

# JICA's Assistance for Mitigation to Climate Change

# JICA

The Co-Benefits Approach to Climate Change

# Climate Change

November 2007



For a better tomorrow for all.  
Japan International Cooperation Agency

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# Sustainable Development and Mitigation Measures

## Accelerated Impacts of Climate Change

Many physical and biological systems are being affected by climate changes around the world. The Summary for Policymakers of the IPCC's<sup>1</sup> Fourth Assessment Report states, "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."<sup>2</sup> Observation since 1850 shows that eleven of the last twelve years (1995–2006) rank among the 12 warmest years in the instrumental record of global surface temperature. Average Northern Hemisphere temperatures during the second half of the 20th century were likely the highest in at least the past 1,300 years. Impacts of climate change have been accelerated in the cryosphere climate system, including mountain glaciers and snow cover as well as terrestrial and marine ecosystem.

If we continue using fossil fuels at the present rate, it is estimated that the average temperature will rise approximately 4.0°C (2.4°C to 6.4°C) over the next century. As a consequence of accelerated climate change, human systems will be affected directly by heat wave or vector-borne infectious diseases and indirectly by decreasing fresh water resources or food production. In particular, these impacts will be serious to vulnerable human systems in developing countries.

## Importance of Adaptation and Mitigation Measures to Climate Change

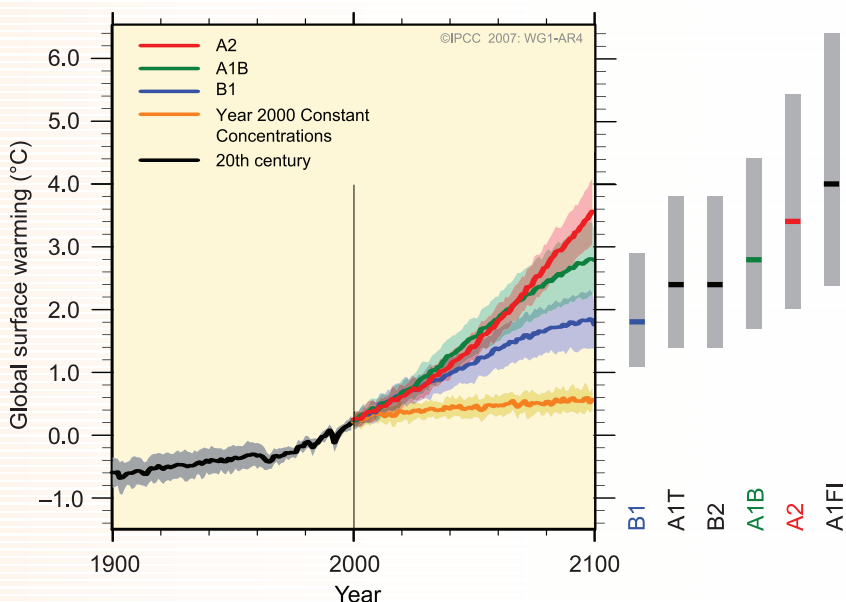
To address climate change from long and medium-term perspectives, urgent mitigation measures are needed, such as reducing greenhouse gas (GHGs) emissions and enhancing GHG removals as well as adaptation measures. The leaders of the G8 nations meeting at the 2007 Heiligendamm summit agreed to consider seriously the decisions which include at least a halving of global emissions by 2050.

## Mitigation Measures and Sustainable Development in Developing Countries

Since most of the increase in GHGs emissions is expected in developing countries in the coming decades, GHGs emissions in developing countries are expected to exceed emissions in

developed countries around the year 2020. In other words, taking action to reduce emissions now not only in developed countries but also in developing countries will be inevitable to mitigate the future threat of climate change on a global basis. However, many developing countries are facing critical issues in order to attain sustainable development, including poverty reduction, management of water and energy resources, improvement of public health and healthcare as well as urban and rural development. Therefore developing countries can not afford to dedicate their efforts only to climate change issues. It is important to address critical development issues effectively in tandem with mitigation measures to climate change so that developing countries can implement mitigation measures independently in a sustainable manner.

Figure 1. Multi-Model Averages and Assessed Ranges for Surface Warming (Relative to 1980–1999)<sup>2</sup>



- A1FI scenario : a world of very rapid economic growth(fossil-intensive)
- A2 scenario : a very heterogeneous world(regionally oriented economic development and politics)
- A1B scenario : a world of very rapid economic growth(emphasis on a balance across all energy sources)
- B2 scenario : a world in which the emphasis is on local solutions to economic, social, and environmental sustainability
- A1T scenario : a world of very rapid economic growth(emphasis non-fossil energy sources)
- B1 scenario : a convergent world

1) Intergovernmental Panel on Climate Change

2) Climate Change 2007 – The Physical Science Basis Contribution of Working Group I to the Fourth Assessment Report of the IPCC

## ■ JICA's Initiatives for Sustainable Development in Developing Countries

The goal of the Japanese government's Official Development Assistance (ODA) is to help developing countries to achieve sustainable development. JICA plays an important role in this initiative as an implementing body. In order to achieve sustainable development in developing countries, it is necessary to prepare a wide range of programs from urban and rural development to disaster management and nature conservation. JICA assists capacity development<sup>3</sup> programs through technological cooperation under ODA for sustainable development in developing countries.

## ■ JICA's Measures to Climate Change: The Co-Benefits Approach

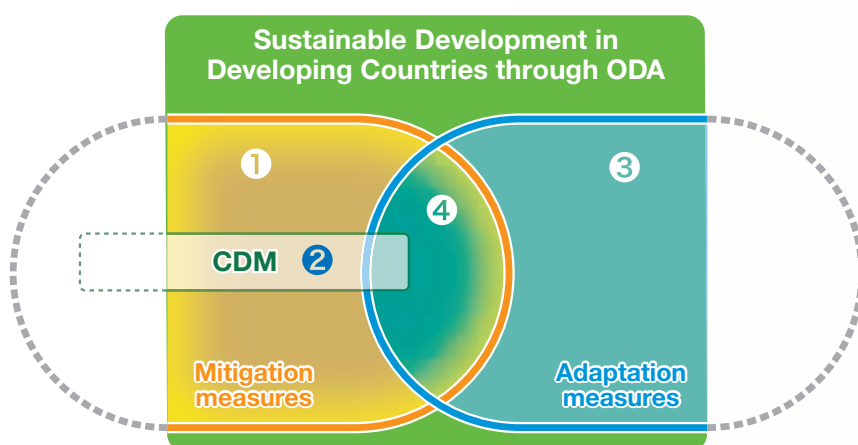
JICA is already active in initiating measures for adapting to and mitigating climate change through ODA programs. These initiatives contribute to both developing countries' sustainable development and actions against climate change. These types of initiatives are referred to as a co-benefits approach to climate change. As the diagram below illustrates the co-benefits approach to climate change includes both adaptation and mitigation measures in a broad sense. For example, mangrove afforestation/reforestation activities provide local communities with developmental benefit by enhancing the livelihoods of local communities by securing firewood and marine resources. They also provide climate benefits as both mitigation measures to enhance CO<sub>2</sub> removals and adaptation measures to address sea-level rise. A single measure can provide multiple solutions for sustainable development while addressing climate change at the same time.

## ■ About This Brochure

This brochure summarizes JICA's co-benefits approach to climate change with an emphasis on mitigation measures (the area marked (1) and (4) in Figure 2). JICA has been conducting case studies of its projects in an effort to develop appropriate cooperative measures that will benefit developing countries' sustainable development and actions addressing climate change. A report and brochure on JICA's approach to adaptation measures<sup>4</sup> and the clean development mechanism<sup>5</sup> (CDM; one of the mitigation measures) are also available.

# What is the Co-Benefits Approach to Mitigation Measures?

Figure 2. Sustainable Development in Developing Countries through ODA



This figure shows addresses to climate change through ODAs to developing countries in achieving sustainable development.

- (1) Mitigation measures: Cooperation activities which contribute to reduce emissions and enhance removals of GHGs, such as cooperation in rural electrification using renewable energy, prevention of deforestation, and afforestation/reforestation.
- (2) Clean Development Mechanism (CDM): Cooperation such as capacity development and support to the implementation of CDM.
- (3) Adaptation measures: Cooperation which leads to improve the adaptation capacity, such as improvement of water supply and irrigation facilities, introduction of crop varieties for arid regions, and disaster management.
- (4) Cooperation which is effective for both adaptation and mitigation measures: Cooperation such as mangrove afforestation/reforestation activities, which are effective for both enhancing CO<sub>2</sub> removals and addressing sea-level rise.

All measures included in the area marked from (1) to (4) can be regarded as co-benefit approach to climate change in a broad sense. This brochure particularly covers co-benefit approach to mitigation measures (the area marked (1) and (4)).

3) JICA regards "capacity" as "the ability of developing countries to set and achieve goals and to identify and resolve development issues." Capacity development is thus "the process that such abilities are enhanced at three different levels - individuals, organizations, and society as a whole - in an integrated way."

4) For more information about adaptation measures, see the JICA's study report, *Study on JICA's Assistance for Adaptation to Climate Change* (July 2007), and the brochure entitled *JICA's Assistance for Adaptation to Climate Change* (November 2007).

5) For more information about CDM, see *Study on JICA's Future Assistance for the CDM—How Can JICA Confront the CDM?*, a separate volume of JICA report, *JICA's Assistance and the Clean Development Mechanism (CDM)* (July 2006), and the brochure entitled *JICA's Assistance and the Clean Development Mechanism (CDM)* (October 2006).

# JICA's Assistance in Mitigation Measures: Forest and Nature Conservation

## ● Outline of Assistance

The natural environment is the foundation that supports nearly every aspect of human life. It provides the natural resources that fuel our economies and shapes our cultures and traditions. In recent years changes in the environment accompanied by rapidly increasing populations in developing countries have led to the depletion of natural resources. This situation has aggravated the problem of poverty in these countries, resulting in a vicious cycle of environmental

degradation and financial destitution.

JICA is committed to ending this vicious cycle and believes that all countries including developing countries should build sustainable social systems by balancing environmental concerns with infrastructure development initiatives. JICA works on preserving the natural environment in developing countries under three strategic development goals: (1) community based sustainable resource use, (2) biodiversity conservation and (3) sustainable forest management.

## Examples of JICA's Assistance

### Gunung Halimun-Salak National Park Management Project

Indonesia

Project Period:  
February 2004–January 2009

#### ▶ Project Outline and Results

Indonesia is located in a tropical region and known for its rich biodiversity. The country is faced with mounting concerns over environmental degradation and declining biodiversity. Overall forest area in Indonesia is decreasing due to deforestation that has been triggered by rapid population growth and increased land use. The Indonesian government submitted a request to the Japanese government for technical cooperation and grant aid in securing biodiversity. In response to this request Japan implemented the Biodiversity Conservation Project (BCP) in Indonesia and granted aid for the establishment of facilities that will aid in preserving biodiversity.

The Gunung Halimun Salak National Park Management Project, which is regarded as an extension phase of BCP, aims to enhance park management and biodiversity preservation. The project holds up Gunung Halimun Salak National Park as a model for disseminating the methods and technologies that were developed during previous cooperation efforts.

#### ▶ Mitigation Effect

The Gunung Halimun Salak National Park Management Project works to halt excessive loss of forest area within the national park, resulting in reduction of

GHG emissions and enhancement of CO<sub>2</sub> removals. The biodiversity conservation including forests calls for collaborative efforts with stakeholders including local governments and communities, whose livelihoods rely on forests, in managing national parks as well as activities to prevent unregulated clearing and destruction of ecosystems.

#### ▶ Project Highlight

The project not only serves as a mitigation measure to climate change but also contributes to the conservation of Indonesia's ecological systems, natural environment and biodiversity that are globally important resources to everyone around the world. Assistance provided by the local government to improve the livelihoods of local communities also helps to maintain and ensure biodiversity conservation.



JICA workers discussing the future of logging sites with local stakeholders

### Sustainable Watershed Management Project in the Upper Area of the Sabana Yegua Dam

Dominican Republic

Project Period:  
April 2006–March 2009

#### ▶ Project Outline and Results

The Dominican Republic has suffered a significant loss of forests by shifting cultivation, as well as commercial logging, forest fires, and hurricanes. In the upper watershed of the Sabana Yegua Dam, which provides the major water supply for the southwestern part of the Dominican Republic, a large area of forest has been lost. This has resulted in watershed degradation and soil erosion. More than 30% of the dam's capacity is filled with soil, hampering the functional capacity of the dam.

JICA conducted a development study in this area and formulated a master plan for forest management. A request then came for the technical cooperation project needed to implement the master plan. JICA has lent its support in introducing the agro-forestry that will preserve the forest. It has also helped introduce simple and appropriate irrigation farming to the area that will provide the needed alternative to shifting cultivation and provide an alternative source of income to local residents. JICA is also engaged in reforestation activities that incorporate

### ● Potential of Co-Benefits Approach to Climate Change

Forests and natural resources play a number of important roles, including conserving biodiversity and protecting water resources as well as supporting the livelihood of communities (from wood and other forest products such as firewood and lumber as well as non-timber forest products such as mushrooms, nuts, resins and herbs).

JICA values the multiple functions of forests and implements projects to ensure and maintain a good balance between the environment and development in developing countries with an eye to enhancing the livelihoods of the local communities through the sustainable use of natural resources. These projects limit excessive degradation of the natural environment while contributing to the reduction of GHG emissions and enhancement of CO<sub>2</sub> removals.



Counterpart organization's nursery

the needs of local residents as well as activities that prevent forest fires and enhance firefighting capabilities.

#### ▶ Mitigation Effect

This project contributes to curbing forest loss that will reduce GHG emissions and promoting the effective reforestation that will enhance CO<sub>2</sub> removals. Forest conservation also prevents soil erosion that will reduce carbon loss from soil.

#### ▶ Project Highlight

This project introduces agro-forestry and simple irrigation farming to replace shifting cultivation in the mountainous areas and improve the livelihoods of people in local communities. The project has been successful in that local residents agreed to discontinue shifting cultivation and plant trees. This project triples the benefits by conserving watershed, enhancing community development and reducing the threat of global warming. It is a good example of how JICA works in cooperation with people around the world.

## Project of Participatory and Sustainable Forest Management in the Province of Comoe

Burkina Faso

Project Period:  
June 2007–May 2012

#### ▶ Mitigation Effect

Cooperation between government agencies and local communities in implementing sustainable forest management activities through this project can put a stop to uncontrolled logging, curb the depletion of forest resources, and reduce CO<sub>2</sub> emissions.

#### ▶ Project Highlight

This project works to address climate change while helping to improve local residents' livelihoods and reduce poverty. A sustainable forest resources management project that helps improve local people's lives is also an effective sustainable measure to mitigate climate change.

#### ▶ Project Outline and Results

Northern Burkina Faso lies in the middle of the Sahel zone. It is currently facing serious desertification and deforestation due to shifting cultivation and uncontrolled logging to sustain a growing population. Even in the southern region, which has relatively abundant forest resources, forests have experienced significant damage or loss, resulting in desertification and an unstable food supply. The government of Burkina Faso has implemented a policy for sustainable forest management while facing serious issues due to lack of adequate technologies and know-how, and implementation mechanisms. Addressing these issues, JICA has conducted a development study and proposed an outline and approach for a participatory forest management plan covering designated forests in the Province of Comoe. This is a technical cooperation project necessary for implementing the plan. JICA supports activities designed to enhance the capacity of community and government organizations, improve technical capabilities and local people's livelihoods.



Grinding Karité nuts (one livelihood improvement initiative)

# JICA's Assistance in Mitigation Measures: Environmental Management

## ● Outline of Assistance

Environmental management entails the maintenance of a healthy balance between human economic and social systems and the environment to ensure the realization of sustainable development in a society. Assistance programs in this area focus on measures to deal with air and water pollution and waste management that arise due to rapid economic development in developing countries. JICA provides support for their central and local governmental authorities in this area to enhance their capacity to deal with these environmental problems. These agencies are also expected to play a significant role in implementing mitigation measures of climate change in these countries. JICA also works on raising environmental

awareness among local citizens and private companies through its assistance programs in order to improve the overall capacity of developing countries to deal with environmental problems. This is why environmental management has both direct and indirect relevance on implementing mitigation measures and plays a leading role in promoting the co-benefits approach to address climate change.

## ● Potential of Co-Benefits Approach to Climate Change

- Measures to control air pollutants at their source, such as power plants and automobiles, are essential to preventing air pollution. They provide co-benefits since energy saving and

## Examples of JICA's Assistance

### Study of Master Plan for Air Pollution Control in Guiyang Municipality

China

Project Period:  
January 2003–August 2004

#### ▶ Mitigation Effect

In this project JICA assessed and introduced approaches in each sector to improve combustion efficiency and production process (cleaner production) in developing a master plan for air pollution control. Energy conservation was addressed as one of significant air pollution control strategies. The measures to conserve fossil fuels contribute to not only preventing air pollution but also reducing GHG emissions.

#### ▶ Project Highlight

Guiyang has been selected as a model city for the Japan-China Environment Model City Plan along with Dalian and Chongqing. Through the JICA project as well as the yen-loan-financed Environment Model City Project, measures to control air pollutant point sources, such as power plants and industrial plants, were implemented and monitoring equipment was provided. A series of these initiatives to control air pollution have effectively contributed to reducing GHG emissions in Guiyang municipality.

#### ▶ Project Outline and Results

Located in a river basin, the city of Guiyang in China was affected by serious air pollution caused by fossil fuel use at the power, heavy and chemical industry plants concentrated in the city center. JICA first conducted the analysis of the air pollution mechanism in Guiyang, and developed a basic strategy for controlling air pollution based on the analysis. JICA also transferred the necessary technologies related to air pollution control through the project.



Guiyang city center shrouded in a haze of smog

### Study on Wastewater Management in Skopje

The former Yugoslav  
Republic of Macedonia

Project Period:  
September 2007–May 2009

#### ▶ Project Outline and Results

Vardar River that runs through Skopje City across international border has been polluted by household and industrial wastewater because there were insufficient wastewater treatment facilities. This project will establish the basic plan for wastewater management in Skopje City towards the year 2020. Its primary goal is to improve the water quality in the Vardar River. Under the basic plan, JICA will conduct a feasibility study (F/S) on sewage facilities and develop action plans. Action plans will include plans for improving the current wastewater management systems, developing implementation systems after sewage facilities have been installed and implementing industrial wastewater management and water quality monitoring.

#### ▶ Mitigation Effect

This project controls water pollution that may also cause methane gas generation

fuel switching in the areas of energy and transportation, for example, not only prevent local air pollution but also reduce CO<sub>2</sub> emissions, thereby contributing to the mitigation of climate change.

- Water pollution prevention measures such as introducing wastewater treatment facilities will prevent untreated industrial and household wastewater from being discharged into rivers and lakes and generating methane gas. The wastewater with high organic substance and treated sludge can be treated in anaerobic condition to generate methane gas which can be used as energy. Therefore appropriate treatment of wastewater and efficient use of sludge can reduce GHG emissions.

- Solid waste containing organic substances generates methane gas not only by open dumping but also in sanitary landfill sites. After properly collecting and disposing of waste at a landfill site, the generated methane gas can be recovered and effectively used. This results in reducing GHG emissions. Promoting the 3R<sup>6</sup> in pursuit of a healthy balance between the environment and economic activities through effective use of resources can reduce GHG emissions during a product life cycle from production to disposal. It is the first step toward building a sound material-cycle society that will lead to solving climate change issues.



Untreated household wastewater discharged into the Vardar River

due to the direct discharge of household and industrial wastewater into river systems through the implementation of appropriate wastewater treatment systems. Methane gas generated from anaerobic sludge treatment can be used as energy to partially substitute fossil fuel consumption.

#### ► Project Highlight

Implementation of wastewater treatment systems is one of the most important water pollution control measures in Skopje. This project is designed to improve environmental quality at the local level through controlling direct discharge of wastewater into Vardar River that is an international river. The measures to Skopje will contribute not only to improve both local and international environmental quality but also to reduce methane gas emission from wastewater as a mitigation measure to climate change.

## Project for Implementation Support for 3R Initiative in Hanoi City to Contribute to the Development of a Sound- Material Society

Viet Nam

Project Period:  
October 2006–September 2009

material-cycle society by putting the 3R into practice. It is expected to promote the effective use of resources and waste reduction that will contribute to reduce GHG emissions. This project also aims at composting collected organic waste as one of its goals. Composting organic waste instead of dumping it in a landfill will result in a shift from anaerobic treatment<sup>7</sup> to aerobic treatment and reduce methane emissions from landfill site.

#### ► Project Highlight

The government of Japan developed Japan's Action Plan for a World-Wide Sound Material-Cycle Society through the 3R Initiative. Based on the plan, Japan will provide assistance in promoting the 3R in developing countries. This project is a part of this government initiative.

This project develops plans for standardized organic waste source separation and recycling systems tailored to central Hanoi City. The implementation of this project is expected to serve as a pilot program for extension to other cities.

#### ► Project Outline and Results

Hanoi City has been facing serious urban waste problems caused by rapid socioeconomic development and urbanization. This project aims to develop a sound material-cycle society under the 3R initiative through a well-balanced 3R system based on source separation of organic waste and recycling. Project includes providing participatory environmental training activities, the implementation of pilot source separation and recycling activities. Based on the output of these pilot activities, standardized source separation and recycling systems will be proposed, and an action plan to extend the standardized program to central Hanoi City will be formulated. Finally the project will recommend a future waste management system to meet source separation programs in Hanoi City.

#### ► Mitigation Effect

This project aims to build a sound

Activity for promoting recycling  
Garbage sorting instruction



6) 3 R denotes "reduce," "reuse," and "recycle."

7) A process in which organic material is broken down by anaerobic microorganisms in the absence of oxygen and converted into methane and carbon dioxide after short-chain fatty acid production.

# JICA's Assistance in Mitigation Measures: Energy Conservation

Co-Benefits Approach

## ● Outline of Assistance

Energy conservation is the most effective, sustainable and cost-effective way to reduce GHGs. Equipped with the world's highest level of energy conservation technologies, Japan is contributing to stabilizing the world's energy supply and demand while realizing sustainable global economic growth through technological cooperation on energy conservation in developing countries.

## ● Potential of Co-Benefits Approach to Climate Change

- Energy conservation geared toward a more effective use of fossil fuels helps reduce GHG emissions. Developing energy conservation plans and implementing technological cooperation efforts and group training will promote energy conservation initiatives by both the public and private sectors and reduce overall energy consumption. Implementing such efforts will go much further to reduce GHG emissions than not implementing any energy conservation measures at all.

## Examples of JICA's Assistance

### Project on Energy Conservation

Turkey

Project Period:  
August 2000–July 2005

#### ▶ Project Outline and Results

Since Turkey relies on imports more than 50% for domestic energy consumption, energy saving is an urgent issue especially in the industrial sector that consumes large quantity of energy. The National Energy Conservation Center (NECC) has been promoting energy conservation through the establishment of certificated energy manager system, energy audits and publicity activities. Turkey, however, was halfway to achieve its energy conservation goals due to insufficient implementation systems and technological capabilities. In the face of surmounting energy issues, the Turkish Government requested that the Japanese Government assist them with technical cooperation project for organizing a practical training course for energy managers.

The training functions of the NECC were improved through the implementation and use of machines and equipment in practical training. Energy managers were assigned to major plants that were mandated to have a certificated energy manager position. This project also enabled more detailed energy audit to be conducted in five major industrial sectors

that received a technology transfer through this project (iron and steel, ceramic, textile, food and pulp). As a result of the energy conservation measures implemented in light of the energy audit findings, 9.5% of total energy consumption at target plants was reduced. The NECC's policy recommendation functions were strengthened through training in Japan and the dispatch of technical experts.

#### ▶ Mitigation Effect

This project not only successfully strengthened the NECC's functions but also is estimated to have reduced up to 5% of total energy consumption in Turkey's industrial sector.

#### ▶ Project Highlight

Long-term and well planned assistance through a variety of programs was the key to the success of the development project. It is another good example of JICA's successful assistance projects that should be applied in other countries.



The Turkish project counterpart is offering a lecture during an energy conservation training course to the energy managers at a local company, using mini-plant equipment that has been provided to the company.

### Master Plan Study for Geothermal Power Development

Indonesia

Project Period:  
March 2006–September 2007

#### ▶ Project Outline and Results

Indonesia is the world's richest country in geothermal resources. The Ministry of Energy and Mineral Resources (MEMR) set a development goal and prepared the legal framework with an aim to consolidate national, local and private efforts for geothermal development. However, progress in the development of geothermal power in this country has been slow. In response to a request from the Indonesian government, JICA conducted a survey of 73 promising geothermal fields throughout the country. JICA then developed a master plan for realizing the Indonesian government's road map for geothermal development, and provided the necessary technical knowledge for crafting development plans at the local level.

#### ▶ Mitigation Effect

Oil-fired power generation currently provides more than half of the power supply in Indonesia. CO<sub>2</sub> emissions per unit of power output can be reduced



### ● Outline of Assistance

A stable electric power supply is an essential element not only to attain the industrial and economic development but also to improve the standard of living of their populations in developing countries. Many developing countries are faced with two major challenges: providing electricity to rural areas, increasing generating capacity and expanding electric power coverage. Independent facilities generating renewable energy, such as small-scale hydroelectric generators or solar power stations, is the most effective and environmentally sustainable route to supplying electric power to outlying areas.

Deregulation of the electric power industry has allowed JICA to shift its focus of assistance from the development of power resources to the development of private sector strategies and systems that will ensure a stable power supply. JICA

provides support for increasing generating capacity, expanding electric power coverage and promoting widespread use of renewable energy resources to meet changing situations in developing countries.

### ● Potential of Co-Benefits Approach to Climate Change

- Building local facilities for generating renewable energy such as small-scale hydroelectric generators, solar or geothermal power stations can more effectively reduce GHG emissions compared with electric power generation using fossil fuels.
- Rehabilitating existing lines to increase transmission and distribution efficiency can reduce necessary fossil fuel consumption, thus resulting in lower GHG emissions.



Steam rising from a geothermal development candidate site

to less than a fiftieth when stable and renewable geothermal power generation is used instead of oil-fired power generation.

Promoting the use of geothermal energy in accordance with the master plan recommended by this project can reduce atmospheric emissions of CO<sub>2</sub> by more than 50 million tons annually compared with thermal power generation.

#### ▶ Project Highlight

Geothermal power development, which is expected to lead to stable power supplies and reduction of GHG emissions, has excellent potential as a CDM project. In the study, a model PDD (Project Design Document) was prepared in order to facilitate the Indonesian government in implementing CDM projects in the geothermal power sector. The study indicated the economic effect of CDM projects, demonstrating that they could contribute to the promotion of geothermal development.

## Master Plan Study for Utilization of Solar Energy

Nigeria

Project Period:  
July 2005–February 2007

#### ▶ Project Outline and Results

70% of Nigeria's total population lives in rural areas. About 90% of the population doesn't have electricity. A lack of basic infrastructure has widened the gap between rural and urban areas, and deteriorated living conditions and productivity in rural areas. Lack of electricity has also accelerated forest destruction due to a dependence on firewood as the main source of energy. The Government of Nigeria has been making conscious efforts to build a new power station and expand existing power networks. However, the challenge facing this effort relates to budgetary and human resource concerns.

The Government of Nigeria developed an energy supply program that disperses power generation by employing renewable energies for remote rural areas which are likely to be left off the grid for some time to come. Based on the program, JICA was asked to develop a master plan for electrification in rural areas using independent renewable power stations.

This study covering four states provides a Master Plan for Photovoltaic (PV) Rural Electrification designed to last until 2020. A pilot project was conducted in three villages where the necessary PV

systems were installed. All the skills needed to operate a system management organization and maintenance technologies were transferred during implementation of the project.

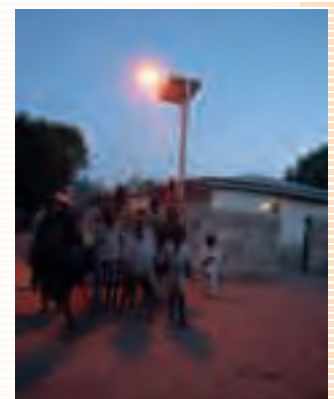
#### ▶ Mitigation Effect

The project promoted to the substitution from dependence on firewood as the main source of energy to photovoltaic energy in pilot project target villages. This resulted in mitigating deforestation and possibly reducing GHG emissions.

Use of solar energy is believed to have replaced fossil fuel power generation.

#### ▶ Project Highlight

This project also contributed to the reduction of poverty in rural areas. The residents' quality of life was improved through electrification by means of effective use of solar energy which is abundantly available in these areas. Such use of renewable energy serves as an effective countermeasure for global warming.



Children gathering under a street light which has freed them from the threat of assaults, snakes and scorpions.

### ● Outline of Assistance

The creation of an adequate transportation infrastructure is a critical issue in developing countries. An inadequate transportation infrastructure often impedes economic development and is a cause of poverty in developing countries. Countries that have achieved a certain level of economic growth are facing new problems such as increasing traffic accidents and chronic traffic congestion in urban areas. These problems cannot be resolved simply with improvements to facilities. A comprehensive and efficient transportation plan that will serve as a framework for creating efficient transportation systems is paramount. In addition to the construction of transportation facilities, JICA also assists individual and institutional capacity development to support the sustainable functioning of transportation systems.

### ● Potential of Co-Benefits Approach to Climate Change

- Increasing use of automobiles can be shifted to the use of public transportation, thereby allowing auto emissions to be significantly reduced in comparison to areas where public transportation has not been developed.
- Projects for mitigating traffic congestion will result in reduced use of automobile fuels. This could potentially cut GHG emissions in comparison to business as usual.
- Constructing terminals that can accommodate large-size container ships will increase the efficiency of marine container transportation and result in a potential reduction of GHG emissions.

## Examples of JICA's Assistance

### Study on Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area

Viet Nam

Project Period:  
August 2002–June 2004



Traffic congestion in Ho Chi Minh City

#### ▶ Project Outline and Results

Economic growth in Ho Chi Minh City has brought accompanying economic, environmental and social problems related to urban transportation. Increased traffic congestion has led to negative economic impacts, traffic accidents and air pollution. Since the city's population is expected to rapidly surge, measures to shift from the use of motor bikes and automobiles to the use of public transportation must be urgently developed and implemented. Against this backdrop, the government of Viet Nam requested that Japan develop a comprehensive urban transportation plan that includes the implementation of

public transportation systems. The project developed a master plan for an urban transport system following an assessment of urban transportation-related problems, and formulated a short-term strategy. Based on the master plan, the feasibility study was implemented for priority transport infrastructure projects.

#### ▶ Mitigation Effect

When the urban transport system recommended by the master plan developed in this project is materialized, use of public transportation (bus and railway) will increase. In comparison to the business-as-usual scenario, this will lower

the demand for automobiles and reduce GHG emissions from automobiles in the future.

#### ▶ Project Highlight

This project is characterized by a comprehensive urban transport master plan for increasing the use of public transportation. Since urban areas in many Asian developing countries have similar problems, this type of project can be beneficial for other cities in mitigating traffic congestion and air pollution as well as reducing GHG emissions.

Part of the project recommended by this study is being financed by a yen loan.

# JICA's Assistance in Mitigation Measures: Water Resources and Disaster Management — Co-Benefits Approach

## ● Outline of Assistance

There are many people in developing countries without access to safe drinking water due to a lack of water resources and insufficient water supply facilities. Natural disasters like floods and earthquakes occur around the world with devastating effects, particularly on those living in developing countries where solid infrastructures to deal with such catastrophes are not yet in place. These disasters can disrupt lives and further exacerbate condition of poverty.

JICA takes a comprehensive approach to solving water resource problems in developing countries by considering such issues as irrigation, flood control, and the aquatic environment. JICA also actively supports disaster-prevention programs through a combined approach that incorporates both physical and nonphysical measures in order to reduce disaster risks.

## ● Potential of Co-Benefits Approach to Climate Change

- Water that has been lost due to leakage or stealing is called non-revenue water. The amount of water supplied to consumers can be increased by reducing non-revenue water. In order to supply water, significant energy and power must be consumed for water purification and distribution. If non-revenue water is reduced, less energy will be used for supplying the same amount of water. This will result in reducing GHG emissions. JICA provides support for enhancing the capacity to maintain and manage water supply pipes and promoting activities to raise public awareness of reducing stolen water.
- Slope and watershed protection measures are essential for preventing sediment and flood damage. Disaster management programs that involve watershed protection have a positive effect on increased CO<sub>2</sub> removal by forestry.

## Examples of JICA's Assistance

### Capacity Development Project for Non-Revenue Water Reduction

Jordan

Project Period:  
August 2005– (3 years)

#### ▶ Project Outline and Results

More than 80% of Jordan's land is a semi-arid plateau. As the water demand increases in proportion to its population growth, Jordan faces constant water shortages. Water supplied from the water works for which fees cannot be collected

is collectively called non-revenue water. Leakage, illegal connection and inaccurate meter installation are the main factors of high non-revenue water. Non-revenue water was over 50% of the total water supply across Jordan in 2002, leading to an increased deficit for the Water Authority of Jordan (WAJ). In response to Jordan's request, the Government of Japan decided to implement a comprehensive capacity development project for non-revenue water reduction. JICA provides support for capacity development of WAJ personnel and organization, on-the-job training in pilot areas and raising public awareness.

#### ▶ Mitigation Effect

Non-revenue water reduction calls for

steady efforts. Jordan's non-revenue water rate will gradually decline as a result of the efforts of the WAJ whose functions have been enhanced through this project. The WAJ will be able to supply water using less electric power (or supply more water using the same power consumption). This will result in reducing the emissions of GHGs from power generation.

#### ▶ Project Highlight

This project helps the WAJ develop an internal system for continuously implementing training and enables it to keep up efficient water delivery when water works are expanded to meet increased demand in the future.



Water leaking from a drain



Checking a water meter using a listening stick

### ● Outline of Assistance

Reliable access to food through agriculture is essential to political and economic stability. Developing countries frequently face food shortages and it can trigger famines and regional conflicts by refugees. Support for agriculture in developing countries thus helps to strengthen the national infrastructure. It also makes an important regional-level contribution to stability in the international community. JICA supports agricultural and rural development in developing countries from the viewpoint of both agriculture promotion as an industry in these countries and improvement of the living standards of farmers.

### ● Potential of Co-Benefits Approach to Climate Change

- Projects that promote the proper use of land contribute to reducing carbon emissions derived from soil.
- Projects that promote adequate fertilizer application facilitate the reduced use of fertilizer, resulting in abatement of GHG emissions derived from fertilizers.
- Projects that promote appropriate livestock management reduce methane gas emissions from livestock manure.
- Projects that introduce improved cooking stoves promote efficient fuel use at home and helps control excessive GHG emissions.
- Rural electrification using renewable energy results in generating less GHGs compared with rural electrification using fossil fuels.

## Examples of JICA's Assistance

### Study on the Oasis Zone Development Focused on Feminine Promotion

Mauritania

Project Period:  
September 2005–March 2008

#### ▶ Project Outline and Results

Mauritania is a mostly desert nation where people live in a harsh environment. In farming areas including the oasis region where many people live in poverty the number of households headed by women has rapidly increased since most men are working away from their homes. Meanwhile increasing poverty is a major social concern in the region. Japan conducted a development study between 2001 and 2004 targeting the oasis region to seek ways to build the institutional capacities which could enable people to establish stable livelihoods based on sustainable use of oasis resource potentials.

This project aims to develop and implement a gender-conscious development plan in order to improve livelihoods and alleviate poverty as well as

to enhance the capacity of the Secretariat of State for the Feminine Condition and other relevant organizations.

#### ▶ Mitigation Effect

Improved cooking stoves introduced as one of the tools through this project, reduce the use of firewood at homes. Promoting the efficient use of fuel in each household will lead to mitigating deforestation and consequently reducing excess GHG emissions.

#### ▶ Project Highlight

Gender is an important focal point in achieving sustainable development. It is a key issue in some areas. This project focuses on women who play a major role in supporting the livelihoods of residents in local communities. Excessive logging for firewood is generally one of leading causes of deforestation, which in turn can result in a lack of firewood and increased labor burden. Introduction of improved cooking stoves can reduce the burden on women, who devote much of their time to fetching firewood, while mitigating deforestation as well as GHG emissions.

#### ▶ Project Outline and Results

Kyrgyz's major industry is livestock and cotton farming. After becoming independent from the Soviet Union in 1991, accompanied by halting fertilizer and agricultural chemicals rationing system, farmers faced to reduced income and subsequent sellout of livestock by increased cost of agricultural production. In addition, because of rising price for fossil fuel such as coal, illegal logging for firewood extraction as an alternative fuel became a social issue.

This project aims to establish biogas technology<sup>8</sup> in rural areas in cold region, and to disseminate the technology in order to address above mentioned issues.

#### ▶ Mitigation Effect

This project will contribute to reducing the use of coal in rural areas, which will reduce GHG emissions. Mitigating illegal logging for firewood will also contribute to reduced emissions and increased removal of CO<sub>2</sub>.

#### ▶ Project Highlight

Establishing and disseminating the biogas technology will bring solutions to fuel problems in rural areas in cold region. Promoting the use of liquid fertilizer instead of directly applying livestock manure will improve agricultural productivity and people's living environment. The project offers a model example since it not only offers multiple benefits but also facilitates reduction of GHG emissions.

### [Under Development] Project for the Support for the Dissemination of Biogas Technology

Kyrgyz

Project Period:  
December 2007–December 2010



Teaching people how to use the improved cooking stove, training essential for people living in the oasis regions where firewood is scarce

8 A technology for producing biogas and effective liquid fertilizer by anaerobic decomposition of organic material (such as livestock manure). Generated biogas can be utilized as fuels for households and power/heat.

# JICA's Assistance in Mitigation Measures: Additional Areas of Focus

## Co-Benefits Approach

In addition to the areas mentioned above, JICA works on initiatives to mitigate climate change in other areas as well. In the area of urban and regional development, urban development projects that promote energy conservation can benefit in reducing GHG emissions in the target areas. Even in the area of education and health, which is often considered to have little to do with climate change, JICA incorporates initiatives to combat climate change, e.g. introduction of equipment that uses renewable energy, without deviating from the original goal of the project. Such initiatives also contribute

to maintaining the sustainability of the project.

JICA offers a number of training programs that focuses on climate change mitigation measures in order to achieve capacity development for implementing these measures in developing countries. These programs play an important role in developing countries' autonomous and long-term efforts toward the mitigation of climate change.

JICA continues to promote the co-benefits approach toward mitigating climate change in more extensive areas.

### Examples of JICA's Assistance

#### Development of Strategies on Climate Change (Group Training Course)

Project Period:  
January 2007–March 2007

##### ► Project Outline and Results

This training course aims to transfer technologies necessary for developing countries to sort out the climate change issues they face and develop measures for improvement by leveraging Japan's expertise in energy conservation with an ultimate goal to meet the requirements of the Framework Convention on Climate Change. The training course covers a wide range of topics from policymaking to more technical aspects. Participants learn the concept of mainstreaming climate change policy into sustainable development as well as methodology such as developing inventories of greenhouse gas emissions and sinks.

##### ► Mitigation Effect

Participants in this training program assess the climate change issues faced by their respective countries and explore solutions. The training course provides them with an opportunity to develop strategies for implementing mitigation measures after learning about Japan's co-benefits approach in energy conservation and pollution control.

##### ► Project Highlight

JICA's training system is superior in both quality and quantity in comparison with training offered by aid organizations of

other advanced countries. JICA provides comprehensive capacity development assistance addressing climate change. The personnel training and technology transfers provided through JICA's superior training system are crucial to developing countries' independent and long-term efforts.

A training session held at Stop Ondankan<sup>9)</sup>



#### Capacity Building for Officers Dealing with A/R CDM Project for Asia-Pacific Region and South and Central America (Training Course)

Project Period:  
November 2007

##### ► Project Outline and Results

The Clean Development Mechanism (CDM) includes the Emission Reduction CDM which aims at reducing GHG emissions and A/R CDM which aims for removal of CO<sub>2</sub> by afforestation and reforestation. Developing countries need to implement A/R CDM for their sustainable forest improvement projects. However initiatives for promoting A/R CDM are limited mainly due to the lack of personnel in charge of planning and implementation of projects.

This course is intended for government officers dealing with A/R CDM projects in developing countries. It provides them with opportunities that will be built

their capacity of the sequence of A/R CDM project cycles related to planning, implementation and monitoring of A/R CDM projects based on the A/R CDM experience, knowledge and technologies in Japan. In this course participants identify the current situation and issues related to A/R CDM and formulate an action plan toward solving these issues with an aim to promote sustainable forest management through A/R CDM projects in their own countries.

##### ► Mitigation Effect

This training program promotes a better understanding of A/R CDM among government administrators in developing countries and facilitates sustainable forest management as a result. This will consequently lead to enhanced absorption of carbon dioxide.

##### ► Project Highlight

A/R CDM contributes to enhanced CO<sub>2</sub> removal, increased income opportunities from afforestation work and credit trading, access to firewood as well as prevention of soil erosion. It can serve as a solution to various problems faced by local communities.

9) Stop Ondanka Web site, <http://www.jccca.org/ondankan/index.html>

# JICA's Mitigation Measures

## Mauritania

Study on the Oasis Zone Development Focused on Feminine Promotion

P.12

▶▶ September 2005–March 2008

## Burkina Faso

Project of Participatory and Sustainable Forest Management in the Province of Comoe

P.5

▶▶ June 2007–May 2012

## Nigeria

Master Plan Study for Utilization of Solar Energy

P.9

▶▶ July 2005–February 2007

## Malawi

Master Plan Study on Rural Electrification

▶▶ August 2001–March 2003

▶ Expected effects of co-benefit approach to climate change  
This project implemented electrification in remote rural areas with renewable energy such as small-scale hydropower. The project is expected to reduce GHG emissions by reducing consumption of fossil fuel (e.g., kerosene).

## Senegal

Integrated Community Forestry Development Project

▶▶ January 2000–March 2008

▶ Expected effects of co-benefit approach to climate change  
This project promotes sustainable management and conservation of forest resources by community, which is expected to lead to prevent CO<sub>2</sub> emissions due to excess use of resources.

## Zambia

Capacity Building and Development for Small-Holder Irrigation Scheme

▶▶ Under development

▶ Expected effects of co-benefit approach to climate change  
Using gravity irrigation system which utilize terrain of the project area, energy to pump up water will not be necessary for the facilities. This project is expected to reduce GHG emissions by harnessing extra consumption of fossil fuel.

**The former Yugoslav Republic of Macedonia**

**Study on Wastewater Management in Skopje** P.6-P.7  
 ▶▶ September 2007–May 2009

**Turkey**

**Project on Energy Conservation** P.6  
 ▶▶ August 2000–July 2005

**Jordan**

**Capacity Development Project for Non-Revenue Water Reduction** P.11  
 ▶▶ August 2005– (3 years)

**Iran**

**Project on Energy Management Promotion**  
 ▶▶ March 2003–March 2007

▶ Expected effects of co-benefit approach to climate change  
 This project has transferred technologies for energy conservation into the industrial sector so as to reduce consumption of fossil fuel and GHG emissions.

**Kyrgyz**

**[Under Development] Project for the Support for the Dissemination of Biogas Technology** P.12  
 ▶▶ December 2007–December 2010

**China**

**Study of Master Plan for Air Pollution Control in Guiyang Municipality** P.6  
 ▶▶ January 2003–August 2004

**Viet Nam**

**Project for Implementation Support for 3R Initiative in Hanoi City to Contribute to the Development of a Sound- Material Society** P.7  
 ▶▶ October 2006–September 2009

**Study on Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area** P.10  
 ▶▶ August 2002–June 2004

**Indonesia**









**Gunung Halimun-Salak National Park Management Project** P.4  
 ▶▶ February 2004–January 2009

**Master Plan Study for Geothermal Power Development** P.8-P.9  
 ▶▶ March 2006–September 2007

**Additional Areas of Focus**

**Development of Strategies on Climate Change (Group Training Course)** P.13  
 ▶▶ January 2007–March 2007

**Capacity Building for Officers Dealing with A/R CDM Project for Asia-Pacific Region and South and Central America (Training Course)** P.13  
 ▶▶ November 2007

 Forest and Nature Conservation	 Transportation
 Environmental Management	 Water Resources and Disaster Management
 Energy Conservation	 Rural Development
 Power and Energy	 Additional Areas of Focus

**Dominican Republic**

**Sustainable Watershed Management Project in the Upper Area of the Sabana Yegua Dam** P.4-P.5  
 ▶▶ April 2006–March 2009

**Mexico**

**Project on the Assistance Plan for Small Producers in “El Soconusco” Region, the State of Chiapas**  
 ▶▶ September 2006–September 2009

▶ Expected effects of co-benefit approach to climate change  
 This project seeks to disseminate improved cooking stoves to the households in the rural area. It will reduce firewood consumption, and contribute to prevent deforestation which will result in reducing CO<sub>2</sub> emissions.

**Brazil**

**Project for Capacity Development on Non-Revenue Water Control for Sanitation Company of the State of São Paulo (SABESP)**  
 ▶▶ July 2007–July 2010

▶ Expected effects of co-benefit approach to climate change  
 Non-revenue water control including leakage control, management of water pressure and enhancement of levying water fee will improve the efficiency in water supply. It will lead to reduce GHG emissions by harnessing electricity consumption required to water supply.



The analysis and recommendations of this brochure do not necessarily reflect the official views of JICA. The information in this brochure is currently under review as part of JICA's study on its future assistance for co-benefits approach to climate change. The brochure and other study reports of JICA are available in PDF format on the JICA home page.

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