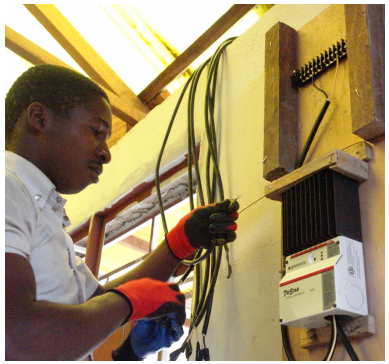
ISAP'2014, July 23-24, 2014, Yokohama

Project-Based Learning for Fostering Global Environmental Leaders





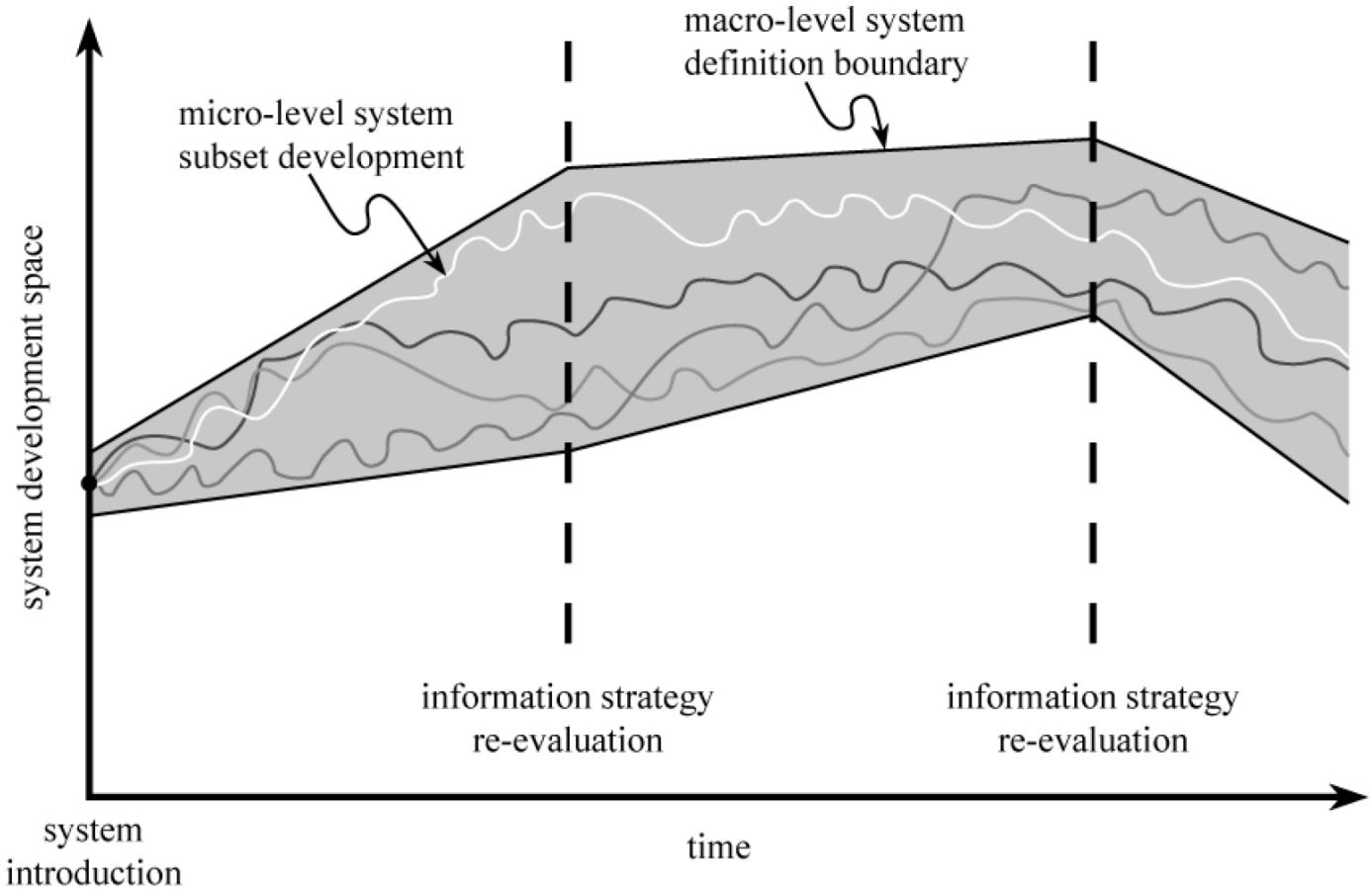



Wanglin Yan, Keio University
(yan@sfc.keio.ac.jp)

Climate Change Mitigation and Adaptation

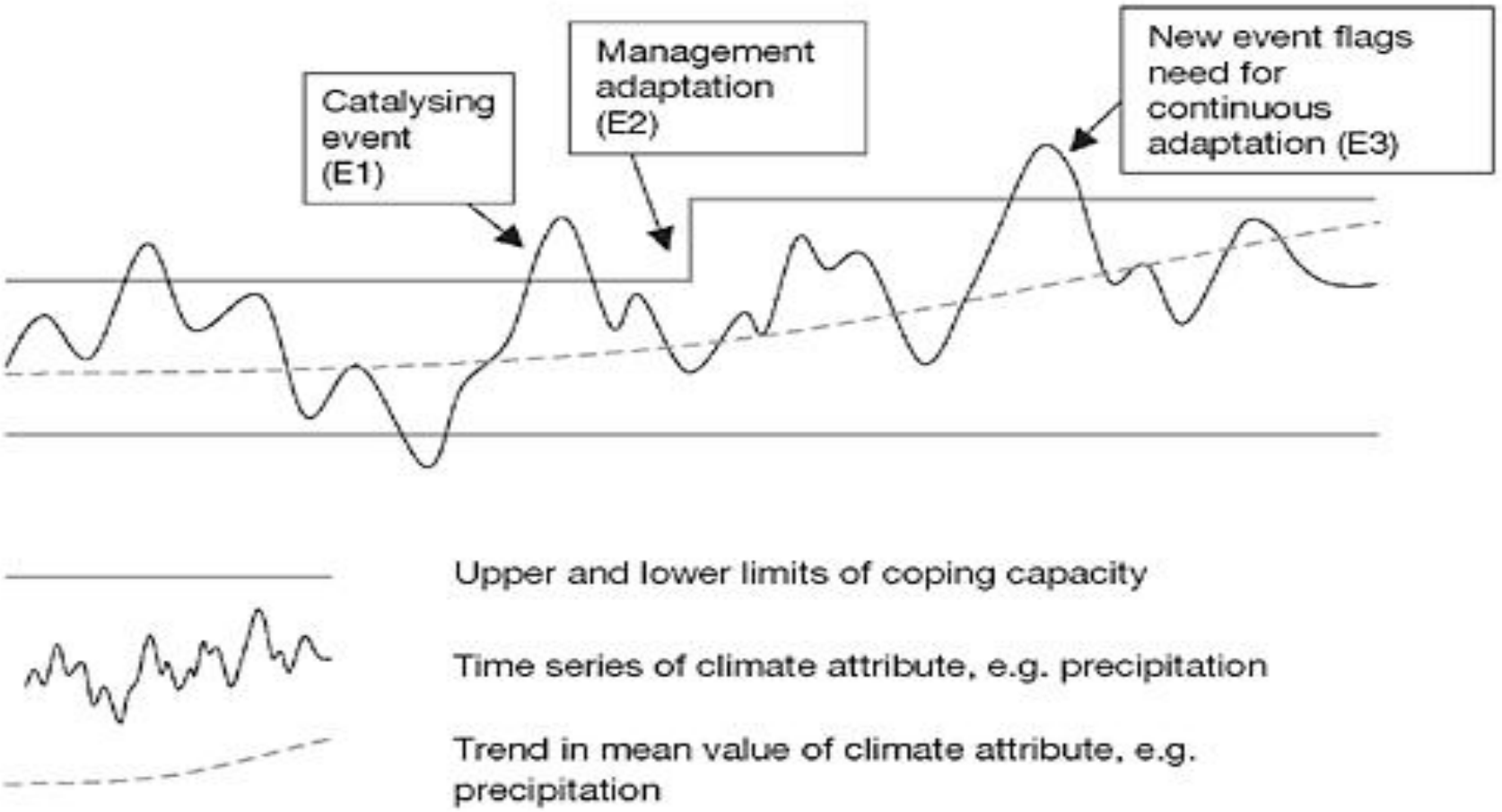
- Mitigation
  - The International Panel on Climate Change (IPCC) defines mitigation as: **"An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases."**
- Adaptation
  - The IPCC defines adaptation as the, **"adjustment in natural or human systems to a new or changing environment."**
- Mitigation and Adaptation
  - While mitigation tackles the causes of climate change, adaptation tackles the effects of the phenomenon.

What is Adaptive Development?



– *Benson et al., 2010, Proceedings of the 7th International ISCRAM Conference, Seattle, USA, May 2010.*

Adaptive Development to Climate Change



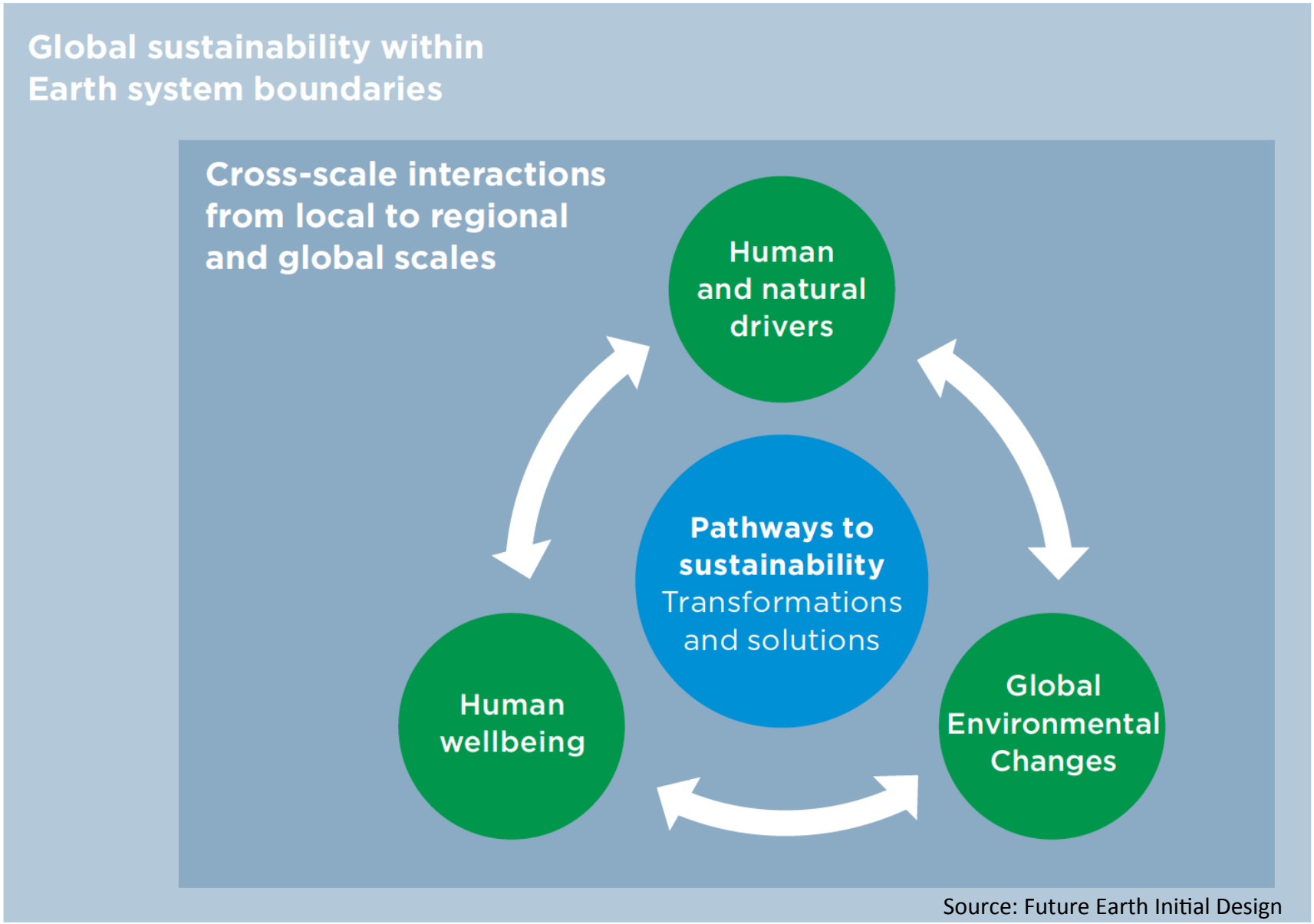
Pelling, Mark. 2011. *Adaptation to Climate Change: From Resilience to Transformation*. Routledge. http://www.amazon.co.uk/Adaptation-Climate-Change-Resilience-Transformation/dp/0415477514.

Adaptive Development

- Adaptive Development adjust the way of development to global change.
  - >Mitigation
- Adaptive Development adjust the way of development to local conditions.
  - >Adaptation
- Adaptive development supports ongoing improvement through user-driven design and modification in the target environment.
  - >Demand Driven

Requires university changing their ways of research and education.

Adaptive Development is a pathway to Future Earth



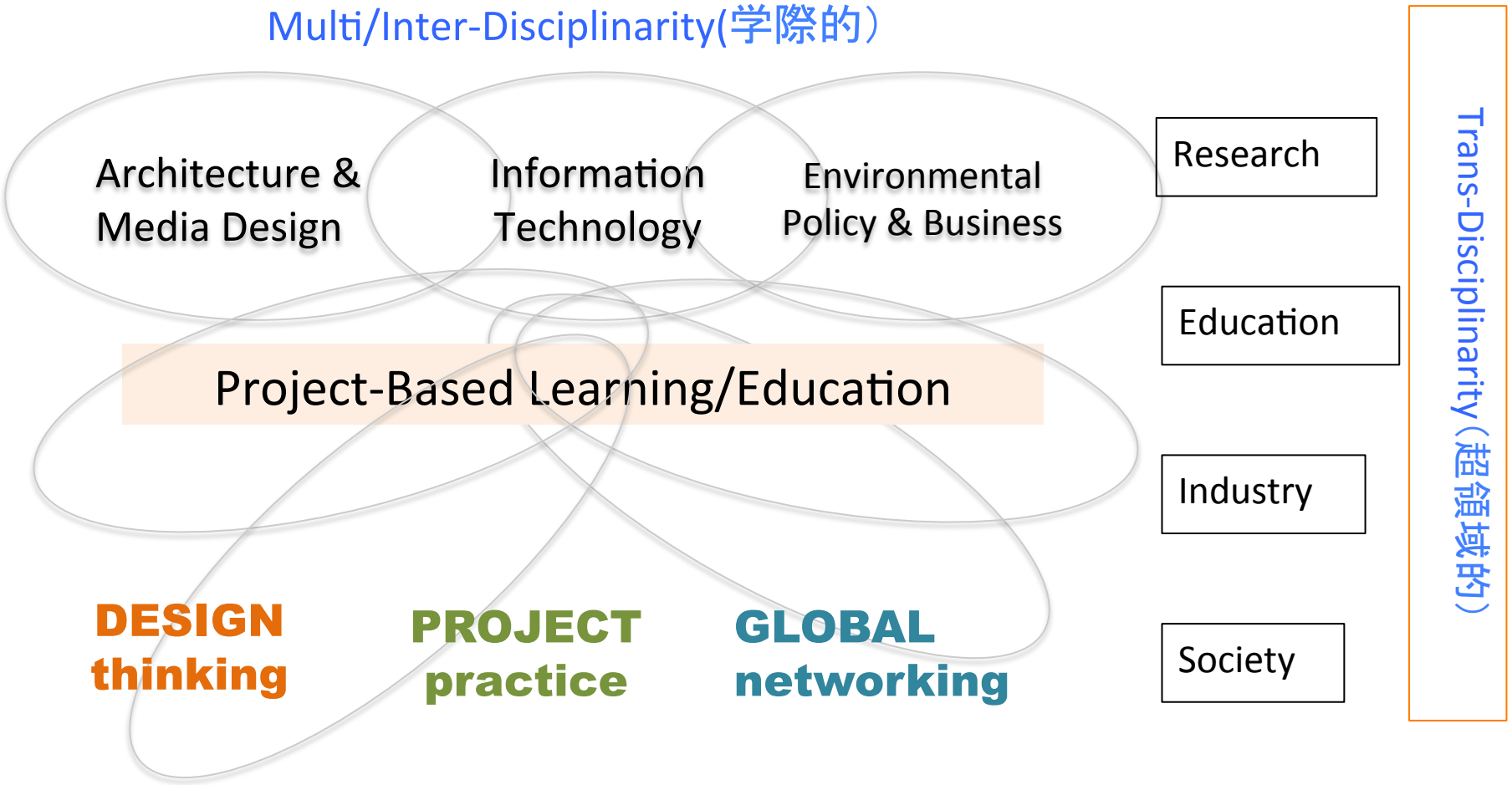
Source: Future Earth Initial Design

Capacity Building is Key in Practice

- Capacity building is an issue and challenge to all stakeholders: scientists, policymakers, businessmen, and residents etc.
- Dedicated capacity building actions will include **building a strong international network of scientists committed to international interdisciplinary and trans-disciplinary research**, a particular focus on early-career scientists and the development of institutional capacity.
- There will be a strong emphasis on enhancing science capacity in lesser developed countries, with regional partners playing an important role.

– Source: Future Earth Initial Design

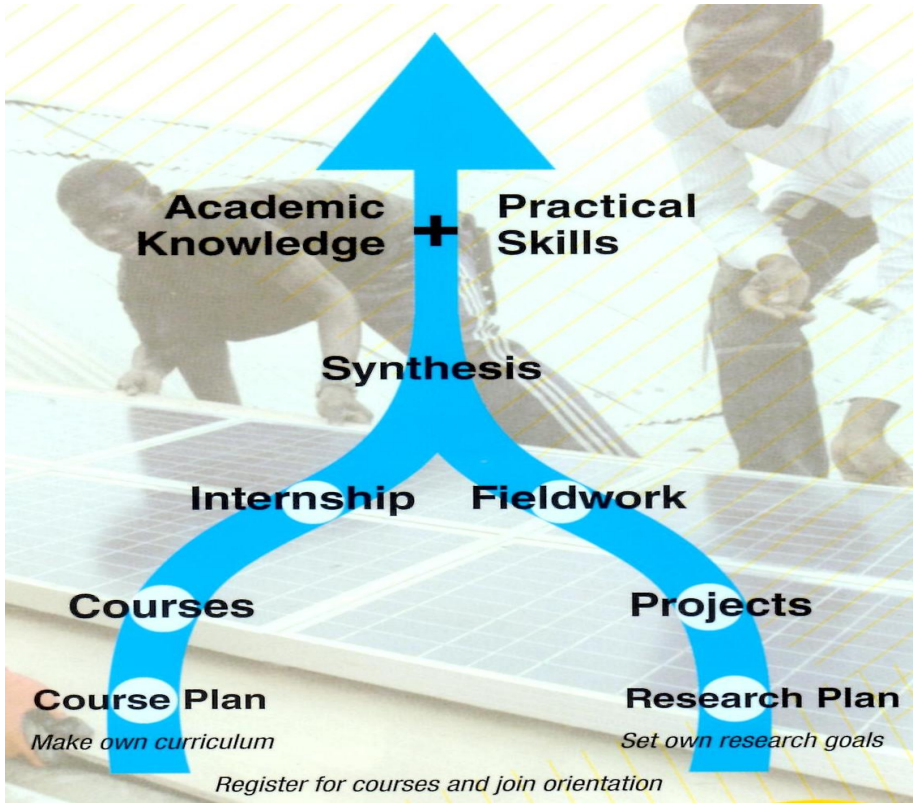
Capacity Building at Keio University
Project Based Learning for problem finding and problem solving



- Our Concept: Fostering Global Entrepreneurs and Innovators with capacity of
  - ①Creativity with Design Thinking, ②Leadership of Project Practice, ③Networking Capability

Project-Based Learning at Keio University

- Shonan Fujisawa Campus (SFC) was built 20 years ago based on information technology and multidisciplinary approach that would train students to take on the challenges of the 21st century.



- Core works, including fieldwork and internship, create a shared foundation for all students.

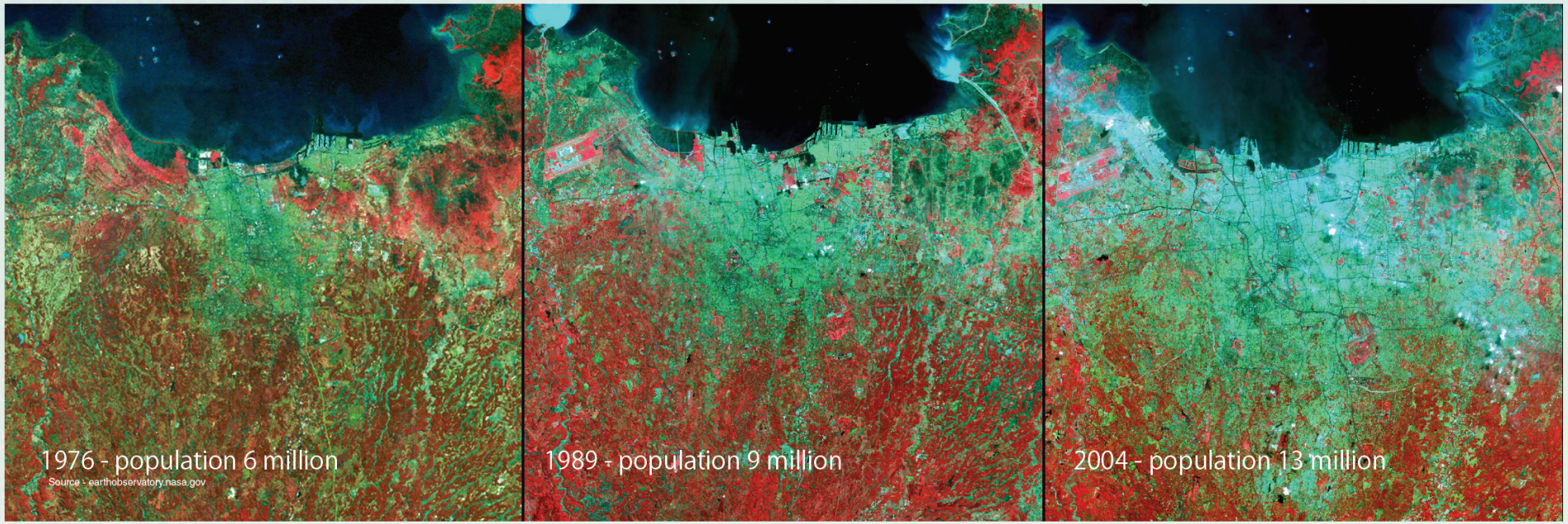
- Studies at SFC are project-based in the fields of environmental policy, environmental science, low carbon society, environmental business, architecture and planning, and communication technology.

- Projects are undertaken by students on their own and with professors as a way of testing ideas developed in the classroom.
- In the process, the students learn how to make plans that span the gap from concept to implementation, how to work with communities, and how to organize their efforts to be efficient and to obtain useful results.
- The outcome can be scientific research, policy formulation, building design, or something entirely new.

Project①

Urban growth and Biodiversity, Jakarta, Indonesia

Professor Tomohiro Ichinose, Satoru Itagawa (PhD Candidate)



The Challenge

Our group intends to look into biodiversity in Megacities that are located in the Asian monsoon region, in cities and its vicinity. The Aichi Target of COP10 is to examine dynamics of biodiversity by the year 2020. Therefore, the group intends to come up with an evaluation method, or indices, that reflect the reality of urban biodiversity. At a macro level, land use, community blocks, and other data based on satellite images are in focus."

If we look further into this problem, dragonflies and other kinds of living things need a certain level of environmental quality in order to survive, so at a micro level, we have to examine water quality, surrounding biota, river dike structures, and other factors that make up the real environment, and consider the relationship between dragonflies and the environment.
In rural area around Jakarta there are a lot of reservoirs or ponds for irrigation, for aquaculture, for drainage, and other purposes. These water areas are becoming a part of urbanized areas, but continue to be home to various animal species and are potentially rich in biodiversity. It is therefore necessary to examine small ponds, some smaller than a room, and examine the appearance of dragonflies.

Indonesia is a flood-prone country, having many dams, reservoirs, and the like. As part of disaster prevention policy the infrastructure is typically made from concrete and are not particularly attractive. In reality, however, people gather at the water front, in order to talk or simply to relaxing. The water front is in fact a very precious amenity.

The water is an essential element in forming a community. There are researchers in our group who are looking into the water quality and the utilization of reservoirs, and it may be possible to find some shared mental image regarding water spaces that people hold in the community. There are people in Jakarta fishing in ponds and rivers as a hobby or, sometimes, actually as food. It may be possible to evaluate biodiversity from this angle.

The idea of the future city emerges through back-casting, which, starting from an ideal image of the city, looks into what we should be doing now to arrive at the goal. Such an image can also be obtained by forecasting, assuming that urbanization would proceed like other cities' experience. However from the point of view of preserving biodiversity, back-casting should be the methodology. As Jakarta develops, it should be possible to set a goal and approach a set target.

Project①

Urban growth and Biodiversity, Jakarta, Indonesia

The challenge is to find a way to grow a city that is just and civil, and that preserves a healthy environment that is rich in biodiversity. In such a case health might be improved by maintaining existing biological systems as the city grows. How to do that is the chief problem, as the actors are diverse and the desires in conflict.

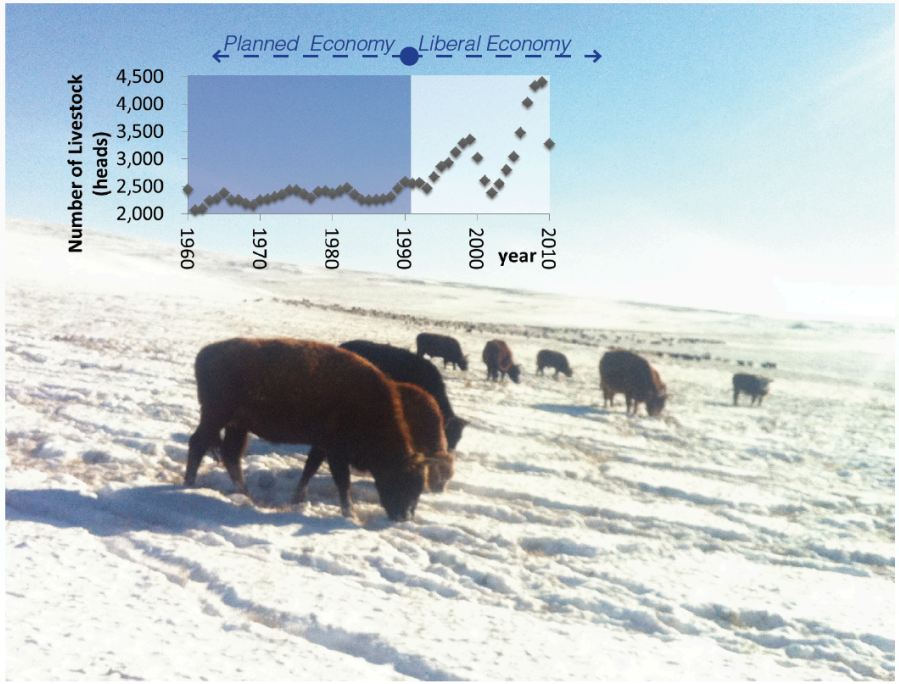
"The project was started in 2009 as an attempt to evaluate the growth of Mega Cities in Asia, to tell a story about them. The environment was one of the focal points, but originally, the topics included heat islands, water quality, and other physical characteristics of the environment. The approach [at that time] was was solely scientific or engineering. I myself was interested in living things, such as dragonflies and I was invited to join the research team." **Tomohiro Ichinose**

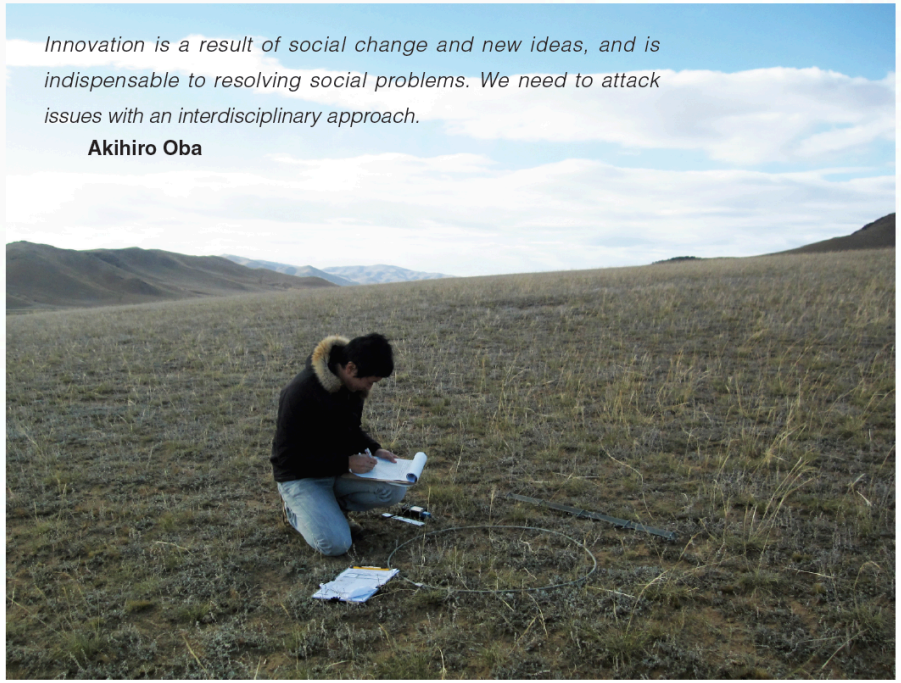
Project②:

ISAP'2014, July 23-24, 2014, Yokohama

Early Adaptation to Climate Change in Mongolia

Professor Wanglin Yan, Akihiro Oba (PhD Candidate)





The Challenge

From the point of view of the government one of the most difficult problems is to maintain conditions so that the traditional nomadic lifestyle does not become impossible. Herding is responsible for some 35% of the employment and when climate or economic effects make it unsustainable an inflow of immigrants into Ulan Bator (the capitol city) or other urban areas chokes the environment and stresses the urban economies. Managing urban problems begins with managing rural ones.

Mongolia is vulnerable to climate change due to its impacts on water and forage resources. Mongolia is also a country in economic transition towards the market. Mongolia will continue to experience dramatic changes in the seasonality, amplitude, and variability of temperature and precipitation regimes, leading to dry-land degradation and desertification. Pastoral social-ecological systems are changing due to climate change and market forces.

Under the combined pressure of climate change and intense human use of natural resources, the natural environment and human lifestyle of Mongolia is changing rapidly: Gobi desertification, permafrost melting, biodiversity loses, poverty of nomadic herders, loses of livestock, decreases of water sources due to evaporation of semi-arid land, degradation of pasture rangeland, overgrazing, migration to urban areas, to name a few.

In Mongolia, from 1999 to 2002 and 2009 to 2010, millions of livestock animals died due to starvation after a so-called "Zud" event. This disasters is characterized by heavy snow and extreme cold in the winter.

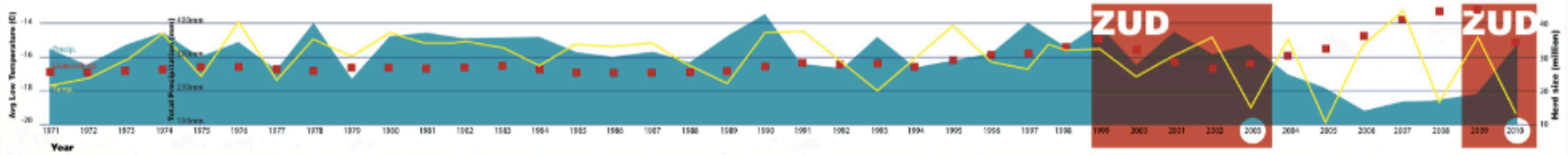
It is important to integrate climate change adaptation with sustainable development, applying Geo-science technology and innovation for green economy. There is need to apply GIS and Remote Sensing for monitoring and analysis and improve adaptive capacities against climate change.

Project②:

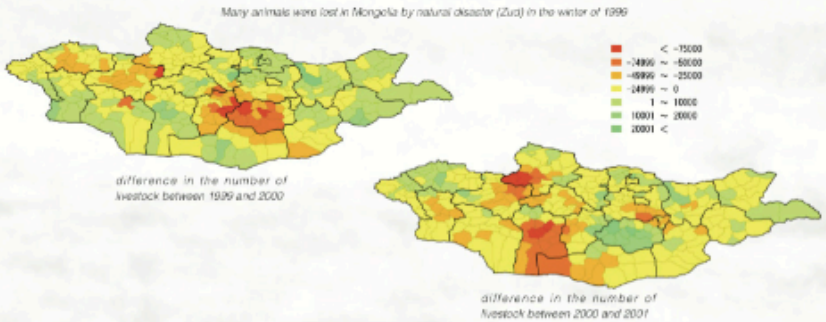
ISAP'2014, July 23-24, 2014, Yokohama

Early Adaptation to Climate Change in Mongolia

Extreme cold and high snowfall causes Zud events with increasing frequency

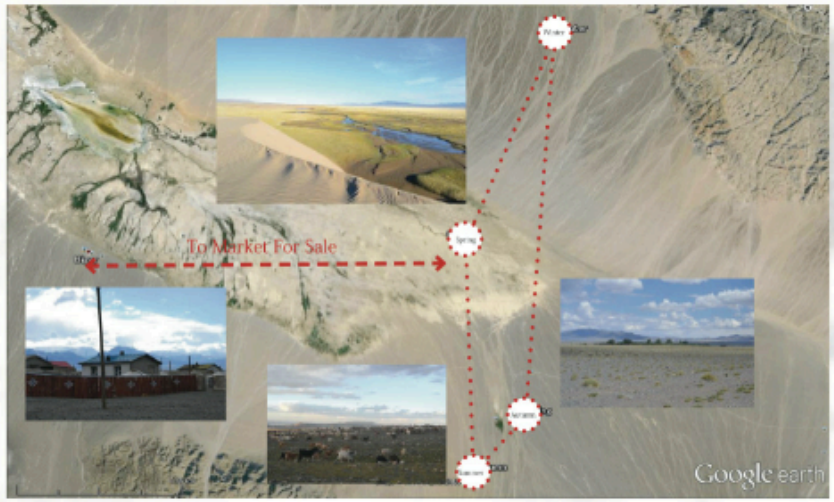


Herd Loss viewed as a national problem

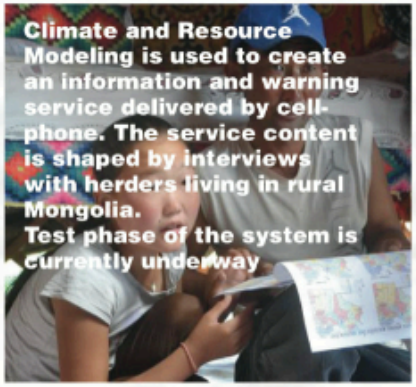


"Capacity building is the key. Sustainable development is only possible when education is provided to the younger generation. When the country is vulnerable to climate change, the issue would have to be dealt with the capable persons from within. For example, the 'Department of Sustainable Development' can be set up within a university. We feel that our project will be able to contribute to that end." **Masataka Watanabe**

Migration patterns of a typical herder family



Urban growth is being fed by families migrating from the countryside after natural disaster



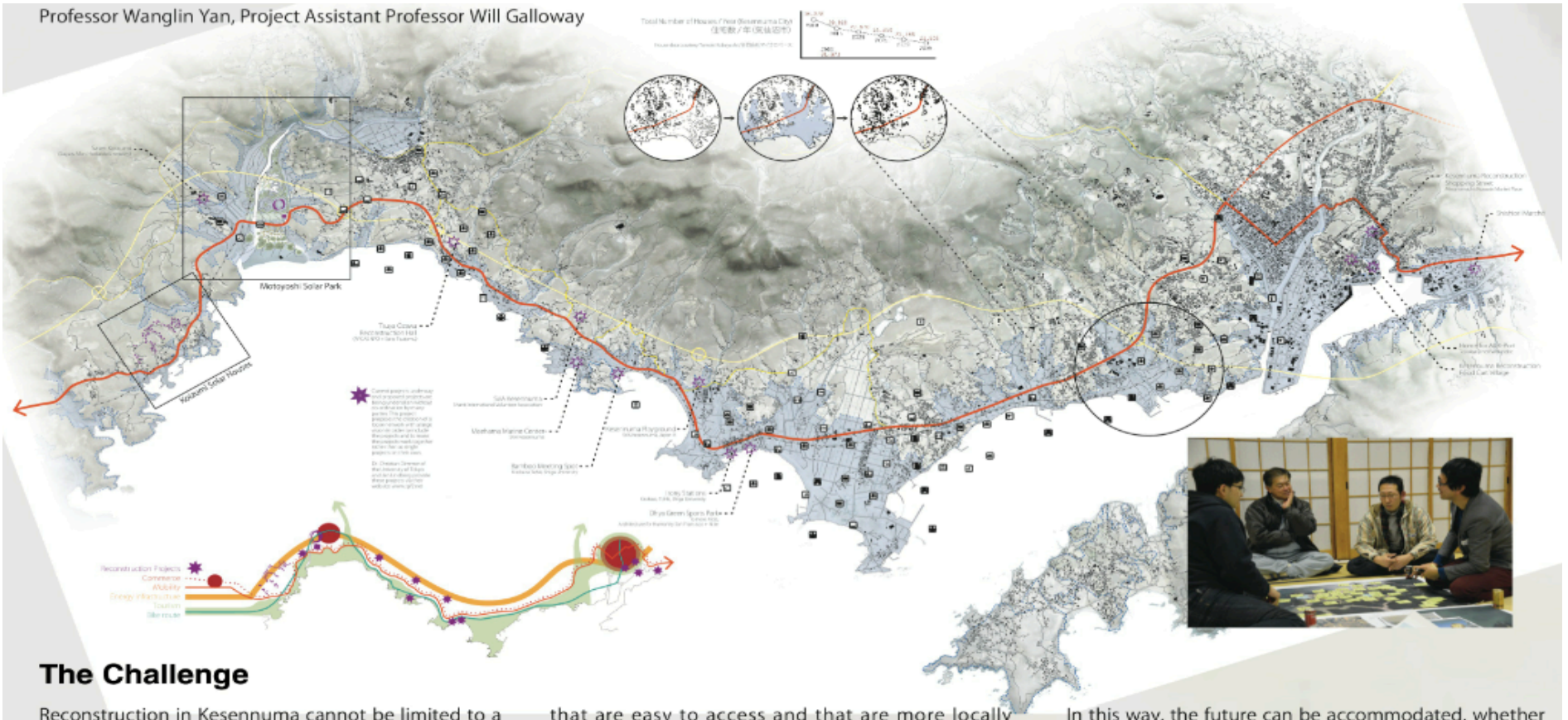
Interview with herder family

Test of information system

Project③

Adaptive Poster-Disaster Reconstruction in Shrinking Society

Professor Wanglin Yan, Project Assistant Professor Will Galloway



The Challenge

Reconstruction in Kesennuma cannot be limited to a simple re-building of the homes and businesses that were lost.

The demographic future of the region, and of all of Japan, will almost certainly be defined in the next decades by a shrinking and aging population. If we are honest about how to rebuild for that future, then it is essential that those realities can be accommodated without the loss of community, a pillar of resilient society. Traditional urban forms in that regard may not be sufficient.

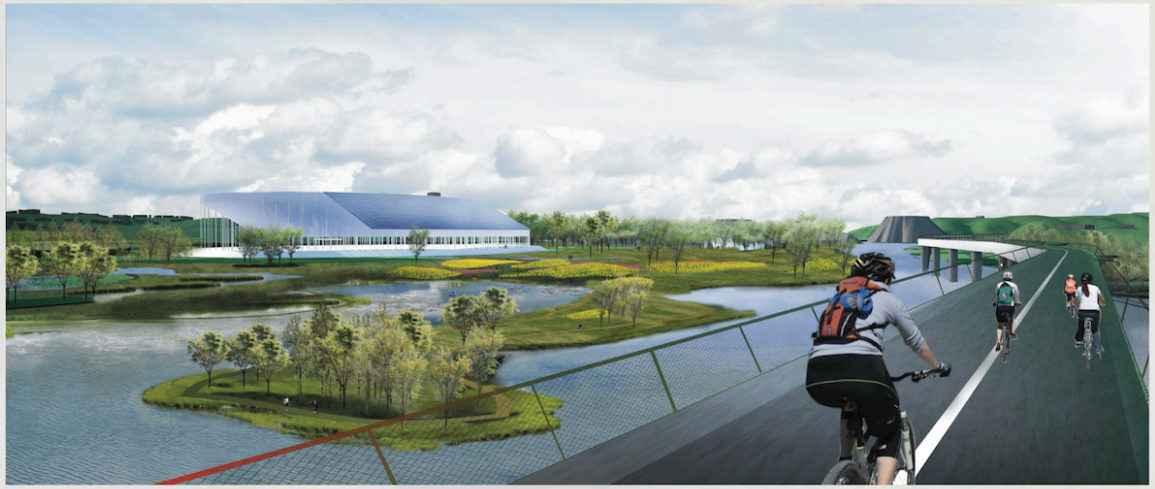
The devastation caused by the earthquakes and tsunamis that hit Tohoku on March 11, 2011 underline the need to build back better, and to create a resilient community typology. This will mean new social forms, but must also include new physical landscapes that are easy to access and that are more locally sustainable in terms of energy and commerce.

Starting with connectivity at the regional scale we have planned a kind of linear community. Energy, tourism, education, health, commerce, and community are treated as a network. We propose to build back an interconnected group of functions that intertwine like a thread through the region, with important communal activities taking place both in the village setting but also on the main roads that connect each group of residents together.

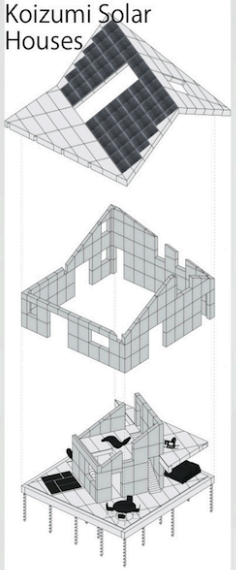
Important community functions are located on the connections between homes so that the sense of community does not rely on density but instead is embedded in access.

In this way, the future can be accommodated, whether population shrinks or expands, grows old or is filled by youthful immigrants, or an entirely different mix emerges. Technology can also be absorbed and energy systems added and modified as it becomes available. The aim is healthy communities, but the approach is flexible rather than prescriptive.

Project③
Adaptive Poster-Disaster Reconstruction in Shrinking Society



Koizumi Solar Houses



Energy production and conservation is not in itself enough as a goal.

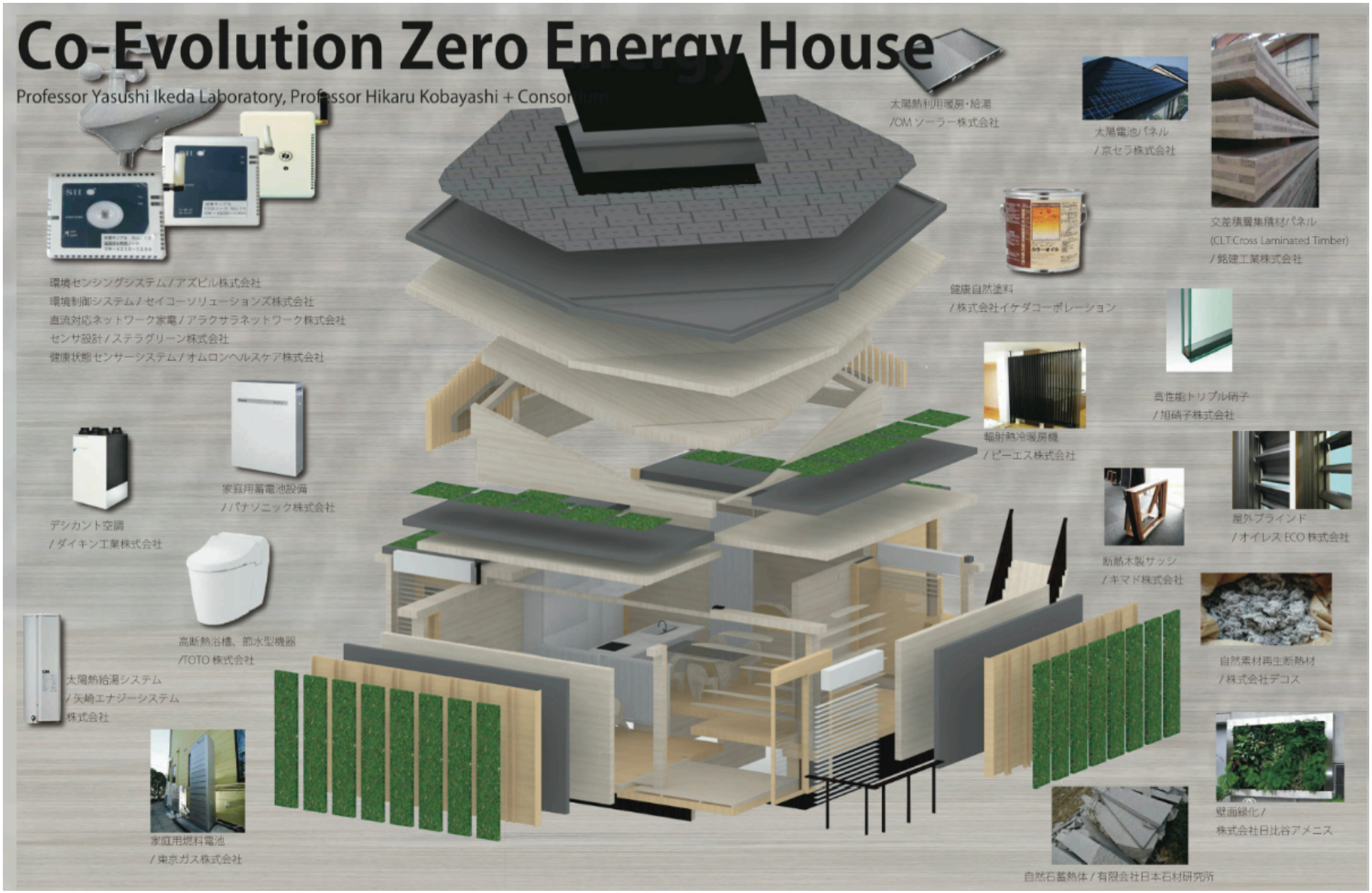
With the current regulations in place the best way to use FIT regulations is through community based energy planning. These homes are intended to work as clusters as well as on their own, and are extremely flexible in planning so that they can be used for groups of residents, not only single families.

KEIO Environmental Innovators

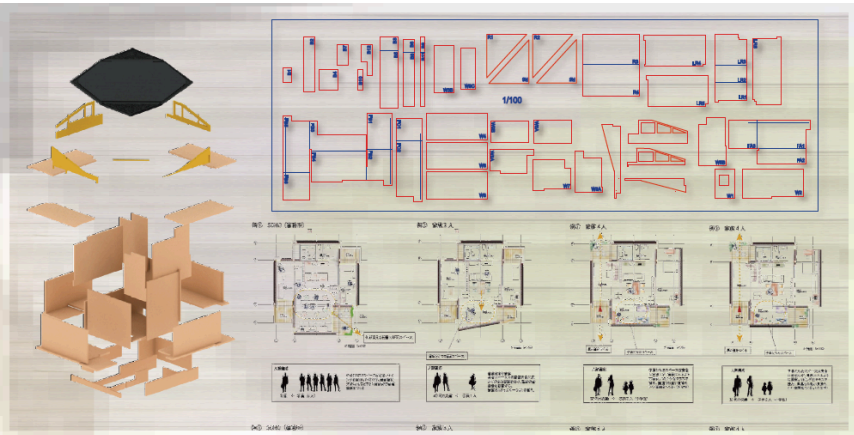
Keio University

社会システム改革と研究開発の一体的推進
Funds for Integrated Promotion of Social System Reform and Research and Development

Project④
Co-Evolution House with Digital Design Technology



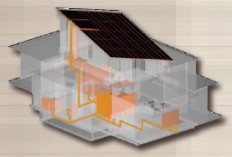
Project④
Co-Evolution House with Digital Design Technology



慶應型共進化住宅開発の３つのコンセプトと池田研究室の役割

木材を中心にした自然素材の徹底的な活用で
環境負荷低減と健康増進を実現
ーデジタルデータによる部品加工とデザインの連携システムを開発ー

高度な環境制御技術により、インフラ無しでも自然エネルギーだけで暮らせるスマートハウスを構築
ー３次元データに統合されたモデル（BIM）を使って
参加企業が提供する先進的環境技術の連携を支援ー



これからのアジアの環境開発に展開できる
ライフスタイルと技術を創造
ー高密度な都市や水辺環境などでの集合的な展開を検討し、
多様なライフスタイルに合理的に適応するためのシステムを開発ー

KEIO Environmental Innovators

Keio University

社会システム改革と研究開発の一体的推進
Funds for Integrated Promotion of Social System Reform and Research and Development

Project⑤

Veneer House Project

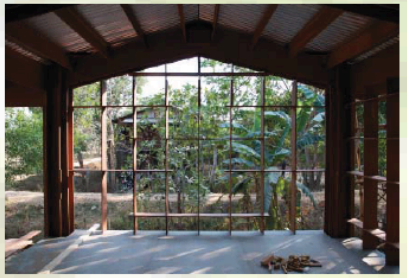
Professor Hiroto Kobayashi Laboratory

Manawhari Learning Center

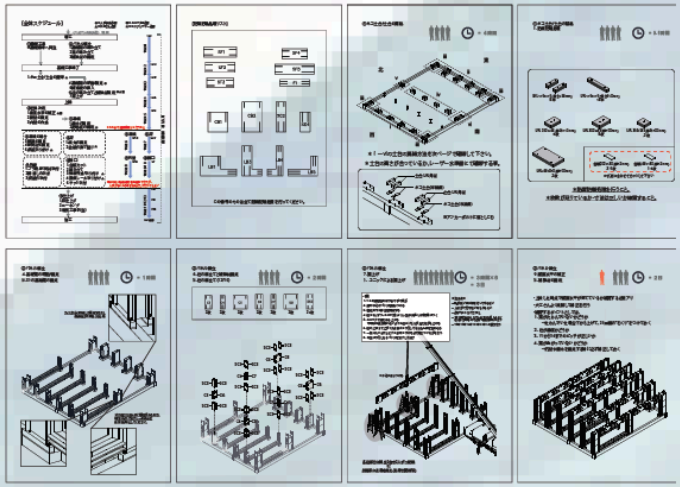
Pathein, Myanmar

The Challenge

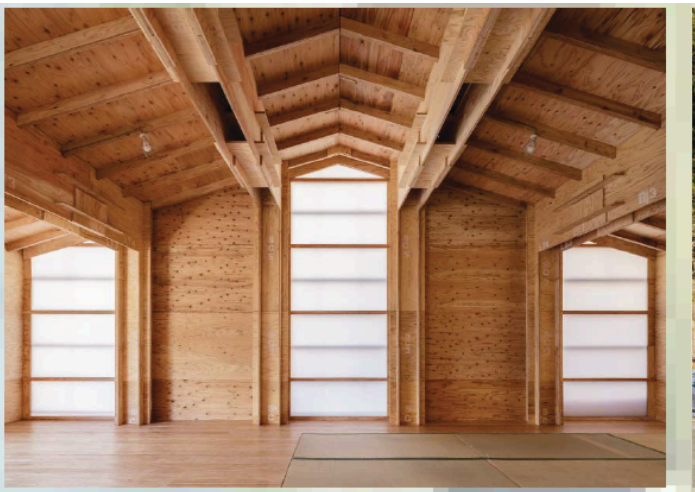
Building low cost houses and community space with the simplest construction methods and materials is essential in the wake of disaster and in areas where construction skills are in short supply. This project is a series of real life tests of construction from Japan to Myanmar that makes use of plywood, cut by hand or computer and assembled with very few tools. Students at Keio SFC designed and built almost all of these projects along with the communities who ultimately use them as part of their education as architects.

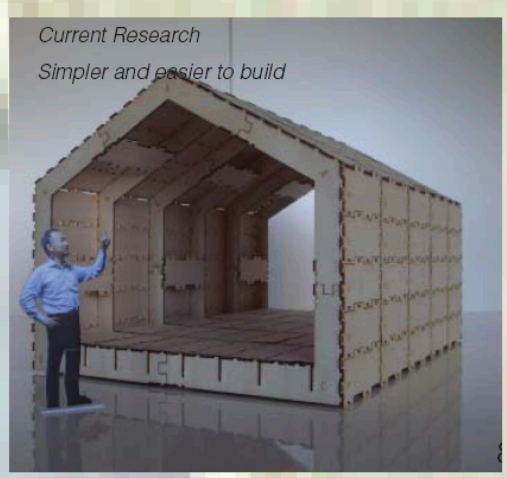


Project⑤
Veneer House Project



Minamisanriku Veneer House
Japan





Maeamihama Veneer House
Japan

KEIO Environmental Innovators
Keio University
社会システム改革と研究開発の一体的推進
Funds for Integrated Promotion of Social System Reform and Research and Development

Project⑥

Agriculture Innovation and Food Security

Agriculture innovation

Enhancing traceability and food security

Automatic watering to reduce workload

Job training and capacity building

Sustainable Agriculture

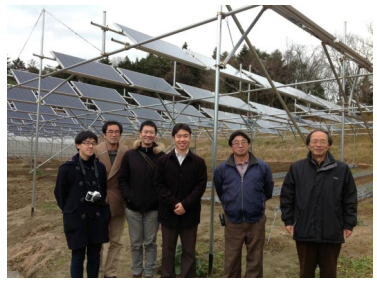
Adaptive Development

Abundant land

Hallow land

unused

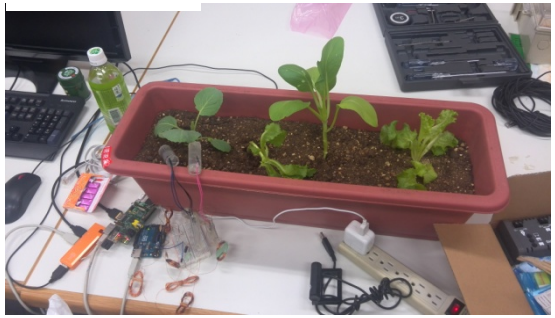
Solar Sharing



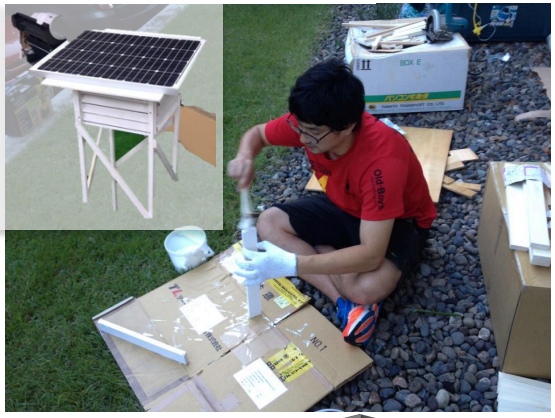
Energy production

Project⑥
Sensor-Net Systems for Adaptive Agriculture

Sensors



Weather Station



・Database
（MySQL）
・Backup

Treatability of food production

Output

Sensor Board

Environmental
Sensors

Monitoring the growth of plants

Web NDVI Camera

Advantages of Project Based Learning

Students with different disciplines and projects come together, learn Design Thinking, and inspire collaborative projects.

Lecture on Design Thinking offered by Mr. Toru Tanaka from IDEO Tokyo

Students of Social and policy Science

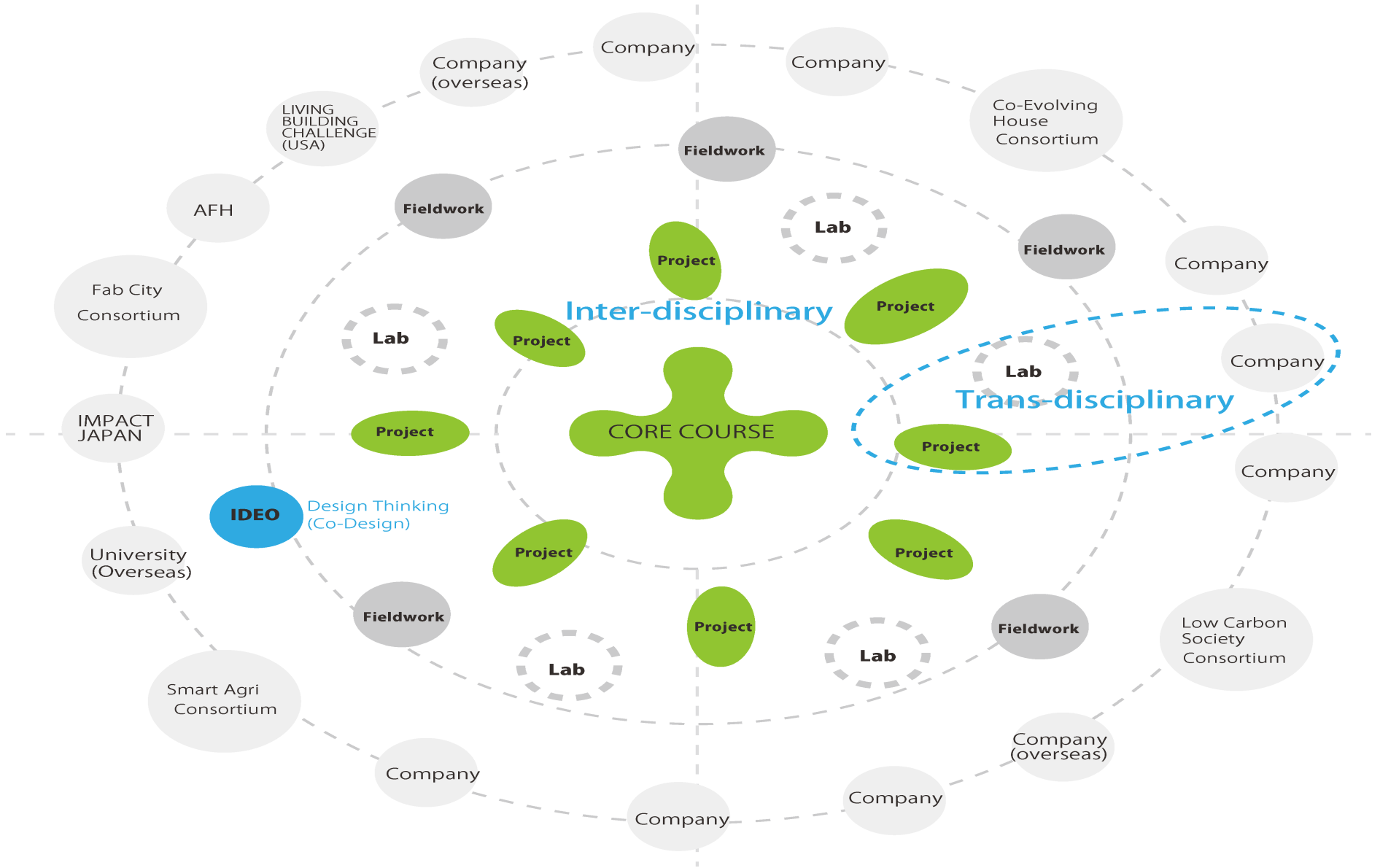
Project on impact of sea level rising to water village (Indonesia)

⇔

Students of Environmental Design

Co-evolution House
（Japanese High Technology）

Interdisciplinary and Transdisciplinary Ecosystems for Fostering Leaders



Closing Remarks

- There is a big gap on research and practice of adaptive development.
- Project based learning bridges scientific knowledge to the fields, the needs for adaptive development.
- Project based learning are collaborations of interdisciplinary and transdisciplinary stakeholders. Supporting ecosystems are essential to sustain the approach.