Autonomous Energy Management System Enabling the Maximum Penetration of Renewable Energy (FY2009-2010)
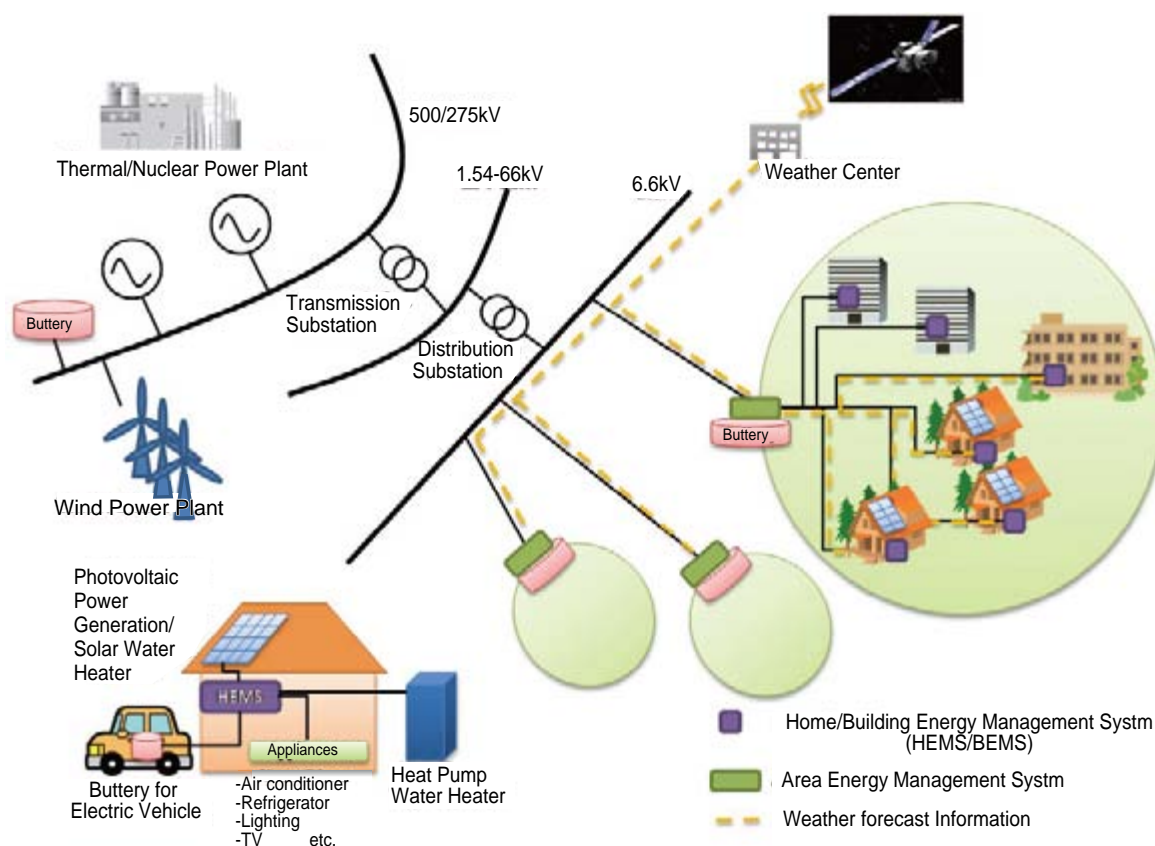
Principal Investigator : **Kazuhiko OGIMOTO,** The University of Tokyo   <H-093>

The University of Tokyo, National Institute of Advanced Industrial Science and Technology

The target of the research project is to develop the autonomous energy management technology which maintains and enhances the quality of energy service in household and commercial building sector and to realize the large penetration of renewable energy such as Photovoltaics into the power system. With the boundary conditions of energy service level and renewable energy generation based on the weather forecast, the distributed energy management system autonomously controls the appliances, distributed generation, and energy storage system in a cooperative way with the central energy management system. This control of the demand side, taking a part of the power system operation which has been exclusively done by the supply system, is expected to contribute to the maximum penetration of renewable generation penetration and enhancement of power system quality, resulting in the resolution of energy and environmental issues.

- Thermal/Nuclear Power Plant
- 500/275kV
- 1.54-66kV
- 6.6kV
- Weather Center
- Buttery
- Transmission Substation
- Distribution Substation
- Wind Power Plant
- Buttery
- Photovoltaic Power Generation/Solar Water Heater
- HEMS
- Appliances
- Buttery for Electric Vehicle
- -Air conditioner -Refrigerator -Lighting -TV etc.
- Heat Pump Water Heater
- ■ Home/Building Energy Management Systm (HEMS/BEMS)
- ■ Area Energy Management Systm
- – – Weather forecast Information

Carbon Dioxide Reduction by Diffusing Low Carbon Vehicles
(FY2009-2010)

Principal Investigator : **Yoshinori KONDO,** National Institute for Environmental Studies (NIES)　　　　<H-094>

NIES, National Institute of Advanced Industrial Science and Technology

This study focuses on low carbon vehicles and their infrastructures that highly contribute to realization of low carbon society in transport sector and also estimates their carbon dioxide reduction potential. Firstly, as a short-term reduction target, vehicles currently being sold are examined to clarify factors causing difference between actual fuel economy and catalog value. Next, the CO_2 reduction potential of electric vehicles including plug-in vehicles (whose batteries can be charged from grid electricity) is estimated based on both their charge frequency and the driving activity data collected by on-board trip loggers in monthly term. As a short- mid term target, feasible and realistic ways and problems to be solved for providing charge equipments and facilities required for electric vehicle penetration are discussed by resident status. As one of mid-long term counter-measures, we aim at establishing next generation transport system by replacing the conventional vehicles with the combination of personal means of transport and mass transit. Taking technological progress into account, we evaluate and propose the possible ways to establish the system according to regional characteristics from various aspects such as CO_2 reduction effect, resource consumption and cost.

Construction of Sustainable-Regional Society Model Based on Agricultural Biofuel Production
(FY2009-2011)

Principal Investigator : **Yasuroh KURUSU,** Ibaraki University　　　　<H-095>

Ibaraki University

Sweet sorghum has an advantage for its wide adapt-ability for cultivated area, rapid growth, and biofuel productivity. Besides, it does not compete with food production and food economy. In this study, we develop processes including cultivation in an aban-donment of farmland and the using residual sub-stance after harvest. The purpose is to build a model of biofuel production and use contributing to the sustainability and self-subsistence of regional soci-ety. Evaluation of environmental influence and effectiveness is also focused on under analyzing land uses of Japan. The model of regional sus-tainable biofuel society is expected for leading production/circulation/society formation.

Research on Low-Carbon Development in Cities in Asian Developing Countries through International Intercity Partnership
(FY2009-2011)

Principal Investigator : **Hisakazu KATO,** Institute for Global Environmental Strategies (IGES)　　　　<H-096>

IGES, Kyushu University, Hosei University

The study explores what kinds of policy tools enable effective low-carbon behavior of households and small and medium enterprises, in particular in the sectors of commercial, households, transport and waste management, in cities in Asian developing countries. The study clarifies low-carbon policies in Japanese municipalities and possibility of inter-national intercity partnership for Japanese cities. The research proposes an international institution for intercity partnership among Japanese local govern-ments and cities in Asian developing countries in order to promote local initiatives towards low-carbon development in cities in different develop-mental stage in Asia.

Revolutionary Research in Feasibility Studies Area

Reconstruction of Past Water Isotopes Using Isotope Data from Corals and Atmospheric-Ocean General Circulation Model (FY2008-2009)

Principal Investigator : **Yusuke YOKOYAMA,** The University of Tokyo <RF-081>

The University of Tokyo, Japan Agency for Marine-Earth Science and Technology

Water oxygen isotopes will be reconstructed using coral samples to understand characteristics of Climate Models (Atmospheric-Ocean General Circulation Models). This will be an important benchmark data to be used for inter models comparison which improves climate projections.

Impacts of Global Warming and Ocean Acidification Reef Building Corals at Northern Latitude Limit in Japan (FY2008-2009)

Principal Investigator : **Tsuyoshi WATANABE,** Hokkaido University <RF-082>

Hokkaido University, Fukuoka University, National Institute for Environmental Studies

Reef building corals growing at their lattitudal limit in Japan can provide an unique opportunity to reconstruct the recent histories of environmental changes. The goal of our project is to evaluate global warming and ocean acidification, and it's impacts on coastal ecosystems.

Using Stable Water Isotope to Evaluate Hydrological Cycle of Climate Model (FY2008-2009)

Principal Investigator : **Naoyuki KURITA,** Japan Agency for Marine-Earth Science and Technology (JAMSTEC) <RF-083>

JAMSTEC

Predictability of precipitation change using the climate model largely depends on how latest model can precisely reproduce present-day global precipitation field. In this project, the reproducibility of simulated present-day atmospheric circulation in Asia will be evaluated using novel dataset: stable water isotopes.

Investigation of Ultimate Source of Arsenic Found in Groundwater Contaminated with Arsenic in Bangladesh by Antimony Isotopic Ratio
(FY2008-2009)

Principal Investigator : **Yoshio TAKAHASHI,** Hiroshima University   <RF-084>

Hiroshima University, Japan Agency for Marine-Earth Science and Technology

In this study, we develop a new method to identify ultimate source of arsenic in various contaminated area using antimony isotopic data, which will be applied to arsenic contaminated area in Bangladesh to verify whether the ultimate source of arsenic in Bangladesh is sulfide ores in the Himalayas.

Evaluation and Prediction of the Effects of Environmental Changes Based on the Diversity Profile of Phyllosphere Fungi
(FY2008-2009)

Principal Investigator : **Hayato MASUYA,** Forestry and Forest Products Research Institute (FFPRI)   <RF-086>

FFPRI, Kyoto University

The objective of this study is to clarify the diversity of philosopher fungi on *Fagus crenata* and to show the effects of environmental changes to the fungal diversity. The knowledge obtained from this study will contribute to construct a system assessing and forecasting the response of Japanese beech forests to environmental changes.

Study on Consumers' Behavior that Can Fulfill both Satisfactory Progress in Our Daily Life and Reduction of CO_2 Emissions
(FY2008-2009)

Principal Investigator : **Yuki KUDOH,** Institute of Advanced Industrial Science and Technology (AIST) <RF-087>

AIST, Shibaura Institute of Technology

This study aims at investigating potential CO_2 reduction of CO_2 emissions of daily activities that meet our needs of life by various life styles. In this study, we will propose daily activities that can be carried out spontaneously for the mitigation of CO_2 emissions and increase of utility.

Estimation of Climate Effect by Global Aerosol Model with 4-Dimensional Data Assimilation
(FY2009-2010)

Principal Investigator : **Toshihiko TAKEMURA,** Kyushu University   <RF-091>

Kyushu University

Spatial and temporal distributions of suspended particle matters in the atmosphere, that is aerosols, are derived with high precision 4-dimensional data assimilation method harmonizing a numerical model with observed data.

Effects of Forest Floor Mosses on Growth of Fine Roots and Emissions of Greenhouse Gases in Boreal Forests after Wildfire (FY2009-2010)

Principal Investigator : **Kyotaro NOGUCHI,** Forestry and Forest Products Research Institute (FFPRI) <RF-092>

FFPRI

This study aims to elucidate effects of forest floor mosses on growth of fine roots and emissions of greenhouse gases in boreal forests along fire chrono-sequence. This study will contribute to prediction of long-term effects of wildfire on carbon dynamics in boreal forests.

Development of High Accuracy CH_4 and Total Hydro Carbon Flux Monitoring System for a Broad-Leaved Deciduous Forest in Japan (FY2009-2010)

Principal Investigator : **Takafumi MIYAMA,** Forestry and Forest Products Research Institute (FFPRI) <RF-093>

FFPRI

To clarify the effective control techniques of CH_4 flux in the forest, this study aims to develop a newly CH_4 and total hydro carbon flux monitoring system for long-term measurement using the tunable diode laser spectrometer and the eddy covariance method.

Global Distribution and Environmental Fate of Emerging Contaminants, Persistent PPCPs, in the Marine Ecosystems (FY2009-2010)

Principal Investigator : **Haruhiko NAKATA,** Kumamoto University <RF-094>

Kumamoto University, Saga University, National Institute for Environmental Studies, Ehime University

The objectives of this study is to investigate the concentrations, bioaccumulation, temporal trend, and geographical distribution of emerging environ-mental pollutants, persistent Pharmaceuticals and Personal Care Products (PPCPs), in the marine eco-systems.

Study on Transboundary Air Pollution and Health Effects Induced by Polycyclic Aromatic Compounds Formed via Atmospheric Reactions on the Surface of Asian Dust Particles (FY2009-2010)

Principal Investigator : **Takayuki KAMEDA,** Kanazawa University <RF-095>

Kanazawa University

The aim of this study is to elucidate atmospheric formation of toxic polycyclic aromatic compounds on the surface of Asian dust particles transported from the Asian Continent to Japan and to evaluate adverse health effects induced by the compounds.

Dynamics and Nature of Fine to Ultrafine Particles in the Atmosphere from East Asia (FY2009-2010)

Principal Investigator : **Satoshi UTSUNOMIYA,** Kyushu University   \<RF-096\>

Kyushu University

The present study demonstrates "multi-scale" analysis of trace toxic metals on ultrafine particles in the East Asia. Our results on the nature of toxic nanoparticles in the atmosphere will provide a fundamental knowledge in establishing the new regulation on PM2.5.

Evaluation of Economic Values of Ecosystem Services of Seagrass Bed Based on Fish Production: Looking for an Area of the Highest Production in Japan (FY2009-2010)

Principal Investigator : **Jun SHOJI,** Hiroshima University   \<RF-097\>

Hiroshima University, Fisheries Research Agency

Biological and physical surveys are conducted in seagrass beds in order to estimate fish production and to detect environmental determinants on the production. The goal of this project is to evaluate spatial variability of the production and to predict its fluctuation due to the global warming.

A Study on the Specific Concentration of Mercury in the Liver of Javan Mongoose Inhabiting the Nansei Islands, Japan (FY2009-2010)

Principal Investigator : **Izumi WATANABE,** Tokyo University of Agriculture and Technology   \<RF-098\>

Tokyo University of Agriculture and Technology, University of the Ryukyus, Kagoshima University

Javan mongoose is an invasive alien species of Nansei Islands where keep rare ecosystems in Japan. Therefore, extirpation of this species is required. We found out that Javan mongoose accumulates mercury with high level. This fact suggests the possibilities to elucidate the details mercury concentration mechanisms using organs and tissues of this animal. This study aims to make clear this phenomenon using cell level approaches and ecological approaches using dynamics through food webs. One of the prospective achievements is to find a new index for understanding the potential of mercury toxicities of wildlife. In addition, effective recommendation for conservation of rare animal is expected.
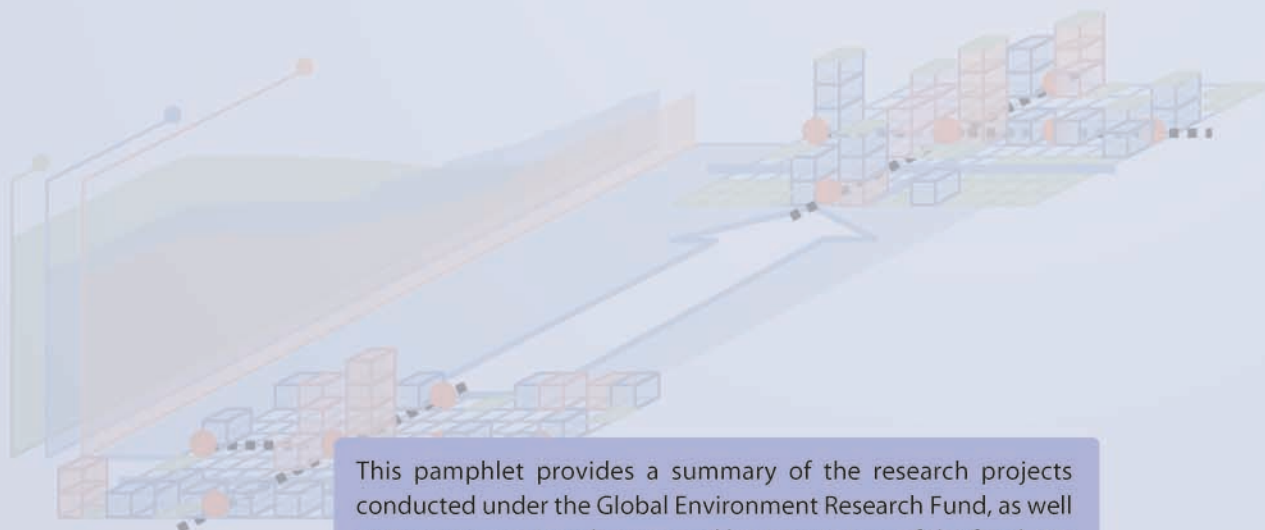
This pamphlet provides a summary of the research projects conducted under the Global Environment Research Fund, as well as its system, research areas and basic structure of the fund. We at Ministry of the Environment hope that this pamphlet will provide useful information for people interested in global environmental issues, and that it will encourage further activities for global environmental protection and conservation.

GLOBAL ENVIRONMENT RESEARCH FUND