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Futurability, Survivability, and the Non-Steady State in the Intergenerational Sustainability Dilemma

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Abstract

The three pillars of society—democracy, the market, and science and technology—are not systems that guarantee survival. This is because they will cause "future failures" that will eventually impose heavy burdens on future generations. Therefore, we need to design mechanisms to reinforce these three systems. This is called future design. Its basic concept is "futurability," which is the ability of the current generation to prioritize the interests of future generations. This study examines the necessity of futurability, its background, and its relationship with intergenerational equity. In particular, using a simple numerical model in which the investment of the current generation affects the resources of future generations, this article shows that if each generation looks only to its own interests, humanity will face extinction. To ensure the survivability of humanity, each generation must demonstrate futurability, especially the importance of demonstrating futurability in a non-steady state.

Keywords

futurability; future design; future failures; intergenerational equity; non-steady state; survivability

1. Introduction

The science and technology we have developed now pose a threat to our own survival (Crutzen & Stoermer, 2000; Rockström et al., 2009, 2023; Steffen et al., 2006, 2007, 2015, 2018). The carbon cycle, disrupted by anthropogenic disturbances, is on the verge of collapse, while the nitrogen cycle, the phosphorus cycle, and biodiversity have surpassed their critical tipping points. Let us consider the nitrogen cycle as an example. In 1913, the introduction of the Haber-Bosch process facilitated the cost-effective mass production of ammonia (Erisman et al., 2008; Smil, 2004). Today, approximately 80% of ammonia is used as fertilizer and the rest is used for producing different materials, including explosives, chemicals, synthetic fibers, and ceramics. Over the years, supply and demand for these applications were effectively balanced through market mechanisms. However, in the past 60 years, the production of nitrogen fertilizers has increased almost tenfold. Thus, the amount of artificial nitrogen compounds produced, other than dinitrogen, is approximately four times that produced in nature, drastically affecting the nitrogen cycle (Galloway et al., 2021). For example, approximately 80% of the reactive nitrogen in fertilizers is released into the environment, contributing to climate change, ozone depletion, and eutrophication (Erisman, 2021).

Increased production of ammonia leads to increased production of nitrogen fertilizers, which, in turn, leads to increased production of grains and meat. The result has been an increase in population for generations (Erisman et al., 2008). This expanding population has significantly increased fossil fuel consumption, consequently exacerbating climate change. The interconnected nature of these issues and the complex web of causal relationships give rise to *future failure* when we place a substantial intergenerational burden on future generations. Therefore, we aim to create a society in which future failures do not occur. In envisioning a society for future generations, the limitations of conventional system designs, which have often fallen short and continue to burden future generations in various ways, must be considered (Saijo, 2020). To this end, a new approach was introduced in Japan in 2015, known as future design (FD; Saijo, 2019, 2020, 2022). The core principle of FD revolves around the concept of "futurability," a distinctly human trait. In FD, the first step includes designing a new system to activate futurability, which is then tested through experiments involving participants. Subsequently, the successful experiments are extrapolated to real communities, municipalities, and private companies. Ultimately, the practices are extended to the national and international levels.

FD puts forth two proposals, both of which are radical and unambiguous (Saijo, 2020). One of these pertains to a critical issue—our decision-making process. We make decisions after discussion and deliberation. However, the fundamental challenge lies in the fact that future generations, who are most affected by these decisions, cannot actively participate in these discussions (MacKenzie, 2021; Smith, 2021; Timilsina et al., 2022). Therefore, FD proposes a paradigm shift in our approach. The key to this proposal is the concept of futurability, which refers to the possibility for the current generation to prioritize the interests of future generations. We argue that this possibility exists within us. An illustrative example of this inherent capacity is the universally observed phenomenon across cultures, eras, and locations where parents consistently prioritize the well-being of their children over their own, often at their own expense. Futurability extends this principle beyond one's immediate family and descendants, emphasizing that the same can also be applied to future generations without direct blood ties.

Eek and Gärling (2006) found that when dividing resources among participants, prosocials prefer to divide equally rather than maximize the sum of gains, while Inoue et al. (2021) found that when current and future generations divide resources, they choose the option that maximizes the gain for both generations. In other words, if the sum is maximized, they will make choices that benefit future generations, even if they reduce the gain of the current generation. Therefore, FD's proposal is not to adhere to conventional thinking, but to acknowledge that humans have futurability.

If we inherently possess the capacity to prioritize the interests of future generations, why, then, are we confronted with the pressing challenges we face today? Where did we go wrong? The answer lies in the social systems that underpin our contemporary world, primarily grounded in democracy, market economies, and science and technology, which often act to stifle our inherent futurability. In this context, simply asking people to change their behavior is not sufficient. Therefore, the FD proposes designing and implementing social systems that activate citizens' futurability.

One such system is imaginary future generations. The starting point for examining this effect was an experimental study in Kamijo et al. (2017). In this, three participants from one generation are considered and they discuss for up to 10 minutes. During this time, if they choose A, the experimenter gives them $36 cash, and if they choose B, the experimenter gives them $27 cash. The participants must decide how to divide the money among the three of them. However, if they choose A, the amounts of A and B are reduced by $9 for each subsequent generation, making A ($27), B ($18), and so on. If they choose B, the amounts of A and B for the next generation will be the same as in the current generation. In other words, an investment of $9 is required for the next generation to receive the same amount as the current generation. This goes on for several generations. In the experiment, 28% of the generations chose the more sustainable B. When an imaginary future person was randomly selected from three people and asked to negotiate with the remaining two on behalf of the future generation, the selection rate for B increased to 60%. Kamijo et al. (2017) named this the intergenerational sustainability dilemma game. Various subsequent experimental studies have tested the effects of imaginary future persons and/or generations (Saijo, 2020, 2022).

In response to these studies, similar practices have also been initiated in Japan. In these practices, the participants are not instructed to represent the future generation, but rather to fly with a time machine to a future, say, 2050, without changing their age. They have to design the social situation and lifestyle there, draw a future history leading up to it, and give advice to the current generation. The current generation groups, however, tend to make policies for the present, substituting present problems for future ones (e.g., Hara et al., 2019). Mayor Shozo Takahashi of Yahaba town, who has observed this practice, declared in his 2018 policy speech that Yahaba is an FD town (Saijo, 2022). He also created a new Future Strategy Department to think about the town's policies from a future perspective and developed its top-level plan—a comprehensive plan that was formulated using the FD method. In addition, Yahaba has begun to legislate FD as a basic policy of the town. Various local governments in Japan have also begun to implement FD. In 2022, the Ministry of Finance formulated an FD team at the national level and began to build a platform that would serve as the foundation of Japan's policy. One notable example of FD is the proposal presented at T7 (Think 7), the preparatory meeting of the G7, which proposed the use of FD to activate the futurability of world readers (Saijo et al., 2022). The United Nations Foundation (n.d.) has also recommended the use of FD in its initiative A Contract for Our Future.

Many people agree that parents willingly reduce their food intake and give it to their children during food shortages. Based on this, we say that a person exhibits *futurability* when he or she experiences an increase in happiness because of deciding to forego current benefits and acting toward enriching future generations (Saijo, 2019, 2020). Previous experiments and practices have begun to show that various FD mechanisms activate futurability beyond kinship.

The definition of futurability intentionally includes ambiguous and undefined terms such as "enriching" future generations and "happiness." Because futurability is viewed as an inherent property of human beings, the terms that appear in the definition are intended to be naturally recognizable according to these situations.

Social science has not used such definitions in the past, traditionally omitting terms that were ambiguous and open to interpretation. For example, Asheim (2010, p. 201), one of the pioneers of the intergenerational equity theory, declared that "well-being does not include the welfare that people derive from their children's well-being." He does not say that there is no well-being derived from the well-being of children. He treats this well-being not as a major component of his analysis, but as an external given. He argues that "the altruism of parents toward their children leads to good outcomes for the long-term development of societies" (Asheim, 2010, p. 216). This is precisely the domain of FD, in which I understand that a certain division of labor has just begun.

Nevertheless, there is a basic question as to whether the "foregoing current benefits" mentioned in the definition of FD violate intergenerational equity. In discussions on intergenerational equity, we often assume a steady state, that is, a scenario where circumstances remain constant and repetitive. However, in a non-steady state, in which a transition is made from a conventional system to a sustainable or even survivable system, it is imperative to adapt our conceptual framework to align with this dynamic context. It is within this context that the concept of futurability assumes a pivotal role. Nonetheless, it is also important to illustrate the application of futurability within the confines of a steady state.

In the present study, we aim to highlight the background of the concept of futurability using various numerical examples in a drastically simplified system. We also examine the relationship between futurability and intergenerational equity and explore why futurability must be defined using such a relationship.

2. Foregoing Current Benefits: Numerical Examples

Within the definition of futurability, the phrase "foregoing current benefits" implies that the decisions of one generation have a lasting impact on the conditions and circumstances of subsequent ones. While this may appear intuitively obvious, we examine this concept further using the simplest possible numerical examples from Kamijo et al. (2017), who used an imaginary future person in the intergenerational sustainability dilemma game.

We assume that the initial resource available to the first generation is 36 units. The first generation must allocate a portion of this resource as investments to ensure that the next generation can maintain similar standards of living as the current one. In other words, the value of resources available to the next generation should be maintained at 36 units. We assume that the investment required for this purpose is 9 units. The remaining 27 units can be used for consumption in the first generation. If the first generation makes no investment and uses all 36 units for its own consumption, the resources available to the second generation would be degraded. Hence, we assume that the total value would be reduced by 9 units to 27 units. For example, suppose that the first generation invests 16 units. Then, the total value of the resources available to the second generation increases by 7 (16 − 9) units and 43 (36 + (16 − 9)) units. To summarize:

$$\text{Value of resources in the second generation} = 36 + (\text{investment in the first generation} - 9)$$

As generations progress, the relationship between the value of resources in generations i and $i + 1$ becomes:

$$\text{Value of resources in generation } i + 1 = \text{Value of resources in generation } i + (\text{investment in generation } i - 9)$$

If we write y_i as the value of the resource of generation *i* and f_i as the investment amount of generation *i*, the equation can be written as follows:

$$y_{i+1} = y_i + \left(f_i - 9\right) \quad (1)$$

Furthermore, each generation must possess a certain level of resources to sustain itself. This value is set to 15 units. Assuming a consistent population size in each generation, this minimum resource requirement is assumed to be fixed. To align with the terminology used in *Our Common Future, From One Earth to One World* (World Commission on Environment, 1987), this minimum amount includes resources required to meet the "needs" of a given generation. Let us assume that if the value of a generation's resources falls below 15, then the human race will be doomed. In Figure 1, the horizontal axis represents the generation number, while the vertical axis represents consumption values. The first generation has 36 units of resources (indicated as A) and must allocate at least 15 units for consumption to satisfy its own needs. Hence, the potential investment range for Generation 1, directed toward the next generation (Generation 2), ranges from 0 to 21 units (calculated as 36 − 15). The y-axis is assumed to be a measure of "happiness" for each generation and is considered directly proportional to their consumption level. Importantly, the decision is determined solely by how much each generation consumes. In this simple model, each generation makes two decisions: consumption and investment. However, once one decision is made, the other becomes automatically determined. Thus, when we consider the concept of futurability, it becomes essential to assess the extent of investment that each generation allocates both for the future generation and for their own consumption.

Suppose the first generation consumes 36 units of resources exclusively for itself, without investing in the next generation (as represented by A in Figure 1). In this scenario, $y_2 = 36 + (0 - 9) = 27$, and the maximum possible investment made by the second generation is 12 (calculated as 27 − 15). Now, let us say that the second generation also refrains from investing, and utilizes all 27 resource units for its own generation (B). In this case, the resource value available to the third generation would be $y_3 = 27 + (0 - 9) = 18$. Even if the third generation utilizes 15 of the 18 units for consumption within its own generation and allocates 3 units for investment, the resource value for the fourth generation would be $y_4 = 18 + (3 - 9) = 12$, resulting in the extinction of the human race in the fourth generation. Recognizing this, the third generation will opt to use 18 units of resources exclusively for its own generation (as indicated by C). This specific consumption pattern is denoted as E1 in Figure 1.

Let us consider a situation where the initial resource value for the first generation is 36 units. In this case, for the subsequent generation, they "forego current benefits" by investigating 9 units for the second generation and allocate 27 units for their own consumption. This scenario is represented as point D in Figure 1. Consequently, $y_2 = 36 + (9 - 9) = 36$. The next generation has 36 units of resources. If the second and subsequent generations consistently invest 9 units, the consumption levels of all generations will remain at 27 units. Despite each generation "foregoing current benefits" by investing 9 units for the well-being of the next generation, all generations enjoy a consistent level of consumption, amounting to 27 units (as E2 in Figure 1). This level of consumption exceeds the minimum needs of each generation and aligns with the concept of sustainable development that "meets the needs of the present without compromising the ability of future generations to meet their own needs," as mentioned in *Our Common Future, From One Earth to One World* (World Commission on Environment, 1987).

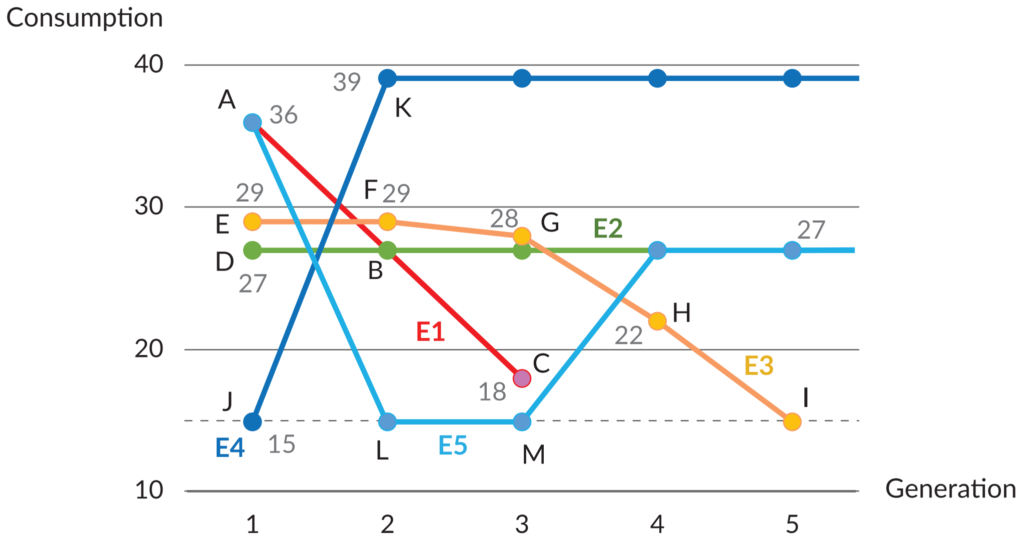

Figure 1. Consumption flows in five examples.

Let us again consider that the first generation has 36 units. In this case, while "foregoing current benefits," 7 units are invested for the second generation, while 29 are consumed (denoted as E). The resource value for the second generation is calculated as $y_2 = 36 + (7 - 9) = 34$. Assuming that it is equitable for the second generation to consume the same amount as the previous generation (29 units), the investment would be 5 units (denoted as F). Consequently, the resource value for the third generation is calculated as $y_3 = 34 + (5 - 9) = 30$. Although the third generation could potentially consume 29 units, as seen in Generations 1 and 2, it consumes 28 units and invests 2 units (G). This results in $y_4 = 30 + (2 - 9) = 23$. We assume that the fourth generation consumes 22 units and invests 1 unit to ensure the survival of the fifth generation (H). Therefore, $y_5 = 23 + (1 - 9) = 15$. Subsequently, the fifth generation consumes 15 (I), and humans become extinct by the sixth generation (E3 in Figure 1). This is later compared to E3′.

Next, we consider a more extreme case. Suppose the first generation invests the maximum number of resources $(21 = 36 - 15)$ and consumes the minimum of 15 units (J). Then, the second generation would have 48 units of resources: $y_2 = 36 + (21 - 9) = 48$. There are many possibilities; however, if each generation after the second invests 9 units, each subsequent generation consumes 39 units (K). In other words, owing to the maximum investment by the first generation, subsequent generations can maintain a high consumption level of 39 units (E4 in Figure 1).

Finally, we consider a more complex scenario. We assume that the first generation makes no investment and indulges in 36 units of consumption (as represented by A). In this case, $y_2 = 36 + (0 - 9) = 27$. Let us assume that after sensing a critical situation for the survival of the human race, the second generation decides to make the maximum possible investment, which amounts to 12 (calculated as 27 − 15) units. This generation limits its consumption to a minimum of 15 units (denoted as L). Then, compared to the first generation, the "current consumption" is significantly reduced. However, the value of the resources of the third generation is 30: $y_3 = 27 + (12 - 9) = 30$. Suppose that the third generation, appreciative of the second generation's wisdom, follows suit and invests 15 units while maintaining consumption at the minimum of 15 units (indicated as M). Consequently, $y_4 = 30 + (15 - 9) = 36$. Ultimately, the situation is the same as that in the first generation. If the fourth and subsequent generations continue to invest 9 units, each generation will consume 27 units (E5 in Figure 1).

This decision-making process, which takes into account past choices while making present decisions, is referred to as "past design." The efficacy of this method was explored in detail by Nakagawa, Arai, et al. (2019) and Nakagawa, Kotani, et al. (2019). In E5, the second and third generations experience "less current consumption" than the first, fourth, and subsequent generations. If, as in E1, the second generation maximizes the satisfaction of its own generation and exhausts all 27 resource units, it would inadvertently lead to the extinction of humanity. The second generation in E5 cannot change its past by resenting the decisions of the first generation. Therefore, it would demonstrate its futurability by investing in 12 units. The third generation is grateful to the second generation and makes investments to realize its futurability and to secure a more promising future for the next generation. The combined actions of the second and third generations result in stable consumption patterns for the fourth and subsequent generations. These later generations also refrain from depleting all their resources in their own generation and make sufficient investments to benefit future generations. In essence, they too exhibit futurability by prioritizing the long-term well-being of humanity.

These examples show that intergenerational equity cannot be considered by simply examining the consumption pattern of each generation. This is due to the intricate linkages between past and future generations, that influence the consumption patterns of each generation. This underlying complexity is succinctly encapsulated in (1). In these examples, 15 units of consumption are defined as consumption that meets "minimum needs," although it could also be viewed as a minimally sustainable consumption level below what is truly needed. In the above example, the second and third generations risked their lives for the survival of humanity as well as for the "happiness" of future generations. This concept is fundamentally encapsulated by "foregoing current benefits" in the definition of futurability.

3. Futurability and Intergenerational Equity

We can examine several examples to analyze consumption flows from various perspectives, all based on an initial resource of 36 units for the first generation, as shown in Figure 1. Notably, post-extinction consumption was excluded in some cases, such as E1 and E3. For this analysis, we assumed there was no post-extinction consumption. Our initial focus is to evaluate their respective efficiencies. We compare two distinct examples, denoted as X and Y. If the consumption stream in EX is greater than or equal to that in EY in each generation, and if the consumption in some generation of EX is greater (not the same) than that of the same generation of EY, then we deem EX as *Pareto superior* to EY. Notably, none of the examples 1–5 exhibit Pareto superiority over the others, indicating that none of them can be omitted on this basis. In other words, none of the examples is inefficient. When there is no example that is Pareto superior to another, we say that this example is *Pareto efficient*. If Pareto efficiency is a mandatory criterion, any example in Figure 1 could be seen as a viable choice. While we considered five examples here, innumerable examples can be created for the first generation using the initial resource of 36 units. However, not all these examples will meet the Pareto efficiency criteria. In E6, every generation consistently consumes 15 units of resources. In this case, E2, E4, and E5 are Pareto superior to E6, indicating that E6 is wasteful, not Pareto efficient, and should not be selected. In the case of E6, each generation accumulates huge resources but does not allocate their fruits to consumption.

Next, we consider intergenerational equity by introducing E3′, a scenario similar to E3. In E3′, the first generation invests 7 units and consumes 29 units. Consequently, $y_2 = 36 + (7 - 9) = 34$. If the second generation invests 6 units, we obtain $y_3 = 34 + (6 - 9) = 31$, and the second generation consumes 28. If the third generation invests 2 units, $y_4 = 31 + (2 - 9) = 24$, and the third generation consumes 29. If the fourth generation invests 2 units, $y_5 = 24 + (2 - 9) = 17$, and the fourth generation consumes 22. If the fifth generation consumes 15 and invests in 2 units (although this is not rational), $y_6 = 17 + (2 - 9) = 10$; hence, the next generation faces extinction. In this way, we have created consumption sequences of 29, *28*, *29*, 22, and 15 for E3′, whereas E3 exhibits a sequence of 29, *29*, *28*, 22, and 15. The only difference between these two consumption streams is that the consumption values of the second and third generations were swapped. Based on the "equity axiom" proposed by Diamond (1965), when only the consumption values of two generations are exchanged, there is "no difference" between the consumption sequences of E3 and E3′. Among the six examples (examples 1–5 and 3′), only E3 and E3′ involve the interchange of consumption values for the two generations. In other words, since there are no other examples where the consumption-only figures for two generations have been swapped, it cannot be determined whether there is no difference between any two examples when viewed through the lens of the equity axiom. There is no difference between E3 and E3′, but it is not possible to determine superiority or inferiority among the other examples. In addition, none of the examples can be narrowed down using the equity axiom, because they are Pareto efficient.

Therefore, we introduced a slightly different perspective. Let us consider two generations as examples. Generation 3 in E1 might feel envious of Generation 1. What would happen if we swapped the consumption figures of the two generations? Even if Generation 3 envies Generation 1, it technically cannot consume at the level of Generation 1 due to the resource constraint outlined in (1). If we consider two generations in the same example, based on whether they envy each other and without factoring in the technical constraints, we find that E2 and E6, where all generations exhibit the same consumption, satisfy the "no envy" condition. Moreover, swapping two generations in these examples adheres to the technical constraints. If intergenerational equity assumes that all generations consume the same amount, then E2, in which all generations consume 27, and E6, in which they consume 15, satisfy this condition.

While the above discussion started with whether or not to "envy" another generation, it is important to note that the same result can be obtained when the following principle is followed: "Leave the next generation in the same situation as the current generation." However, E6 is not Pareto efficient, and only E2 satisfies both Pareto efficiency and intergenerational equity. We can define the consumption pattern as "sustainable" when both these conditions are met. Recall that in E2, even if "current consumption is reduced," each generation invests only 9 units to ensure that the next generation inherits an environment comparable to their own.

If so, are E4 and E5 unsustainable? Did the first generation in E4 and the second and third generations in E5 not demonstrate futurability, preventing the extinction of humanity and contributing to its survival? Let us say that the consumption stream is *survivable* if later in the consumption stream the consumption of each generation is far enough from the "minimum needs" to be the same or monotonically increasing and satisfies Pareto efficiency. Therefore, E4 and E5 are survivable.

The consumption stream is *survivable* if some generations demonstrate futurability in a non-steady state before later generations reach a steady state in which the level of consumption remains the same so that they increase investment for the benefit of future generations. In other words, survivability is defined so that investment behavior, such as that of the first generation in E4 and the second and third generations in E5, is evaluated positively in the non-steady state. To the best of our knowledge, there has never been a concept that describes human characteristics in a non-steady state and includes time and its influence on the way future generations should be.

Let us consider the meaning of “non-steady state” more deeply, within the definition of survivability given above. Suppose that in the second generation in E4, for reasons such as a nuclear war or a pandemic, the next generation must have 40 units of investment instead of 9, to maintain the same environment as the current generation. Thus, the second generation invests 30 out of 48 units of resources. Thus, consumption would be 18, and $y_3 = 48 + (30 - 40) = 38$. The reason the human race did not become extinct is that the first generation invested as much as possible for future generations, as did the second generation. Let us assume that the next generation invests 20 units to maintain the same environment as the current generation. If the third generation invests 18 units and consumes 20, then $y_4 = 38+(18-20) = 36$. If the subsequent investment in maintaining the environment is 10 units and each generation continues to invest 11 units, the consumption stream from the first generation will be 15, 18, 20, 25, 26, 27, 28, etc.

Survivability also allows for some form of large investment or growth. In the event of a pandemic, we will have to invest heavily in its prevention. We will have to prepare for huge earthquakes. If crop failures persist, we will have to focus on improving cultivation methods and artificial fertilizers. We will have to focus on new, less environmentally hazardous pesticides for crop diseases. Furthermore, the explosion of AI and genetic technologies will have a great impact on the happiness of both present and future generations. Of course, we must also pay attention to the negative aspects of these technologies and aim to design a social system that considers the “well-being” of people now and in the future, as part of our futurability.

Do these generations, that have demonstrated futurability in a non-steady state, feel unequal just because they consume less than other generations? Nakagawa and Saijo (2020) find that those who exhibit futurability gain some social perspective and have a bird’s eye view of the situation. In the context of this section, each generation may not measure happiness solely in terms of its own consumption. Therefore, we may be able to see a new horizon for the discussion of intergenerational equity.

The above understanding is based on the viewpoint that futurability is a human trait, and social system design is used to realize it. Some researchers, such as Agyeman (2012), have proposed several coordinate axes for designing social systems. She proposed four axes of sustainability: (a) addressing well-being and quality of life; (b) meeting the needs of present and future generations; (c) achieving justice and equity in terms of perceptions, processes, procedures, and outcomes; and (d) living within the limits of ecosystems. Only sustainability focuses on the positions of the designed mechanisms along each axis. In this sense, sustainability does not address the question of whether there has been a change in human nature, nor does it look at the relationship between the design of mechanisms that are highly evaluated in each axis and changes in human nature. Therefore, if we believe that these coordinate axes can be used to evaluate mechanisms that demonstrate futurability, these approaches can be seen as complementing each other.

4. Conclusion

Humans possess several unique traits, one of which is holding an innate optimism about their futures (Sharot, 2011). Paradoxically, this optimism has often contributed to a series of failures, burdening future generations. Over the past several centuries, the development of science and technology has played a major role in creating future failures. In response to these challenges, the concept of futurability can likely be a potential solution to prevent or control future failures.

Futurability often contradicts the basic concepts of human behavior that are used in traditional social sciences. For example, futurability is inconsistent with the economic incentives to pursue immediate benefits. However, through various experimental studies, such as Inoue et al. (2021), Kamijo et al. (2017), Nakagawa, Arai, et al. (2019), Nakagawa, and Kotani, et al. (2019), we have gradually learned that people instinctively demonstrate futurability.

Accordingly, in this study, we introduce a simple dynamic that connects two time points and illustrates the role played by futurability. We also examined the relationship between intergenerational equity. We found that futurability plays an important role in ensuring the survival of humankind in a non-steady state. Furthermore, it plays an important role in maintaining a steady state and admits a growing stream of consumption. The issue here is not about growth or non-growth, but about future generations, including the current one, exhibiting futurability and maintaining well-being. Thus, FD does not aim for no-growth (degrowth). We do not consider Earth to be in a state of static equilibrium. We aim for our survival and the "well-being" of present and future generations during changes, large and small, that entail risk-taking (Paulson et al., 2020).

The intergenerational dynamics, as described in (1), are fundamentally straightforward. For example, the investment required for the next generation to sustain an environment similar to that of the current generation is often presumed to be a constant value. However, it could be envisioned as a monotonically increasing function influenced by the consumption or the resources accessible to the current generation. An alternate extension of this concept could involve considering not only the current generation but also the consumption patterns of preceding generations. Despite the potential for these and other conceivable extensions, I believe that the core implications conveyed by the definition of futurability are unlikely to undergo substantial changes.

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Conflict of Interests

The author declares no conflict of interests.

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