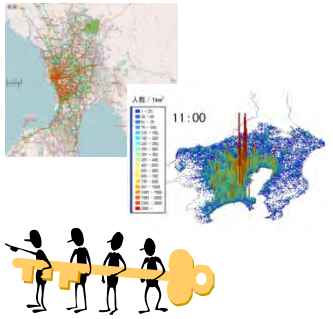
Green Network of Excellence -environmental information-

Six key research topics in GRENE-ei

GREen Network of Excellence -environmental information- (GRENE-ei)

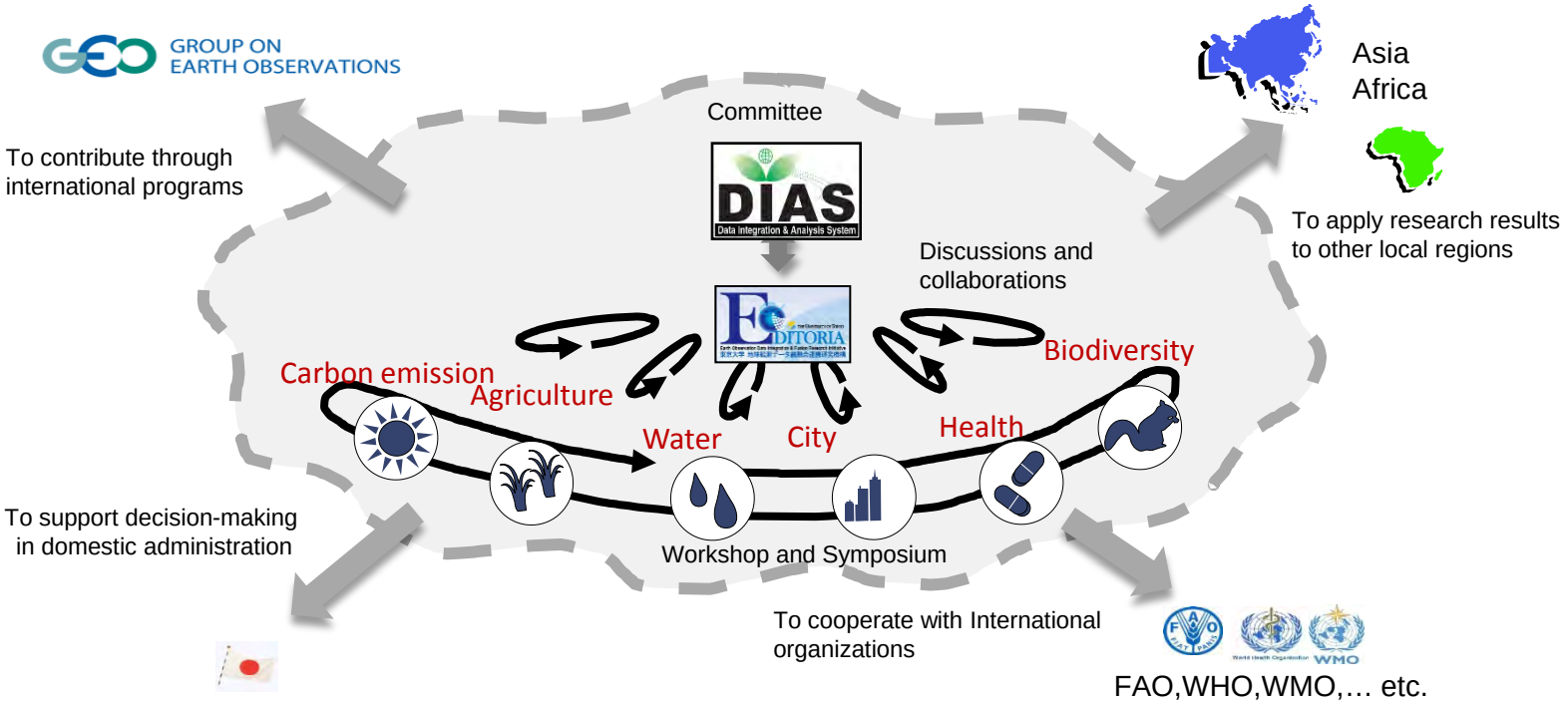
http://grene.jp/english/

Coordinated by: **Earth Observation Data Integration and Fusion Research Initiative (EDITORIA), the University of Tokyo**



Abstract

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

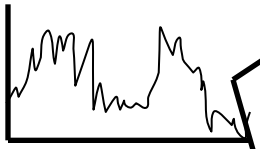
*Univ. Tokyo, Chiba Univ., Nara woman's Univ., Nagoya Univ., and RIHN**

**Research Institute for Humanity and Nature*

CO_2 sonde

Ground-based remote sensing

Vertical profiles



Continuous measurements

CO_2 and CH_4 emissions from biomass burning

【bottom up approach】

MODIS

NDVI
→Biomass
Fire info.
Fire radiative power

【Top down approach】

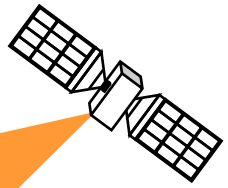
GOSAT

Columnar concentration
+
Upper atmos. concentration
↓
Lower atmos. concentration

Synergy of various types of satellite data

Sampling for flux estimation

CH_4 emission from rice paddy



SCIAMACHY

Columnar concentration
↕ Different methods
Columnar concentration
+
Upper atmos. concentration
↓
Lower atmos. concentration

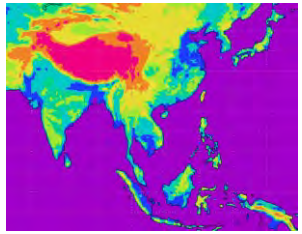
GOSAT

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)

Climatic Changes and Evaluation of Their Effects on Agriculture in Asian Monsoon Region



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

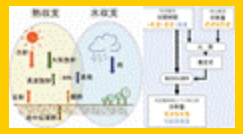
Climate change research

Development of Agro-climatological Data-base in the Developing Countries JAMSTEC JAPAN AGENCY FOR MARINE-EARTH SCIENCE AND TECHNOLOGY

Digitization of old observational data recorded in paper format

Agro-meteorological data base
Near real-time meteorological data acquisition system

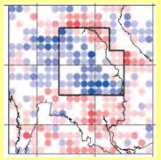
Estimation of the element of Agricultural Meteorology



heat balance model

Impact of Land-Use/Land-Cover (LULC) Changes on the Asian Monsoon Climate - Land-Atmosphere Interaction Study -

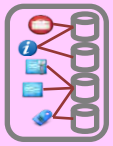
首都大学東京 TOKYO METROPOLITAN UNIVERSITY



/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

DIAS



Agricultural effect research

Climatic Changes and Evaluation of Their Effects on Agriculture Based on a Field Survey

農研機構 NARO

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

THE UNIVERSITY OF TOKYO

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

NIAES National Institute for Agro-Environmental Sciences

/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

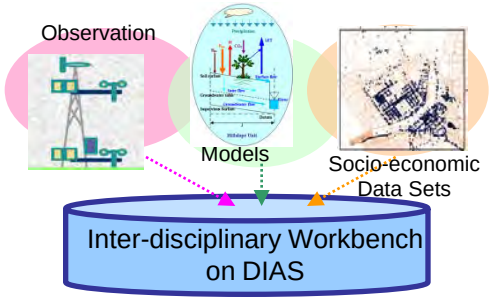
Benefits

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

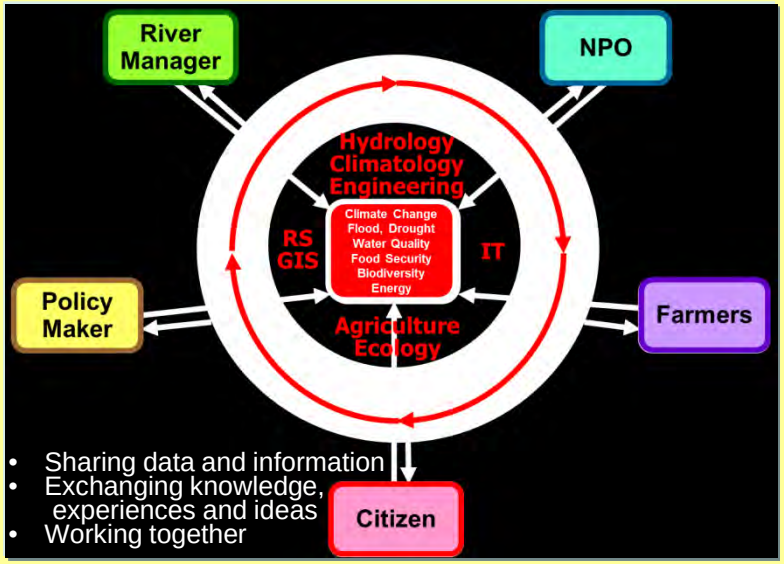
Building River Basin Resilience by Introducing an Inter-disciplinary Workbench on Data Integration and Analysis System (DIAS)

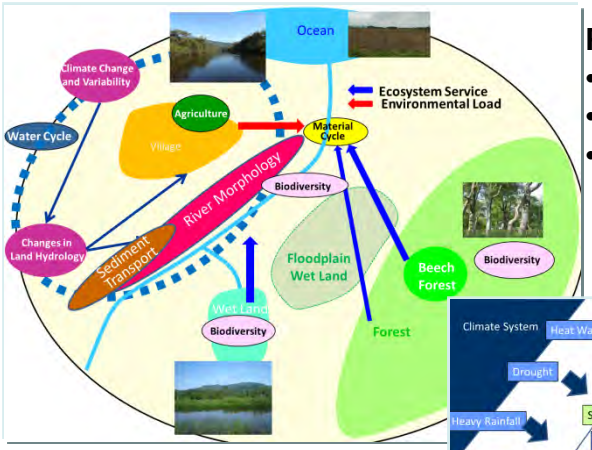
Ryosuke Shibasaki, The university of Tokyo *in collaboration with* Kyoto University

- 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.



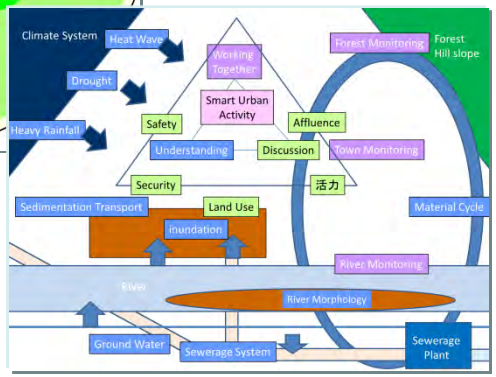
Inter-disciplinary workbench on DIAS





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.

GRENE-City: Designing Resilient Cities and National Land
- An Application of Environment Information Technology -

Nagoya University Yoshitsugu Hayashi, Tsunetoshi Mizoguchi, Yasuhiro Suzuki, Hiroki Tanikawa, Hirokazu Kato, Naoki Shibahara
University of Tokyo Takaaki Kato, Shinji Sato, Ryosuke Shibasaki, Eiji Hato, Yoshiyuki Kawazoe

Archive

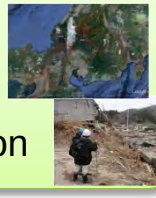
Analysis and Design

Utilization and Development

Capacity Building

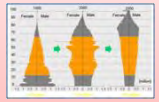
Natural Change

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



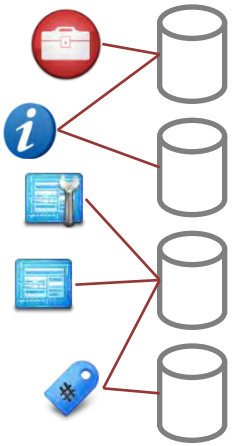
Social Change

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



Store

Progressive Integrated Database on DIAS Platform



Powered Nature

Vulnerable Society

Re-design for resilient land and Society

Nature — *Well-Organized Land Use and Infrastructure* — **Human Activities**

- *Efficiency of Compaction*
- *Material Stock and Flow*
- *Historical Data of Disasters*

Evaluation

Implementation Plan ***(Smart Shrink?)***

Government | Specialist | Citizen | NPO | Community | Company

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")

Chiho WATNABE（Univ. Tokyo）With： Yamagata Univ., Res Inst Human and Nature

outline This project tries to analyze quantitative relationship between environmental changes including climate change, environmental pollution or ecosystem degradation and health events by integrating the large-scale environmental information archived in DIAS and the local-scale information to suggest the solution and/or mitigation measures for each issue .

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.

Climate Change

Social change

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

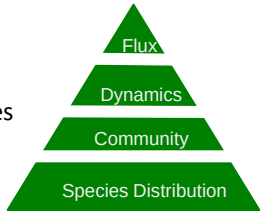
GRENE (Green Network of Excellence)

Environmental Information: Biodiversity and Ecosystem

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

Aim of Project

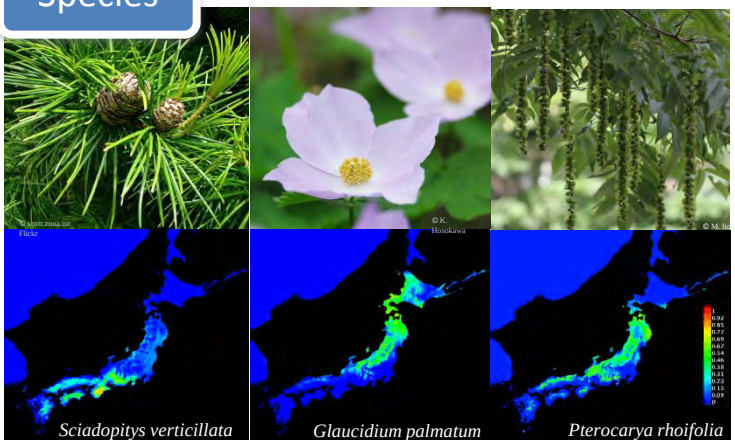
- Accumulation of biodiversity and ecosystem information
- Providing these data under standard ontologies
- Providing biodiversity and ecosystem data as maps through the use of other environmental information as background



Defining Layer Structure in Biodiversity and Ecosystem Information

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

Species



Modeling and Prediction of 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/).

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.

Layers

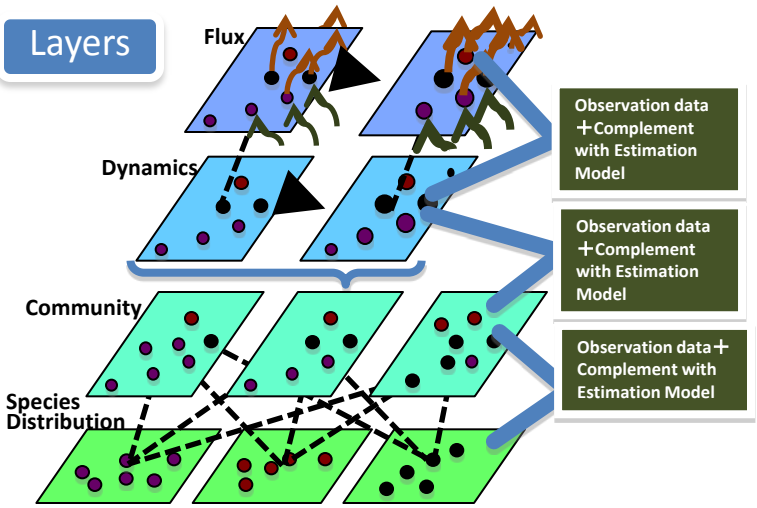


Fig. 3 Relationships of the four layers.

Community

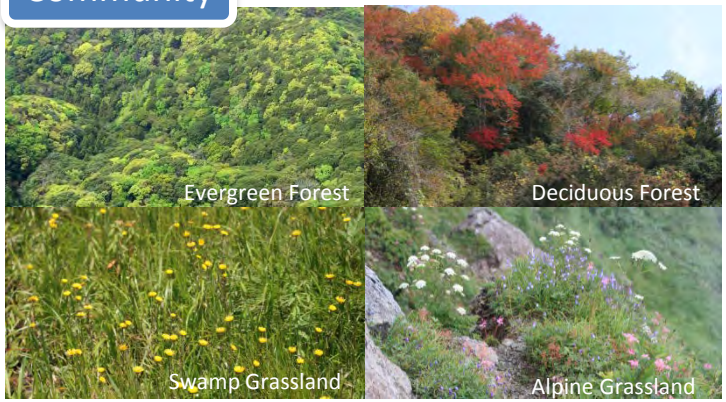
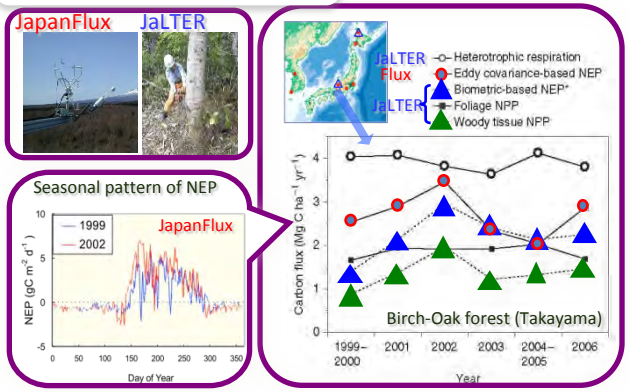


Fig. 2 Some plant community types in Japan

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).

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

Acknowledgement. This project is supported by the grant from MEXT, Japan. We thank to data providers including Biodiversity Center of Japan, MOE, National Museum of Nature and Science, and GBIF-Japan (The Global Biodiversity Information Facility in Japan).

This project has started in FY 2011 and is supported by
the Ministry of Education, Culture, Sports, Science and Technology.
for more information please visit http://grene.jp/english/