Japanese Global Warming Countermeasures
Leading Cases

Ministry of the Environment
Dec. 2017
Japanese Global Warming Countermeasures
Leading Cases

【Transparency】
① GOSAT-1, GOSAT-2: Whole-atmospheric GHG concentration observation is the *master cards* in improving transparency
② “DAICHI” ALOS 1 and 2, Largest-class Land Observing Satellite

【Mitigation】
③ Fukushima: Top-runner in the new energy society
④ Japan is advancing into the hydrogen society
⑤ Floating Offshore Wind
  Turbine Generation: Achieving low cost, high efficiency, and high *durability*
⑥ *Cellulose* Nano Fiber (CNF): Transforming biomass resources into cutting edge technology
⑦ Innovative energy saving CCS

【Adaptation】
⑧ Asia-Pacific Adaptation Information Platform (AP-PLAT): Tools for designing adaption measures
⑨ Utilizing satellite remote sensing technologies: Developing storm surge/storm wave hazards maps in Small Island Developing States
GOSAT-1, GOSAT-2: Whole-atmospheric GHG concentration observation is the *master card* in improving transparency

- **The target of GOSAT series**
  - Contribution to advancement of Climate Science
  - Contribution to Climate Policy (Promoting low carbon society)

- Developed by MOEJ, Japan Aerospace Exploration Agency (JAXA), and National Institute for Environmental Studies (NIES)
- Current model has been operating for 8.5 years after its launch (Designed life: 5 years)
- Launching a succeeding model, GOSAT-2, in FY2018, and aiming to start the GOSAT-3 developing Project in FY 2018.

- **Observation locations by GOSAT**

- **Approx. 13,000 locations**

GOSAT: Greenhouse gases Observing SATellite

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GOSAT-2 Major Characteristics

- Planned launch: FY2018
- Orbital altitude: Approx. 613km
- Designed Life: 5 years
- Observation items: Major GHGs (CO2 and Methane e.t.c.), CO
- Observation quality: 500km radius, Monthly average 0.5ppm (CO2), 5ppb (Methane)
# GOSAT Observation Results

## Monthly Average CO₂ Concentration Distribution

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*※L3 product deficit*
GOSAT Observation results:
DAICHI ALOS1 and 2, Largest-class Land Observing Satellite

ALOS2 Characteristics

- Acquire, process and provide high resolution observation data in a wide area in case of large-scale natural disaster
- Image resolution of 1~3m, observation range of 2,340km, provides images in 2 hours after occurrence of natural disaster at fastest
- Expansion of satellite data use in various fields: Monitoring deforestation, Monitoring ice in Polar regions, Understanding land subsidence

ALOS-2 imagery of deforested areas

Optical image of the same area as above
### Fukushima Prefecture: Model Area for Future New Energy Society

- Appealing Fukushima’s technologies and models to the world

#### Expanding Renewable Energy ~Enhancing power grid network for further use ~

- Fukushima Renewable Energy Institute, AIST
- Fukushima Floating Offshore Wind Turbine
- Support for Renewable energy use
- Large power grid battery experimental project
- Enhancement of power grid network in Abukuma and Futaba area

#### Building a Hydro Society Model

~Producing, Storing, Transporting, Using Hydrogen with renewable energy ~

- Base technology researches for hydrogen energy carriers (MCH)
- Large scale hydrogen production by renewable energy (World’s biggest 10,000kW-class)
- Expansion of hydrogen use

#### Building a small community

~Pushing forward the reconstruction using renewable energy and hydrogen~

- Smart community building project for the reconstruction
- Establishing a CO2 free hydrogen model town
- Expanding to the whole prefecture (Conducting FS survey)
Japan is advancing into a Hydrogen society

- World’s largest patent applications in Fuel-cell field, more than fivefold of the second country
- 200,000 Fuel-cells for household already installed, 40,000 fuel-cell vehicles by 2020.
- Together with a large-scale energy saving, establish a CO2 hydrogen provision system (aiming by 2040)

### Energy efficiency of fuel-cells

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<th>Power plant</th>
<th>Fuel cell</th>
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<tr>
<td>Electricity use</td>
<td>35%</td>
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<tr>
<td>Transmission loss</td>
<td>5%</td>
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<td>Waste heat</td>
<td>60%</td>
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<tr>
<td>Heat energy use</td>
<td>0%</td>
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<tr>
<td>Overall Energy efficiency</td>
<td>35%</td>
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Reference: Hydrogen, Fuel-cell Roadmap

For Hydrogen Production...

- Mid-term: Utilization of non-used energy
- Long-term: Utilization of renewable energy (Wind, Solar Power)
Japan is advancing into a Hydrogen society

Realize Hydrogen Production, Transportation, and Use By Utilizing Small Hydroelectric Generation

Produce

Transport

Use

Control Center

Fuel Cell Vehicle

Fuel Cell

Control Center

Fuel Cell

Heated Pool

Welfare Center

Dairy

Small Hydroelectric Generation

High Pressure Hydrogen Trailer

High Pressure Hydrogen Curdle

H₂

H₂

H₂

H₂
Japan is advancing into a Hydrogen society

Practical application for production, transportation, and unitization of hydrogen produced from plastic wastes by 2020
The floating offshore wind turbine can be introduced in deep sea areas around Japan (>50m).

The demonstration project with commercial scale (2 MW) has been implemented.

- The world first hybrid spar model
  - Cost has been saved by using concrete.
- High efficient power generation
  - Operation ratio is over 30% (onshore is 20%).
- High resilience
  - Resistance to the largest typhoon with 53 m/s of wind and 17 m of wave height.
- Coordination with the fishers
  - Fishes have gathered around the system.
Next-generation materials

■ The R&D on Cellulose Nano Fiber (CNF) and High heat Resistance plastic
■ CNF is light as and five times as strong as steel.
■ The next-generation materials can contribute lighter and energy efficient automobile.

Realization of low carbon and sound material-cycle society by CNF

(Figure: Nano Cellulose Forum)
Absorbent using Amin can capture 90% of CO2 from emission. Concentration of absorbent liquid will be 99.9%. This absorbent can yield high removal rate of CO2 with low pressure and low concentration, which can be applied for coal fired power plants.
ESG and Principles for responsible investment

- The United Nations supported Principles for Responsible Investment (PRI) to incorporate E(Environment)・S(Social)・G(Governance) into the investment.
- Japan has developed “Japanese version of Stewardship Code” and “Corporate Governance Code”, which introduced ESG elements.
- The world largest Government Pension Investment Fund of Japan (GPIF) joined PRI in 2015. It has selected ESG index and engaged ESG investment.
- Japanese ESG investment reached about 80 trillion yen in a year. It has been growing since the GPIF joined PRI.

Policies on ESG investment and disclosure

1. Awareness raising on ESG investment
   The guidance will be developed for the investors to evaluate the companies’ business strategy on environment and sustainability

2. Use of ESG information
   - The platform for disclosure of environment relevant information
     - the world first system integrating ESG information sharing, analysis and direct dialogue.
     - the rule boon on disclosure of ESG information and dialogue. (700 companies have joined)
Facilitating diffusion of leading low carbon technologies, and contributing to sustainable development of developing countries.

17 partner countries with 122 projects in the pipeline (22 are registered projects)

Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals.

**JCM: Japanese Technology Transfer scheme**

- **JAPAN**
  - Leading low carbon technologies, etc, and implementation of mitigation actions
  - Used to achieve Japan’s emission reduction target

- **Partner Country**
  - **JCM Projects**
  - **MRV***
  - GHG emission reductions/removals
  - Operation and management by the Joint Committee which consists of representatives from the both sides

*measurement, reporting and verification

Credits
JCM: Transfer various low carbon technologies

**Renewable Energy**
- PV (Maldives)
- PV (Mongolia)
- Waste to Energy (Myanmar)

**Saving Energy**
- Waste heat recovery in cement industry (Indonesia)
- Digital taco graph (Vietnam)
- Energy saving (Indonesia)
- High Efficiency air conditioning (Vietnam)
- High efficient boiler (Mongolia)
- Energy saving (Thailand)
- High efficient refrigerator (Indonesia)
- High efficient transfer (Vietnam)
- Co-generation system (Indonesia)
- LED control (Cambodia)
The **Platform** will be established by 2020 to share **climate risk information** via online with research institutes/universities in both developing/developed countries.

To support adaptation measures by providing advanced scientific climate risk information.

Japan will take a lead in the following activities under the Platform:

1. **Develop dataset** on projection of climate change impacts in the region through bilateral & intensive studies.
2. **Develop supporting toolkits** for officials and stakeholders engaged in adaptation planning.
3. **Build capacity** on climate change impact assessment/adaptation planning.

The Asia-Pacific Adaptation Information Platform (A-PLAT) will be established by 2020 to share climate risk information via online with research institutes/universities in both developing/developed countries. Asia-Pacific Region by 2020.
Satellite-based remote sensing technology: 3D Hazard Map for Pacific SIDS

- Tropical cyclones cause coastal wave, surge, and inundation, which is the major natural disaster in SIDS.
- Satellite-based remote sensing technology will support simulation of surge and inundation, and development of 3D hazard Map.