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### Abstract

*Future Design*, a new movement among Japanese researchers, asks the following question: what types of social systems are necessary if we are to leave future generations sustainable natural environments and sustainable societies? One such method is using an “imaginary future generation,” and I overview the literature including the background of this method, the results of relevant laboratory and field experiments, and the nature of relevant practical applications in cooperation with several local governments.

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## 1. Past, present, and future

Steffen et al. (2004, 2015) indicate that the Earth system's variables such as emission levels of CO<sub>2</sub>, nitrogen oxides, and methane; ground temperatures; and the amounts of rainforest loss; have been increasing at an accelerating pace since 1950<sup>1</sup>. Alongside this, socio-economic variables such as population, urban population, real GDP, use of water, and flows of information have likewise been rapidly increasing. However, these data also indicate that the OECD nations have been reaping most of the results, i.e. the 'umami,' of those changes. The above expresses what we have done until now, i.e., our "past." Steffen et al. (2004) call this phenomenon the "Great Acceleration."

An indicator of a more recent past is the relation between the Human Development Index (HDI) and Ecological Footprint (EFP) per capita<sup>2</sup>. The HDI's chief components are a country's average life-expectancy, level of education, and per-capita income – an indicator of a country's "well-being." Meanwhile, EFP is an indicator of sustainability, and it shows whether the given country is living within its share of global means. Developing countries have both low HDI and low EFP, while developed countries are high in both. The goal ought to be low EFP and high HDI. However, not a single country is heading in that direction.

So how could we evaluate the result of the Great Acceleration, i.e., the present? Rockström et al. (2009) evaluate the Earth system in terms of nine domains, indicating that the biochemical circulation of nitrogen and phosphorus, as well as biodiversity, have virtually gone past their tipping points. They also point out that climate change and land system changes are approaching their tipping points. Such investigation into whether the Earth system's variables are kept within a safe range for humankind is called "planetary boundary research."

Next, let us take a look at the near future. Maggio et al. (2012) predict peaks in production volumes for oil, coal, and natural gas in the near future. According to this study, the amount of coal that we are projected to consume during the *first half* of the 21<sup>st</sup> century – not the whole 21<sup>st</sup> century – is about 1.7 times the amount we consumed during the entire 20<sup>th</sup> century. Furthermore, during the first half of the 21<sup>st</sup> century, we are projected to consume about 1.5 times the amount of oil and about 3 times the amount of natural gas that we consumed during the 20<sup>th</sup> century. Thus, for fossil fuel-use, the 20<sup>th</sup>

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<sup>1</sup> Approximately 55 million years ago, there was an age called the PETM (Paleocene–Eocene Thermal Maximum) in which Earth's climate was the warmest. According to Yasunari (2018), the current CO<sub>2</sub> emission level per year is about 10 times that of the time of the PETM.

<sup>2</sup> <http://data.footprintnetwork.org/#/sustainableDevelopment?cn=all&yr=2014&type=BCpc,EFCpc>

century was the 'approach-run,' while the current century is the 'climax.' In October 2018 the Intergovernmental Panel on Climate Change warned that the temperature rise since pre-industrial times will exceed 1.5 °C around 2040 if we continue in this fashion.<sup>3</sup> In response to this, the BBC stated on October 8, 2018 that it is the "final call to save the world from 'climate catastrophe.'"<sup>4</sup>

As a result of the above changes the relatively stable Holocene that lasted for more than 10,000 years has ended and we have entered the Anthropocene, a new geological age wherein humankind has changed the Earth itself (see Monastersky (2015)). Until now the Earth has gone through 100,000-year cycles of glacial and interglacial periods. However, Steffen et al. (2018) point out that even if we achieve the Paris Agreement's goal, there is a possibility of a future in which Earth deviates from that cycle into a new one involving a greenhouse Earth and a hothouse Earth.

Meanwhile major countries have huge levels of outstanding debt. The debt of Japan exceeds 200% of its GDP, while that of the United States exceeds 100%. For Germany, this figure is about 70%. The current generation is maintaining its wealth by using up the future generations' resources. In the case of Japan, to resolve the debt balance we would be required to raise consumer tax to about 30 or 40% and keep it that way for a hundred years; only then will the balance go down to about 70% (Hansen et al. (2016)). It is still uncertain as to which generation would do this of its own accord.

## 2. How did this happen?

Why do we keep changing the future Earth's environment and taking away resources from future generations? According to Sapolsky (2012), humans possess three traits. The first is *sociality*. By the cooperation of multiple people humans have triumphed over other animals and stand at the top of the food-chain. However, sociality requires certain education and experience; it is not something that is acquired instantly. The second is *relativity*. We react not to absolute volumes, but to relative volumes of what is felt by the senses: when there is a sudden, loud noise, or if it suddenly becomes dark we naturally react – by default – to increase the chances of our own survival. In the context that we do not react unless some abrupt change occurs to an external factor, this trait may be reinterpreted as the principle of *optimality* (the behavioral principle in which in order to maximize the objective function, we differentiate it and find the point where it is zero). The third is *shortsightedness* (or *impulse* by Sapolsky (2012) ); it is not easy to resist eating something tasty in front of you. I would like to add a fourth human trait: *optimism*. For it is

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<sup>3</sup> [https://www.ipcc.ch/pdf/special-reports/sr15/sr15\\_spm\\_final.pdf](https://www.ipcc.ch/pdf/special-reports/sr15/sr15_spm_final.pdf)

<sup>4</sup> <https://www.bbc.com/news/science-environment-45775309>

possible that humans, in order to increase the chances of their own survival, have evolved to be optimistic about the future, forgetting bad memories from the past to instead pursue immediate pleasures of the present (Sharot (2011)).

We may consider these human traits as the premises upon which our society's basic frameworks, such as the market and democracy, are built. First, let us consider the market. While the market is 'an extremely good device for realizing the *short-term* desires of people,' it does not 'allocate resources in a way that takes account of future generations' – the future generations cannot participate in today's markets. Likewise, democracy is not 'a device that incorporates future generations;' it is 'a device that profits people who live *now*.' Running for a political office today to enrich a generation a hundred years later would most likely end in an election-defeat. Although sociality of some sort is clearly necessary to build social systems, these resulting devices deeply reflect relativity, shortsightedness, and optimism.

Following the Industrial Revolution various innovations took place and we began using massive amounts of fossil fuel. The social systems that we created, including the market and democracy, then fed back the human traits encouraging relativity, shortsightedness, and optimism, while weakening sociality. And these transformed human traits, in turn, transformed the content of the market, democracy, and innovations. Despite being the cause of the various future failures mentioned above, this has built a society that blindly focuses on growth. For this reason, we now need various social systems to restrain the market and democracy.

### 3. Is transformation in favor of a sustainable society possible?

Future Earth was organized in 2012 as an international research platform for the generation of knowledge and action to accelerate radical innovation in favor of a sustainable society, and it has been active since 2015.<sup>5</sup> One of the basic concepts of Future Earth is *transdisciplinary* research. This is a framework in which stakeholders and scientists co-design research projects, co-produce knowledge, and co-deliver results. However, both the stakeholders and the scientists belong to the current generation and even if the outcome of their activities following the incentives is win-win, there is still the possibility that future generations will lose. Is it not the future generations, therefore, who we should include as stakeholders? And is it not the current generation's ways of thinking and acting that we ought to target for change?

From this viewpoint, "Future Design" emerged with the aim of creating human

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<sup>5</sup> <http://www.futureearth.org/>

“futurability.” A person exhibits *futurability* when he or she “experiences an increase in happiness as a result of deciding and acting to forego current gains in order to enrich future generations”; the design and praxis of a society generating futurability is called “Future Design” (Saijo (2018)). This presents a fundamental question as to whether it is possible to feel the same happiness felt by a parent eating less to give more to his or her child by benefitting future generations to which we are unrelated by blood. The establishment of the concept of futurability reflected a concern regarding the concept of sustainable development (fulfilling the needs of the current generation without detracting from the needs of future generations) that was expounded in the Brundtland Commission’s *Our Common Future*. For example, in the case of the aforementioned scenario about outstanding debt, it is impossible for the current generation to reduce the future generations’ burdens without bearing a significant burden itself.

Viewed in association with the economic concept of incentive, which is based on the pursuit of self-interest, futurability may seem preposterous. However, from the viewpoint of the continuation of humankind, futurability is an important incentive. Indeed according to the conventional framework of the study of economics, participants with futurability as an incentive would be free-ridden by others, and according to evolutionary game theory, those with such an incentive would perish.

Within the framework of conventional mechanism design, the production of a social mechanism or system that would increase the number of people who have futurability may become an important task. In this paper, however, rather than using an approach of designing such a mechanism I would like to take an approach of designing a social mechanism that would *activate* futurability, according to the supposition that it is intrinsic to humans. This is based on the results of various experimental investigations. Even if we suppose humans have futurability, activating it is not easy. But is it impossible to build a new social mechanism of some form that would strengthen the sociality that has been weakened under the market and democracy while weakening relativity, shortsightedness, and optimism instead?

In the past few years, Japanese researchers of various fields have begun developing new methods involving the use of an imaginary future generation (see Kobayashi (2018)). I will introduce this new movement called “Future Design” below.

#### 4. Towards Future Design

Let me introduce an experimental research by Kamijo et al. (2017) that became the starting point for future design research. In this study groups of three participants were composed to represent different generations, and each of these groups was given a task to

hold a discussion for up to 10 minutes and then choose between A (\$36) and B (\$27), to redistribute this money among its three participants, and receive the money and leave. The experiment was designed so that if the group chooses A, A and B will each decrease by \$9 for the next generation (a different, separate group of three participants), and if the group chooses B, there will neither be changes to A nor B for the next generation. Each generation was given information about the decision made by the previous generation(s) and was also made to understand that other generations would follow. The participants were paid according to the decisions that had been made by their generations. If human relativity (principle of optimality) was activated, the choice would naturally be A. Meanwhile, in some groups, one out of the three participants were chosen and asked to represent the people of the following groups (generations) as he or she negotiated with the other two participants. The payment that this participant received would be in line, however, with the decision made with the other two on how to share the money. Let us call this participant an *imaginary future person*.

Twenty-eight percent of the groups without imaginary future persons and sixty percent of the groups with imaginary future persons chose B, confirming the effectiveness of imaginary future persons: it was found that playing the role of future generations could activate the futurability, not only of that person, but of others as well. Following this, the same experiment was conducted in Dhaka (an urban community) and a rural community in Bangladesh as well as in Kathmandu (an urban community) and a forested community in Nepal; the results confirmed that while introduction of imaginary future persons in non-urban communities is effective, it has no effect in urban communities (Shahrier et al. (2017a)). Shahrier et al. (2017b) and others are also beginning to confirm effective functioning of new decision-making mechanisms that were designed based on their studies. For example, a great increase in the chance of sustainable choices was observed, not by introducing imaginary future persons, but instead by openly including a stage where the reason for the decision that was made is to be left to the next generation (Timilsina et al. (2018)).

Imaginary future persons think about changes in the present from a future point of view, but it has also been confirmed that a retrospective, imaginary experience of sending advice from the present to people of the past can make that person think like an imaginary future person when thinking about future challenges. Nakagawa et al. (2018) recruited ordinary people and had them think about the future of the forests in one part of Japan (Kochi). The participants read past newspaper articles and sent imaginary advice to people in the past who were wondering which of several options they should choose. By doing so, the participants chose scenarios that support sustainable forests, just as imaginary future

persons would do.

The above experimental research has also begun to spawn future design's practical application. In places such as Yahaba, Iwate Prefecture, researchers have begun the process of verifying whether an imaginary future generation created in the present – representing the interests of the future generation and given a role involved in vision design and decision-making – could negotiate the present generation into making decisions that overcome the intergenerational conflict of interests (Hara et al. (2017)). The Cabinet Office had required all municipalities to produce a “long-term vision” for 2060, and taking advantage of this opportunity, a total of six workshops were held at a monthly pace from the second half of 2015 to March 2016. Four groups, each of 5 to 6 people, were composed of Yahaba residents, and two of these groups were asked to think about the Yahaba in 2060 from the viewpoint of the present generation and then propose policies for the present time – an ordinary workshop to draw up policies for the future. Meanwhile, the remaining two groups were asked to go directly to 2060 on a time machine and draw up policies from there.

Even after several workshops, the present generation groups still treated the current problems as tasks of the future. For example, they predicted that long waiting lists for nursery schools would remain a problem, or that there would not be enough care facilities for the elderly, even in 2060. Apparently they could not help but to view the future as an extension of the present, creating visions that focus primarily on finding solutions to current problems and producing ideas within the limits of present conditions. In contrast, the imaginary future generation's thoughts were original; raising the priority of finding solutions to complex and time-consuming tasks; freely picturing the future independently of current conditions; and taking advantage of both physical and sensory resources in their surroundings to make sustainable use of them.

Six months after the policymaking workshops, Nakagawa et al. (2017) held interviews with the locals who had been the imaginary future generation. It was then discovered that these former participants, rather than experiencing a conflict of some sort between today's 'I' and the imaginary future person 'I,' had now been viewing both from a societal perspective. Furthermore, it was discovered that they found joy in the very act of thinking as an imaginary future person, and that way of thinking had since been occurring naturally in their everyday lives. The study thus revealed the possibility of activating people's futurability by having them become imaginary future persons.

## 5. Future tasks

Practical adoption of future design methods has begun. They have been used to



deliberate on the design of the new city hall of Matsumoto, Nagano Prefecture (Nishimura et al. (2018)); the introduction of renewable energy in Suita, Osaka Prefecture; future plans for private enterprises; and solutions to various problems at ministries and agencies. The future design method is similar to fractal analysis. It can be applied to local problems, and it can also be geared to face global challenges. The future design method could be applied to the UN's decision-making processes, and it also has the potential to effectively function at world leaders' congregations, such as the G7 and G20.

It also has the potential to innovate the very structure of town assemblies. For instance, let us say that a town assembly has ten members. Out of these ten, three are assigned to be future representatives. In order to become a future representative, a candidate must compete in election by making policies from the viewpoint of the town's future. At the extension of this idea is a proposal to change Japan's upper house into the "future house" and create a future ministry.

That said, although humans appear to have futurability, it is still unclear as to why it can be activated. For this reason, Aoki (2018) proposes a new field dubbed, "neuro future design." In addition, some as Kobayashi (2018) and Hiromitsu (2018) have taken the discussion into the philosophical context of John Rawls's *Theory of Justice*.

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