the same cluster, i.e., which domains or criteria are relatively similar. As shown in Figure A1, many clusters tended to include the same domains rather than the same criteria. The total number of the items (combinations) with the same domains in the same clusters was 22, and the number of the items with the same SD criteria was 12 for Japan. These numbers were 26 and 25 for South Korea, 29 and 14 for Thailand, and 25 and 16 for Vietnam. For the total for all four countries, these numbers were 102 and 67.



**Figure A1.** An example result of a cluster analysis for the standardized current importance of the 58 combinations of domains and SD criteria (Japanese respondents only). The items on the left of the dendrogram indicate the combinations. Boxes around the combinations indicate the clusters determined at the red line. The six domains are A: economy, B: ecosystem, C: education, D: energy, E: Food, and F: health. The 11 SD criteria are 1: accessibility, 2: capability, 3: convenience, 4 efficiency, 5 environmental capacity, 6: inclusiveness, 7: resilience & stability, 8: security, 9: self-sufficiency, 10: social justice, and 11: variety of choice.

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