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The Relation Between Human Activities and the Natural Environment:
An Essay on the Introduction of Environment-Related QOL*

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1. Preface — Problématique

Environmental issues are among those that need the most attention in today's numerous global problems. The climate change represented by global warming, for instance, is giving a major effect on our daily lives, as seen in droughts resulting from abnormal weather and floods accompanying heavy rain. Recently we have also witnessed changes in the Earth itself such as in volcanic eruptions and earthquakes. Although it is unclear how much of these changes in the natural environment are rooted in human activities, it is certain that part of the cause lies in the structure of modern society which is advancing its scientific and technological civilization.

In Japan, the Kumamoto and Aso regions experienced a major earthquake in April 2016 and human society there has suffered enormous damage, including much personal injury. At the same time, the earthquake also brought significant damage to the natural environment, particularly in the Aso region. Earthquakes are normally a natural phenomenon. However, when one considers the damage that these earthquakes wreak on human society, it is essential that we be constantly aware of changes in the natural environment. Moreover, the problem we face today is, if we believe that our civilization is damaging nature, how will humans confront nature and coexist with it?

This paper examines the relationship between human activities and the natural environment from this perspective. When considering global sustainability in particular, people are required to maintain the natural environment while they seek rich lives. Here I shall examine the relationship between changes in nature and human activities, our understanding of the Earth's environment, and levels of life satisfaction as the premises upon which this discussion is based. From each of these premises I will also introduce and examine the general concept of "environment-related QOL" for posing the question of how the environment ought to be for humans.

2. Premise 1— Human Activity and Changes in Nature

It goes without saying that modern civilization has developed based on science and technology. The technology which on the one hand has brought comfort to human society has on the other hand damaged natural environments through global warming, the pollution of the oceans, and radioactive contamination, for example. In short, human activity itself has occasionally exploited nature and occasionally destroyed that nature.

This is in one sense the double edged nature of technology. The development of technology directs humanity towards a mode of existence in conflict with nature without our realizing it. For instance, humans form cities surrounded by concrete, build tall buildings, and reside and live in these buildings. Our technology has allowed us to take various measures in expectation of earthquakes and severe storms. However, nature is not to be contained within the confines of human imagination. Changes in nature exert a significant pressure on us as humans and occasionally wreak damage upon society in the form of natural disasters. In short, changes in nature can become "negative elements" for human society.

Earthquakes, one of these natural disasters, are natural actions which have occurred over a long time span and for the Earth these are "normal" changes which have been repeated over and over throughout its 4.6 billion year history. This is the same for the living organisms which reside on the Earth. Earthquakes are "natural disturbances" and they result in "ecological disturbances." In short, ecosystem extinctions and regeneration and new creation occur as a result of the Earth's activity and from there new ecosystems are formed in nature. Individual organisms

face the problems of how to confront nature (exposure), how much change in nature they can endure (vulnerability), and how well they can recover their original state once they have been disturbed (resilience).

Earthquakes cause great loss for human activities, such as in the destruction of buildings and the loss of life. In this sense earthquakes are a "negative element" (a hazard) for human society. However, humans develop within nature and we inevitably confront environmental disturbances as we sometimes encroach upon nature to make a living. Consequently, just as with other types of organisms, humans face the problems of exposure to nature, vulnerability to nature, and resilience to natural disasters (such as earthquake disasters). Actually, in so far as humans have exploited nature for their livelihoods, spaces of human life are exposed to nature and are vulnerable.

Even so, human intellect has striven to cope with nature. Continued efforts have been made at self-restraint in human actions which cause changes to nature such as with global warming. It is difficult to prevent natural disasters such as earthquakes, but people have taken measures at disaster prevention and disaster reduction in order to at least try to curb the damage.

However, nature normally has self-cleaning abilities. If human activities exceed the nature's capacity and if this develops into something irreversible, human ability will not be able to call forth the "resilience" of the Earth. In this sense, we have no choice but to consider the fact that we have entered a period for looking at our civilization in a new light. In short, we must think about global sustainability.

3. Second Premise — Seeing the Global Environment in a New Light

A number of movements have developed across the world in response to global changes in the environment. Below I introduce two recent efforts to deal with environmental problems.

(1) The Anthropocene

In 2000, Nobel Prize laureate Paul Crutzen, together with Eugene F. Stoermer, proposed the concept of the "Antropocene." [1] This concept refers to the current geological situation on Earth. The geological epoch in which we currently live is called the Holocene. However, Crutzen argues that the remarkable progress of recent human activity has created a new stage in global history. Indeed, humans have increased their consumption of the Earth's resources, increased emissions of CO_2 and nitrogen oxide, and caused atmospheric pollution. In addition, humans have caused new compounds to accumulate in the environment in the current period. Humans already have the ability to exceed nature's capacity for revitalization and have transformed the Earth as its new rulers. Up to the present period, natural changes created geological changes and these changes accumulated in the Earth's strata. However, in the present period, the results of human activities have engraved themselves in the Earth's strata—this is the period referred to as the "Anthropocene."

Crutzen and Stoermer tried to detect the beginnings of the Anthropocene in the Industrial Revolution of the 18th century. This is because one can see significant influence on the Earth by human activity over more than 200 years beginning with the invention of the steam engine. They were concerned about the continued prosperity of the human race in the Anthropocene and they pointed out that the current period is one of global crisis for humanity. [2] We are in need of environmental management that is globally sustainable.

On the topic of the Anthropocene, J. Zalasiewiez relates the following, although it is meant somewhat ironically. [3] After tens of thousands of years, we will find things in the stratum of what we call now the "Anthropocene" such as concrete, plastic, and radioactive materials and new compounds which did not originally exist in the natural world. Furthermore, there will be archeological sites such as mining tunnels and the remains of urban subways. And the artificial heart valves and joint replacements seen in the bones of excavated humans serve as proof of human technology.

The problem here is what has caused the change in the Earth's environment. If the Anthropocene comes to an

end in the far future and the cause of this is human science and technology, that is exactly the problem. In this sense, we can possibly understand the concept of the Anthropocene as a warning bell for modern civilization.

(2) Planetary Boundaries

Another movement can be seen in the "planetary boundaries" proposed by Johan Rockström and his colleagues at the Stockholm Resilience Center. [4)]

As indicated above, modern civilization is rooted in science and technology and has put more and more of a burden on nature. As a result, it has caused critical changes in ecosystems and climate changes such as global warming. Rockström states the following. "During the Holocene, environmental change occurred naturally." Because these changes arose within the scope of the capacity of the Earth's system, the rich natural environment enabled the development of human beings. However, while science and technology have on the one hand provided rich lives to human beings, they have at the same time burdened the environment through excessive development that exceeds the Earth's capacity. Science and technology have thus robbed the Earth of its resilience.

Working from this perspective, Rockström gives the following nine processes and examines the boundaries of the Earth's system. These indicate the boundaries (limits) at which humans can live without problems on the Earth.

Process 1 Climate change
Process 2 Ocean acidification
Process 3 Stratospheric ozone depletion
Process 4 Nitrogen and Phosphorus cycle
(4a - Nitrogen cycle (part of a boundary with the Phosphorus cycle))
(4b - Phosphorus cycle (part of a boundary with the Nitrogen cycle))
Process 5 Global freshwater use
Process 6 Change in land use
Process 7 Rate of biodiversity loss
Process 8 Atmospheric aerosol loading (not yet quantified)
Process 9 Chemical pollution (not yet quantified)

Rockström sets the thresholds and quantitative indices for these processes as the range within which humans can safely live without exceeding the capacity of the Earth's system (however, processes 8 and 9 have not yet been quantified). As a result, Rockström indicates that we have already exceeded the Earth's boundaries for processes 1, 7, and 4a. He expresses his concern that climate change from process 1 is headed towards irreversible climate change as a result of radiative forcing and the concentration of CO_2 in the atmosphere which are causing global warming. On the other hand, ecosystems are significantly contributing to the maintenance of the Earth's environment. Consequently, the loss of biodiversity from process 7 increases the vulnerability of terrestrial and aquatic ecosystems and increases the vulnerability of the natural environment such as climate change and the acidification of the oceans. Furthermore, in the nitrogen cycle of process 4a, the increase in nitrogen oxide emitted by industries, including from the use of agricultural fertilizers, weakens the resilience of ecosystems.

Rockström does not reference the Anthropocene in this article, but he rings a warning bell about the human activity today that is having a major effect on maintaining the conditions of the Holocene. The thresholds presented by the planetary boundaries are boundaries for preventing irreversible change that would make the Earth's environment lose its resilience. In order to maintain the Earth's environment, we need to coexist with nature so that human activity and the capacity of nature are kept in balance.

4. Third Premise — Human Life and the Earth's Environment

(1) Raising an issue as to How the Environment is Understood

Human civilization is standing at a crossroads. This is because global sustainability is tied to both human activity and the natural environment. Consequently, we must consider the following two points.

"Humans seek to maintain their livelihoods (i.e. civilization) and to make further progress."
"Humans need to conserve and maintain the natural environment which surrounds them."

These issues contain elements that are fundamentally opposed to one another. As Rockström points out, the natural environment of the Holocene period enabled the high level of development of civilization. However, it is a fact that the progress of technology beginning in the 18th century has damaged nature and caused a variety of problems. For instance, the climate change which we are currently experiencing and which resulted from the development of civilization has brought natural disasters to human society and humans are frantically trying to cope with this. How can humans pursue abundance in their own lives while maintaining the natural environment? A breakthrough solution is needed to secure rich lives for humanity while maintaining the natural environment.

Humans fundamentally seek satisfaction in their lives—their own civilization. This satisfaction is not simply individual but rather is desired on the level of society. This is because individuals value future society for how it will extend their own lives and they hope for the continuation of society. However, the continuation of today's society will at the same time also cause a crisis arising from the destruction of the natural environment. Thinking in this way, we must be conscious of the environment in our values of human life in order to make the above two points simultaneously possible. Said differently, we must incorporate the maintenance of the environment as part of human life and tie this into satisfaction as a whole.

(2) About QOL (Quality of Life)

Today we use QOL (quality of life) as a concept to express one's life satisfaction. The "life" in quality of life expresses "the essence of human existence as it relates to life and death" on the one hand and "the conditions of one's everyday life" on the other. Consequently, QOL means "the quality of human existence and life." For instance, in terminal medical care QOL refers to good living condition for the patient. Even if the patient is facing death, one honors that person's humanity and aims to improve their life so that they are able to enjoy what remains of their life.

In this way, QOL is often used for health and medicine, but historically this has not always been the case. QOL in a broad sense refers to satisfaction and abundance in life generally, including daily life and work. In short, improving the QOL or increasing the QOL means that humans on an individual and society-wide level are able to have satisfying lives. The emergence of a concept similar to QOL is said to go back to the period of the Industrial Revolution in the 18th century. The Industrial Revolution in the United Kingdom promoted urbanization and industrialization, but amidst the poverty and environmental pollution of this period the ordinary people gained "a desire for a higher standard of living." As a result, QOL appeared as a way of thinking about "the difference between individual expectations and the reality of livelihoods."

However, as is well known today, President Nixon in the United Sates was the first to explicitly introduce the concept of QOL. The environmental problem of photochemical smog was already an issue of concern for citizens in the Johnson presidency. Accordingly, in the presidential election Nixon supported the improvement of standards of living through improving the environment, argued that "We need a high standard of living, but we also need a high quality of life", and clearly incorporated the concept of QOL into his policies.[5] Consequently, we can see that

the concept of QOL was historically first used to examine the richness of the environment in which humans lived.

In the 1970s QOL was discussed as happiness and satisfaction in the lives of individuals and in the 1980s it was developed in the field of health insurance. Even before then, WHO (the World Health Organization) played a significant role in the establishment of QOL standards in the fields of human health and medicine. Actually, in 1947 WHO defined health as follows.

> "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." [6)]

We could say that this definition is the prototype for today's health-related QOL standards.

WHO also defined QOL in the 1990s (WHOQOL).

> "WHO defines Quality of Life as individuals' perception of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectations, standards and concerns." [7)]

Currently WHO has determined six areas for the evaluation of QOL [8)] and has established 26 items as indices for the evaluation of QOL.

It is also understood from the above definition from WHO that QOL indicates an individual's satisfaction and sense of peace physically and mentally resulting from their perception of what a healthy life is. However, generally "there are no clear definitions for QOL." Many different kinds of QOL have been examined in research up to the present and even the name is not always the same. [9)] It is also possible to think of QOL as a "psychological volume" composed of people's subjective awareness.

Consequently, a "QOL for mankind" is possible conceptually, but it is neither realistic nor necessarily appropriate. Because QOL means a kind of "satisfaction" at the individual level, one has to clearly indicate one's targets and objectives. In short, the essence of QOL is considering satisfaction in concrete objectives that individuals are aware of in order for them to live their own life.

5. Towards the Introduction of Environment-related QOL

(1) Introducing Environment-related QOL as an Expansion of the QOL Concept

Based upon the concept of QOL from the previous section, I examine the possibility of pursuing a rich human society which incorporates the maintenance of nature in its values.

QOL is a concept which can be introduced across a wide section of human life. For instance, there is even research which defines "information-related QOL" as "a variety of kinds of satisfaction and soundness obtained through the suitable use of the user's information literacy in the information environment." [10)] In addition, there is research which has developed the "quality-adjusted life years" index for securing QOL in people's livelihoods and economic efficiency in the expansion of living space which accompanies urbanization. [11)] This research also examines "safety and security" for natural disasters. Furthermore, it is also possible to understand QOL broadly as an environment that is socially meaningful and which surrounds humanity. For instance, the EU defines quality of life as "8+1 dimensions." [12)]

This paper attempts to introduce environment-related QOL (eQOL) from the dual perspectives of "a rich human life and the maintenance of the natural environment." The concept of eQOL is based on global sustainability supporting today's civilization and human life. Human life is always vulnerable and exposed to nature. It is therefore closely tied to environmental problems and natural disaster. However, nature does more than threaten humanity. Rather, the problem that is important for humans is how to "enjoy" our coexistence with nature. eQOL

standards are a set of values and a measure for satisfaction obtained through the process of "enjoying" one's life sustainably within the given environment. Consequently, in eQOL standards for humans the simultaneous maintenance of global sustainability possesses equal significance.

(2) eQOL Constituent Concepts

In order to define an eQOL we need clear targets and objectives. Furthermore, we need constituent concepts in order to achieve an eQOL and we need a basis from which to judge whether the constituent concepts are reasonable and valid.

Perspectives on how people think about the natural environment are diverse and complex. When looking at nature as a physical subject outside of humans, nature is a resource for humans and an object of cultivation. At the same time, nature can become a threat to the continuance of human life. On the other hand, nature can also be a psychological support for humans, as in the ocean being a source of healing for humans. In the same way, nature may also be the target of tourism or recreation. Fundamentally, the meaning of nature differs according to the positional relationship of humanity to nature. This is because while there is a perspective which understands nature as an object to be controlled by humanity, there is also a perspective which regards humans as part of nature.

The following viewpoints have been determined by considering eQOL in response to each of these perspectives.

(eQOL (I) : e-QOL for the natural environment including the ecosystem
(eQOL (II): e-QOL for humans confronting the environment

Here, eQOL (I) means the maintenance of the natural environment. In short, this is a viewpoint which finds satisfaction and value in the maintenance of the natural environment independent from human activity. eQOL (II) means considering nature amidst its connections to humanity, both in physical and psychological terms. It is believed that in the end a perspective which combines these two will form a complete eQOL.

The following is a list of possible constituent concepts for eQOL.

[1] Physical Value for the State of Nature
[2] Mental and Emotional Value for the State of Nature
[3] Diminishment of Natural Hazard
[4] Social Value for the State of Nature

Here, [1] indicates on the one hand the maintenance of the natural environment as it is while at the same time meaning the maintenance of nature with consideration for human use. However, a major premise of this point is the coexistence of humanity and nature or, in another word, global sustainability. It is significant that [2] is fundamentally dependent on a consciousness of the personal value of nature. In addition, humans must always protect their own life from natural disaster. Therefore, [3] is also a major factor. And lastly, the social consciousness of value in [4] consists of the satisfaction that humans themselves derive from the maintenance of the natural environment in a way that coexists with humans.

Generally, QOL indicates the satisfaction of an individual in relation to a target. However, eQOL is not simply restricted to the individual level. This is because in the end we must consider the maintenance of the environment for the continuation of life for the whole of humanity. Even so, we must also consider the development of each step for eQOL, such as from the individual to the group or from the region to the whole (see Fig. 1).

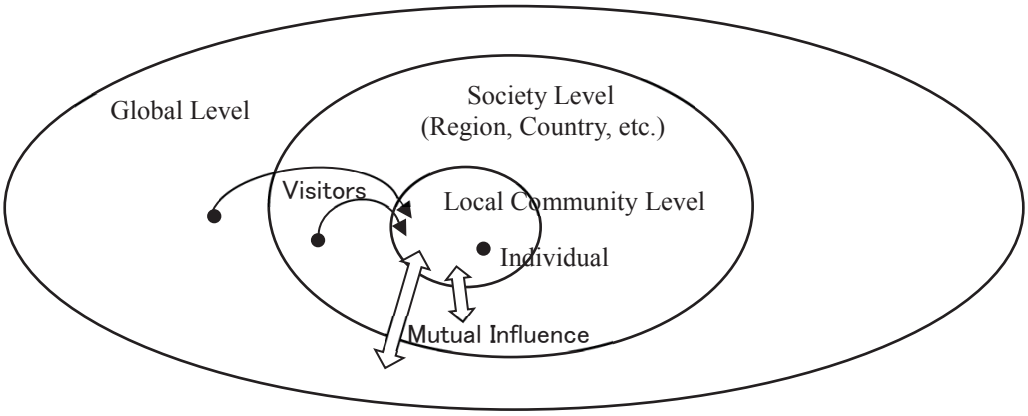
Step 1: Satisfaction from and consciousness of the value of the local natural environment in which one lives.
(Consciousness from the individual to the local community)

Step 2: Outsiders' satisfaction from and consciousness of the value of maintaining the natural environment in a region.
(Tied to the nurturing and development of one's own consciousness of value)

Step 3: Sharing among a wider area of satisfaction from and consciousness of the value of the natural environment in each local community.
(The diffusion of a consciousness of value from the individual to local communities to broader communities)

Step 4: Diffusion of several models at the country level and globally.

Here, I have considered the maintenance of the local environments in different regions at the individual and group level. This consists of the satisfaction of the local group (eQOL indicators). These will have external effects as well through tourism and educational activities. In this way eQOL standards, including many activities for the maintenance of the environment, will be cultivated and the standards will develop from a regional to a national or global scale.



(Fig. 1) Diffusion and Cooperation of eQOL

6. Conclusion

It is not easy to achieve both comfort for human activities and sustainability for the natural environment. This is because human activities are always confronted with natural threats (exposure and vulnerability). However, this does not mean that natural disasters consist only of negative elements for the humans who have formed cities surrounded by concrete through the high level of development of their material civilization. They provide opportunities to rediscover the fact that humans coexist with nature. For instance, because of the tsunami which exceeded 15 meters in height in the Great East Japan Earthquake in 2011, communities are now building breakwaters which can cope with this. However, there is no guarantee that the next tsunami will be limited to this scale. The barrier walls between the human and the sea (which provides food on the one hand and provides psychological healing on the other) themselves contain negative elements.

For that reason, the question of how humans will live in the natural environment is a problem tied to inner human psychology. It is here that we find the significance of examining environmental problems as a discourse on civilization.

Notes

* This article is based on the Research Report on Core-Project of Environmental Studies 2017: Hirano, Y. & Nakashima, T., "Research Report on the Core-Project 2017 of Mori-Sato-Kawa-Umi" (Woods-Field-River-Sea) – an essay on the concept of eQOL", *BUNMEI (Civilization)*, Institute of Civilization Research, Tokai University, No.22, 2017, pp.35−44, (in Japanese).

1) Stoermer had already coined the notion of "anthropocene" in the 1980s, in a sense, but took it up as a global subject with Crutzen in 2000.
Crutzen, P. J. & Stoermer, E. F., "The Anthropocene", *IGBP Global Change Newsletter*, 41, 2000, pp.17-18,
also see: Crutzen, P. J. & Stoermer, "Geology of Mankind", *Nature*, 415 (23), 2002,

2) Crutzen and Stoermer indicate the following factors as major catastrophes for our planet: 1) an enormous volcanic eruption, 2) an unexpected epidemic, 3) a large-scale nuclear war, 4) an asteroid impact, 5) a new ice age, and 5) continued plundering of Earth's resource by partially still primitive technology.

3) Jan Zalasiewicz, "A History in Layers", *Scientific American*, 315, 2016, pp.30−37

4) Rockström, J. et al., "A safe operating space for humanities", *Nature*, 461(24), 2009, pp.472−475

5) Richard Nixon, 221 - *Statement Announcing the Creation of the Environmental Quality Council and the Citizens' Advisory Committee on Environmental Quality May 29, 1969*
http://www.presidency.ucsb.edu/ws/?pid=2077

6) "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.",
quoted from "*CONSTITUTION OF THE WORLD HEALTH ORGANIZATION*" (Basic Documents, Forty-fifth edition, Supplement, October 2006)
http://www.who.int/governance/eb/who_constitution_en.pdf

7) "*WHOQOL Measuring Quality of Life*" (1997)
http://www.who.int/mental_health/media/68.pdf

8) 1) Physical health, 2) Psychological health, 3) Level of Independence, 4) Social relationship, 5) Environment, 6) Spirituality/ Religion/Personal beliefs

9) e.g. HQOL: health-related QOL, NHQOL: non-health-related QOL

10) Kazuaki Miyamoto & Soichi Sakabe, "Development of Information-related QOL in Information Society", *Socio-Informatics*, "Nihon Shakai-Joho-gakkai Zenkokutaikai ronbunnshu", The Society of Socio-Informatics, 22(0), 2007, pp.186−189

11) Noriyasu Kachi et al., "A Quality of Life Index Measured by Life Year for Evaluating Residential Areas and Its Application to Examining Policies to Control Urban Sprawl", *The Japan Society of Civil Engineers*, Vol.62, No.4, 2006, pp.558−573 (in Japanese)

12) Homepage: "*Eurostat (Statistics Explained)*"
http://ec.europa.eu/eurostat/statistics-explained/index.php/Quality_of_life
The indices of QOL are fixed as follows:
1) material living condition 2) productive or main activity, 3) health, 4) education, 5) leisure and social interaction, 6) economic and physical safety, 7) governance and basic right, 8) natural and living environment, 8) overall experience of life.

Reference

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Hirano, Y., & Nakashima, T., Research Report on

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