Green Network of Excellence
-environmental information-
Six key research topics in GRENE-ei

- Project coordination
- City
- Health
- Water
- Agriculture
- Biodiversity
- Carbon emission
Overview and project coordination.

Studies on GHG emissions from biomass burning and rice paddy in East-Asia using synergy of satellite data and ground based observations.

Climatic changes and evaluation of their effects on agriculture in Asian monsoon region.

Building River Basin Resilience by Introducing an Inter-disciplinary Workbench on Data Integration and Analysis System (DIAS).

GRENE-City: Designing Resilient Cities and National Land.

Establishment of Research Platform for Developing Models to Predict Future Health Risks Posed by Changes in Climate, Land Use and Population .(Ecohealth)

Environmental Information: Biodiversity and Ecosystem
The aim of GRENE-ei is to enhance green innovation and networking in the fields of earth environmental science and information engineering. This project has six research topics and each topic is on a different research field. The fields are Carbon emission, Agriculture, Water, City, Health and Biodiversity. EDITORIA as a coordinator promotes interdisciplinary researches based on Data Integration and Analysis System (DIAS) which is a centralized system containing big data and applications in earth science domain. GRENE-ei is funded by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in Japan.

To create interdisciplinary networking opportunities and research innovations in earth science
To contribute to global issues through international collaborations
To generate valuable societal benefits from research outputs
Studies on **GHG emissions** from biomass burning and rice paddy in East-Asia using synergy of satellite data and ground based observations

Univ. Tokyo, Chiba Univ., Nara woman’s Univ., Nagoya Univ., and RIHN*

*Research Institute for Humanity and Nature

**Continuous measurements**

**Vertical profiles**

**Ground-based remote sensing**

**Sampling for flux estimation**

**CO₂ sonde**

**Horizontal profiles**

**CH₄ emission from rice paddy**

- **GOSAT**
  - Columnar concentration
  - Upper atmos. concentration
  - Lower atmos. concentration
- **SCIAMACHY**
  - Columnar concentration
  - Different methods
- **MODIS**
  - NDVI
  - →Biomass
  - Fire info.
  - Fire radiative power

**CO₂ and CH₄ emissions from biomass burning**

**Bottom up approach**

**Top down approach**

Synergy of various types of satellite data

Target area: East-Asia (Thai, China, Indonesia)
Climatic changes and evaluation of their effects on agriculture in Asian monsoon region (CAAM)

Leader: Masaru Mizoguchi (The University of Tokyo)

Aims
1. To improve the reliability of future climate prediction
2. To develop the information platform which will be useful to design adaptation and mitigation strategies in agriculture against the predicted climatic changes in Asian monsoon region

Climate change research
Development of Agro-climatological Data-base in the Developing Countries
- Digitization of old observational data recorded in paper format
- Agro-meteorological data base
- Near real-time meteorological data acquisition system

Estimation of the element of Agricultural Meteorology
- Heat balance model

Impact of Land-Use/Land-Cover (LULC) Changes on the Asian Monsoon Climate - Land-Atmosphere Interaction Study -
- Use of climate-model output on the DIAS and a detailed land surface data
- Elucidation of the importance of land surface atmosphere interaction including the impact of anthropogenic Asian monsoon region

Agricultural effect research
Climatic Changes and Evaluation of Their Effects on Agriculture Based on a Field Survey
- Assessment System Using Meteorological Data and Crop Models
  - Construction of the system for crop simulation under various conditions
  - Evaluation of the impact of climate change on crop production
- Validation of evaluation system by field survey
  - Survey of cropping
  - Comparison of simulation and real planting
  - Cultivation based on the simulation test

Development of Information Platform to Design Adaptation and Mitigation Strategies of Major Crops against the Predicted Climatic Changes
- Collection and maintenance of information related to land use and land management, soil and Agricultural Meteorology
- Collection of basic data on greenhouse gas balance in agricultural land

Benefits
1. Development of basic environmental information and its application to decision-making in the Asian monsoon region
2. Training of young researchers to lead the study of global warming mitigation measures and adaptation research and climate change
3. Construction of information infrastructure for the realization of global warming adaptation and mitigation measures for agricultural sectors
Building River Basin Resilience by Introducing an Inter-disciplinary Workbench on Data Integration and Analysis System (DIAS)

Ryosuke Shibasaki, The university of Tokyo  in collaboration with Kyoto University

- To develop a prototype of inter-disciplinary workbench on the Data Integration and Analysis System (DIAS) which enables to integrate global Earth observations, predictions, socio-economic data sets and models.
- To develop a supporting system for sound decision making on climate change adaptation, water resources management, biodiversity conservation, agriculture management and urban planning.

Inter-disciplinary workbench on DIAS

- Sharing data and information
- Exchanging knowledge, experiences and ideas
- Working together

Rural River Basins:
- Shubuto River, Japan
- Sangker River, Cambodia
- Nyando River, Kenya

Urbanized River Basins:
- Asa River, Japan
- Huong River, Vietnam
- Citarum River, Indonesia

Constructing knowledge infrastructure, creating scientific knowledge and building resilience to solve environmental problems and address unanticipated situations.
Greene-City: Designing Resilient Cities and National Land
- An Application of Environment Information Technology -

- Government
- Specialist
- Citizen
- NPO
- Community
- Company

Analysis and Design

Utilization and Development

Capacity Building

Archives

Progressive Integrated Database on DIAS Platform

Natural Change
- Climate Change (Global Warming, Sea Level Rise, etc.)
- Natural Disaster (Earthquake, Tsunami, etc.)
- Eco-system Deterioration

Social Change
- Aging of Population
- Aging of Infrastructure
- Urban Sprawl
- Motorization

Re-design for resilient land and society

Efficiency of Compaction
Material Stock and Flow
Historical Data of Disasters

Evaluation

Implementation Plan (Smart Shrink?)

Nature
Well-Organized Land Use and Infrastructure
Human Activities

Visualization

Users’ Request

Extension from Japan to Asia
Establishment of Research Platform for Developing Models to Predict Future Health Risks Posed by Changes in Climate, Land Use and Population (“Ecohealth”)


While many fields relevant to global-scale issues including climate, ocean, agriculture, ecosystem, and urban are closely associated with the field of health, quantitative analyses between the health area and other areas have not been well explored. Using the wide range of environmental information archived in DIAS, this project tries to explore new aspects of the relationship between health events and environment to provide the directions of mitigation/adaptation for global-scale issues in the health area, and to demonstrate the usefulness and potential of the integrated database such as DIAS for the health field.

**subtheme1**: Developing a predictive model regarding health effects of atmospheric environment integrating human mobility and social change

- endpoints: mortality or respiratory diseases in the urban areas of developing countries.
- developing models integrating human mobility and social and public health infrastructure.
- developing methods to link large-scale observation data to local exposure data.

**subtheme2**: Developing a vector-associated infectious disease trans-mission model using Health and Demographic Surveillance System (HDSS)

- endpoints: schistosomiasis and Thai liver fluke in rural areas in developing countries.
- the effect of climate change as well as social changes on the distribution of vector snails and distribution of their water habitats will be integrated.
- exploring the possibility of linking HDSS and DIAS.

**subtheme3**: Developing a predictive model for water-associated infectious diseases due to changes in natural and anthropogenic environment

- endpoints: risk of water-associated infectious diseases, especially those associated with urban flood events.
- developing a model integrating secondary infection and behavioral patterns.

**Integration**

Applying social and CC scenario
Exploring Coupling of generated models
Evaluating the Model output with health economics

Indicate the possible solutions for the targeted local issues
Develop predictive models extendable to other localities sharing similar health issues
Demonstrate the usefulness and potential of Data integrated systems to health/medical society
**GRENE (Green Network of Excellence)**

**Environmental Information: Biodiversity and Ecosystem**

University of Tokyo, Hokkaido University, Tohoku University, and National Institute for Environmental Studies

**Aim of Project**

- Accumulation of biodiversity and ecosystem information
- Providing these data under standard ontologies
- Providing biodiversity and ecosystem data as maps through the use of other environmental information as background

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**Species**

- **Species Distribution**
  - Of ca. 5,000 species of seed plants indigenous to Japan, ca. 2,000 species had been analyzed by Ecological Niche Modeling (Fig. 1).
  - The predicted distribution maps are available from the Database (http://acacia.c.u-tokyo.ac.jp/spdist/).

**Community**

- **Compiling Plant Community Distribution Map**
  - Based on plant community census data (more than 10,000 sites are available in Japan, an example on right) and species distribution maps, we are now compiling plant community distribution map, complemented by community modeling (Figs. 2 and 3).

**Dynamics and Flux**

- **Modeling and Estimation of Community Dynamics and Flux**
  - Using plant community information, we are planning to make prediction model for dynamics and flux (Figs. 3 and 4).

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**Defining Layer Structure in Biodiversity and Ecosystem Information**

- Flux
- Dynamics of ecosystem
- Species community structure
- Species distribution

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**Fig. 1** Examples of predicted natural distribution of Japanese plants using Ecological Niche Modeling. *S. verticillata* and *G. palmatum* are endemic to Japan at genus level.

**Fig. 2** Some plant community types in Japan

**Fig. 3** Relationships of the four layers.

**Fig. 4** Ecosystem Net Production(ENP) Comparison between JapanFlux data and JaLTER(Japan Long Term Ecological Research Network) data

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