

The Human-Survivability Studies: A Personal View on the Inevitability, Practice, and Prospects

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6 Nov 2023

Introduction

We proposed the **Human Survivability Studies (HSS)** at the Graduate School of Advanced Integrated Studies in Human Survivability, Kyoto University in 2012 as a **trans-disciplinary research** combining natural science, humanities, and social science perspectives to solve global issues for the survival of humankind.

Based on nearly a decade of research on the HSS, we present an overview of **the needs, requirements, organization, and goals of HSS**. In parallel, we propose **the complementarity principle**.

We present the **Blockchain-based Token Economy**, which functions as a decarbonized society to solve an energy issue, as a case study of HSS. It examines the nexus of energy, environment, and economic growth.

Finally, we discuss a **value system** to replace GDP growth by increasing social fairness and well-being.



Needs of the HSS

Today's **energy issues**, as represented by renewable energy, are highly complex and have many different aspects. Because of the many aspects of the issue, it is difficult for any discipline to understand the nature of the energy issue.

For example, electrical engineers analyze power system engineering and study the elemental technologies of various devices. Economists concentrate on the economics of power systems and the institutional design of electricity markets. Environmentalists point out the danger of rising temperatures and sea level rise due to increased greenhouse gases.

Undoubtedly, **these individual studies are essential, but the actual implementation of the recommendations suggested by these studies may need to be revised with the implications of other studies.** Such contradictions are severe, and a methodology is required to resolve the various contradictions and obtain higher-order solutions.

Such a methodology can be possible by a trans-disciplinary research approach for energy issues using **data science, computational science, network science, economics, and humanity**, for example.



Concept of the HSS: Requirements

The following “ **three criteria** ” can be used to distinguish HSS from other types of research.

- **Aims to find solutions to complex global issues.**
- **Integrates the perspectives of natural science, humanities, and social science at Kyoto University.**
- **Implements the academic research results in the real world.**

When we proposed the HSS, we only sought to be aware of the overall structure of education and research at Kyoto University.

In other words, we intended from the outset that the HSS would be positioned within the education and research system of Kyoto University.

We adopt a trans-disciplinary research approach, identified as (1) Problem focus, (2) Evolving methodology, (3) Collaboration [Wickson2006].

The trans-disciplinary research approach is highly compatible with our HSS criteria.

Organization: Trans-disciplinary Research Groups

Human Survivability Studies Research Group is a meta-research group that discusses synergies and trade-offs of results from 11 trans-disciplinary research groups.

Earth & Planetary
Environmental Disaster RG

Network Society RG

Mindful Living RG

Sustainable Economy
RG

International
Development RG

**Human
Survivability
Studies RG**

Natural Resources and
Energy Policy RG

Future Wisdom RG

Global Commodity
Issues RG

Global Political
Economy RG

Green Chemistry &
Circular Economy RG

Global Health Design
RG

Organization: Social Innovation Center

Students and faculty members working together in the 11 trans-disciplinary research groups have produced valuable research results. However, is it just academic research results that are being disseminated? **Isn't it necessary to apply the research results to society, even on a small scale?** The Social Innovation Center (SIC) at GSAIS, Kyoto University, was established in 2021 with that purpose in mind.

The Social Innovation Center works in collaboration with faculty members from other graduate schools and research institutes of Kyoto University to apply research results on complex global issues to society. The work of SIC focuses on five research areas, namely **(1) blockchain, (2) human space science, (3) water, energy and disaster prevention, (4) well-being, and (5) Chem-bio-economy**. In addition to publishing the results of our academic research, we would like to do more to apply our research results to society and to create know-how to find “solutions to global issues”.

Ultimate Goal

As of today, there is no concrete methodology for the integration of traditional fields of disciplines. If there is a research methodology unique to HSS, it is "**discipline integration**" i.e., a methodology for integrating fragmented fields of disciplines.

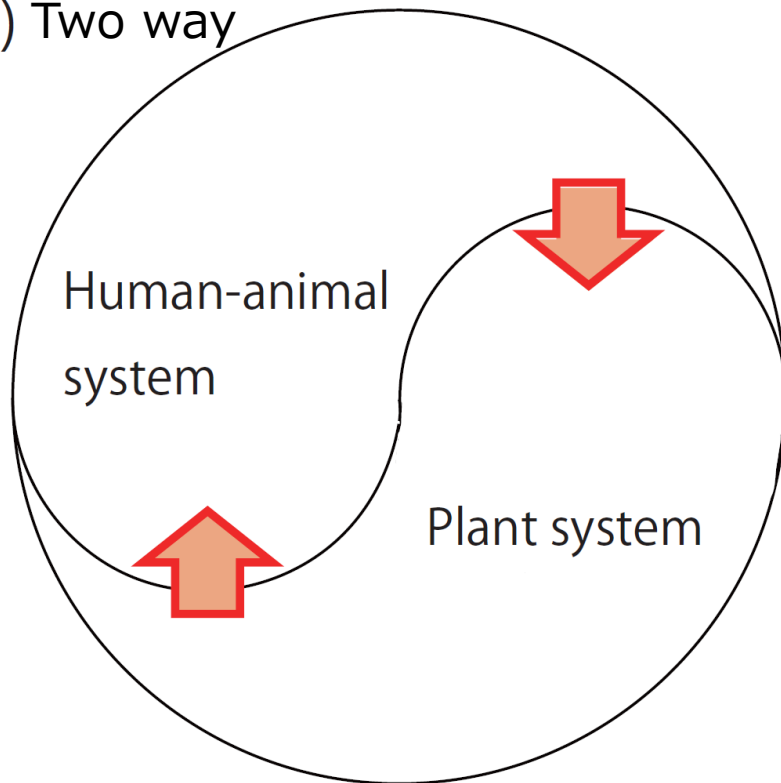
The discipline integration does not mean a mere combination of disciplines. **The ultimate goal of HSS** is to construct a concrete methodology to integrate disciplines that have yet to be thought of so far and to systematize **the general theory of discipline integration in axiomatic form.**

Our goal is not to create a new discipline but to establish a methodology for discipline integration. This methodology will enable us to make a significant social impact systematically.

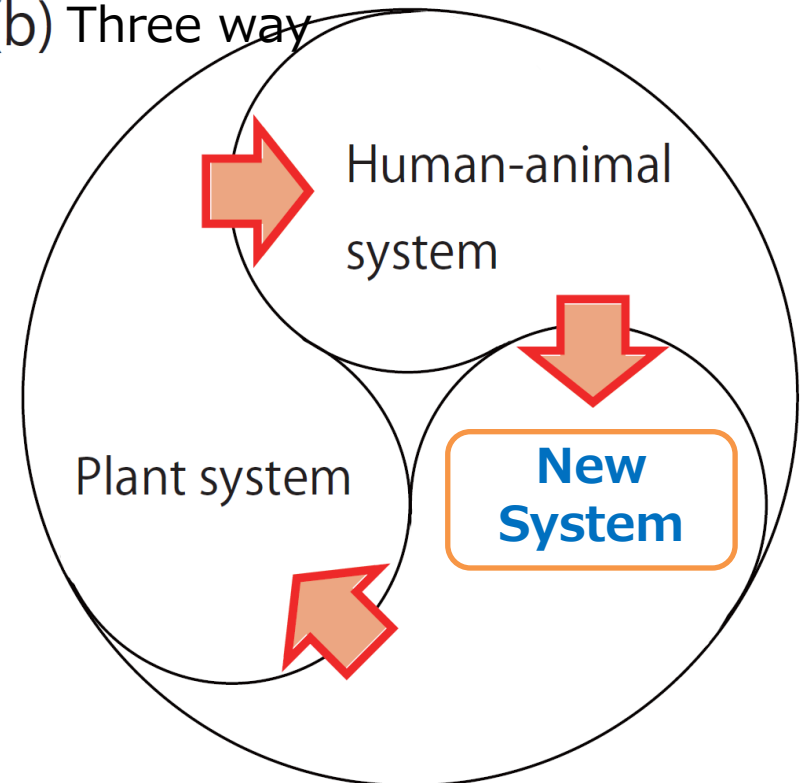
Practice: Complementarity

Performing “discipline integration” with only “three criteria” is difficult. For this reason, an additional guiding principle is necessary. **As a guiding principle, we propose complementarity.**

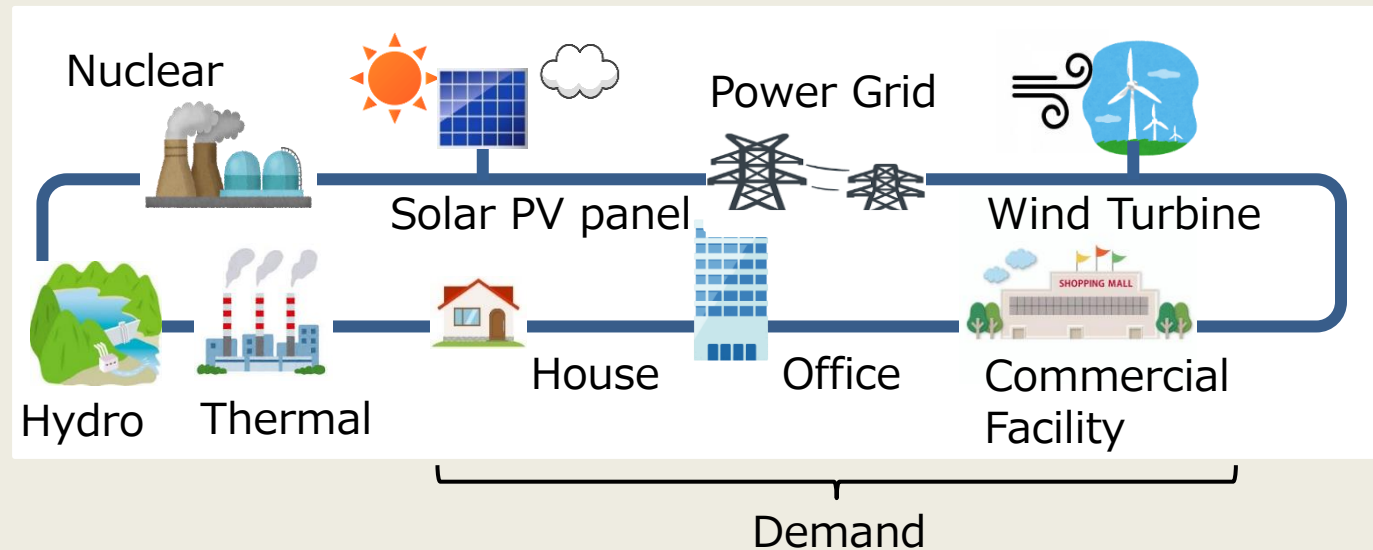
(a) Two way



(b) Three way



Practice: Today's Power Grid



Practice: HSS guided by Complementarity

□ Data Science

Stochastic modeling of output time-series of renewable energy

□ Computational Science

Linear programming to minimize the investment cost of the power system

Combinatorial optimization for evaluating the stability of the grid operation

System dynamics modeling of grid flexibility

□ Network Science and Informatics

Blockchain-based token economy

Improving well-being with **Living Environment Monitoring System**

□ Economics

Carbon offset mechanism and FDI

Decentralized finance for renewable energy token trade and carbon pricing

□ Humanity

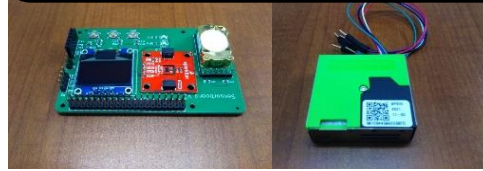
New value system(social fairness and well-being) instead of GDP growth

Practice: Decarbonized Society as "New System"

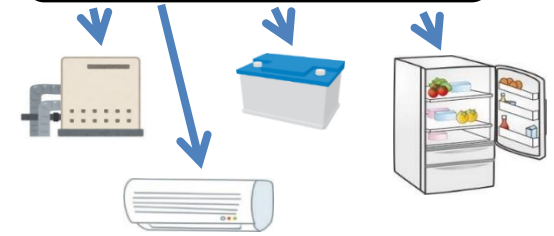
Well-being in Aging Society



Living Environmental Monitoring (temp, humidity, CO₂, PM2.5)



Smart Meter & HEMS controller

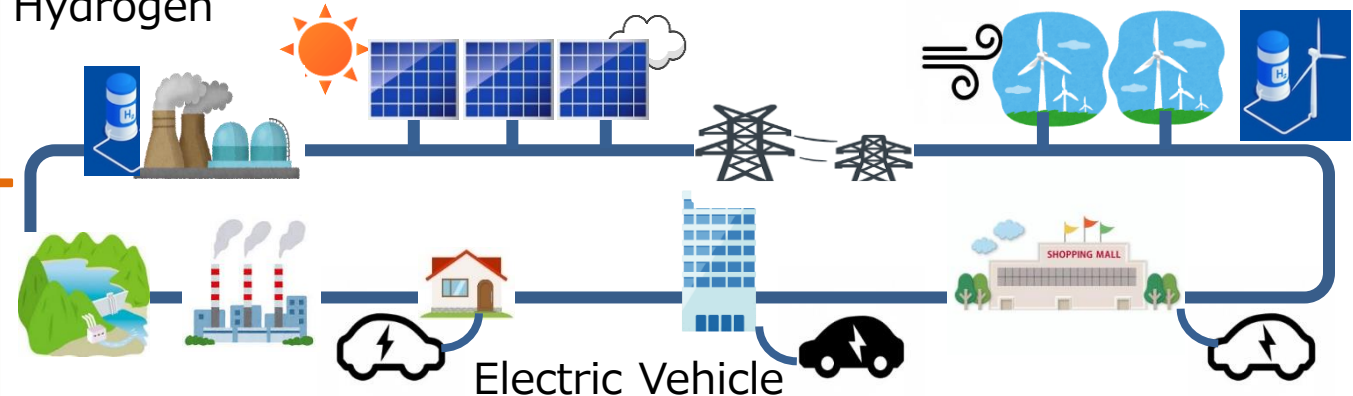


Blockchain-based Token Economy



Decentralized Finance

Hydrogen



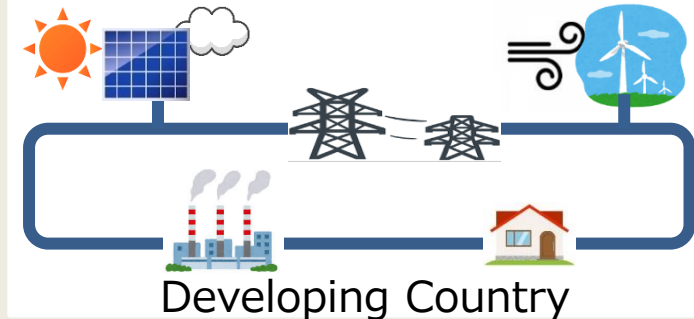
Electric Vehicle

Development Economics

Carbon Offset Mechanism



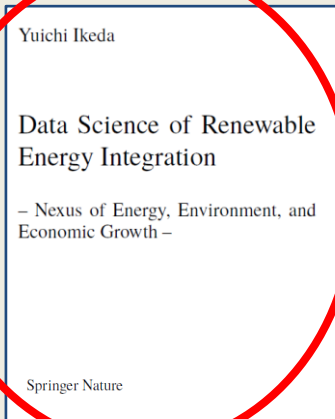
Foreign Direct Investment



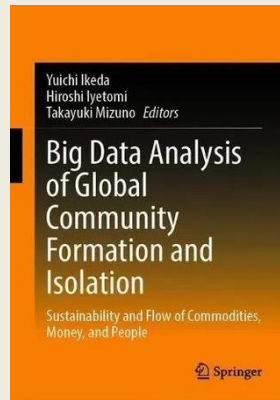
Developing Country

Personal History of Discipline Integration

Forthcoming



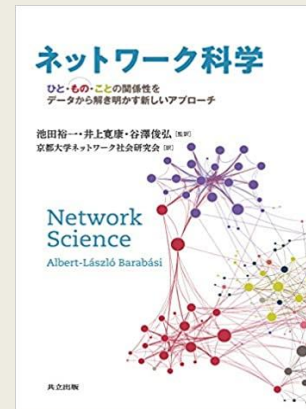
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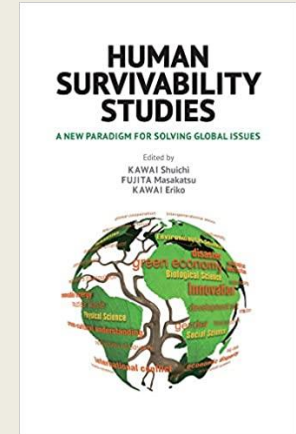
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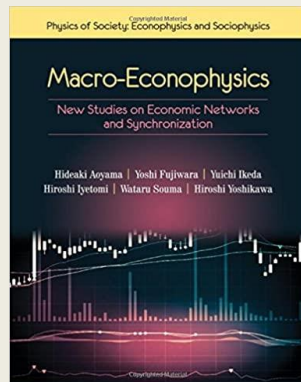
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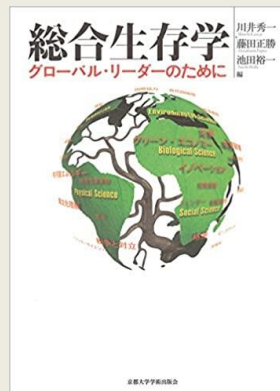
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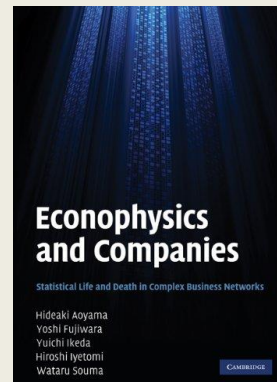
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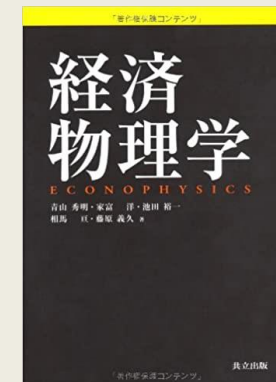
2015 Jun



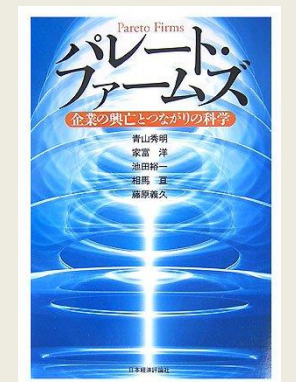
2010 Aug



2008 Oct



2007 May



Prospects for the Future

Today, the welfare that people pursue will not be economic wealth as represented by GDP but **social fairness and well-being**. We must establish quantitative measures or proxy variables to express social fairness and well-being.

To consider measures of social fairness and well-being, the "**old values and social norms**" that we discarded in industrialization in the 20th century may provide a hint. It seems that the following three values that have existed in Kyoto for a long time are essential:

[Value1: **KIWAME**] To sharpen everything to the ultimate limit

[Value2: **MOTENASHI**] A warm welcome to new commers

[Value3: **SHIMATSU**] An attitude of moderation and frugality in life

When these three values are restored, our objective will no longer mean "economic growth" but a concept that means an increase in social fairness and well-being. Thus, based on the value system, the "new system" will be built to enhance the sustainability of human society.

As a successful case study in HSS, we will propose and implement specific technologies, systems, and policies to realize such a future.

Summary

- ❑ We presented an overview of the needs, requirements, organization, and goals of HSS.
- ❑ Performing **discipline integration** with only **three criteria** is difficult. We proposed **complementarity** as a guiding principle of the HSS.
- ❑ We presented the **Blockchain-based Token Economy**, which functions as a decarbonized society to solve an energy issue, as a **case study of HSS**. We confirmed that complementarity is a functional guiding principle of the HSS.
- ❑ Finally, we discussed a value system to replace GDP growth by increasing social fairness and well-being. **We need more discussion on the value system.**

Thank you for your attention.

