Industrial Development

Supporting Developing Countries in Promoting Industry and Creating an Economically Independent Society

Of the eight Millennium Development Goals (MDGs), relevant goals are shown in color.

In the field of industrial development, JICA supports the development of the private sector, which serves as an engine for economic growth. While focusing on promoting trade and investment, tourism development, small and medium-sized enterprises development, and the vitalization of local industry and economy, JICA provides broad-ranging support to develop industrial infrastructure in developing countries, including support for the stable supply of electric power, mining, renewable energy, and energy conservation. The objective is to empower developing countries to build industrial bases, advance industry, increase job opportunities and create a society in which local residents can receive benefits from economic development.

Public-Private Partnerships are an important theme in today's global economy. JICA is placing emphasis on cooperation by utilizing Japan's advanced technologies such as in the environment and other sectors as well as yield benefits for industries in both countries.

Private Sector Development

Overview of Issue

Efforts to develop the private sector aim to promote economic growth in developing countries by enhancing the capacity of the private sector and local industries. The growth and expansion of private sector corporations and local industries are essential to diversifying and strengthening the competitiveness of industries in developing countries. Improving the investment climate for private firms will contribute not only to energizing industries by making them stronger but also to developing communities by exploiting local resources and the self-fulfillment of the people. The governments of developing countries are being asked to tap the vibrancy of their private sectors from a dynamic and inclusive perspective in order to expand job opportunities and thus reduce poverty.

In addition, the New Growth Strategies of the Government of Japan require building stronger ties between Japan and countries in Asia and other areas with rapidly growing economies. This is another reason for the increasing importance of private-sector development.

JICA Activities

JICA's private-sector development initiatives have so far centered on Southeast Asia and East Asia. Today, both of these regions are experiencing tremendous economic growth. In light of this fact, there is an increase in requests from Africa to learn from the experiences of Asian countries.

The volume of trade and investment in the global economy has risen substantially due to globalization. Asian countries that have grown into emerging economies on the world stage, as well as many developing countries in Africa and other regions, are actively taking part in international frameworks such as the World Trade Organization (WTO) and Economic Partnership Agreements (EPA).

On the other hand, economic globalization has increased the likelihood that one country's economic crisis will spread quickly, widely and significantly damaging the economies of vulnerable countries and regions, as witnessed in the global financial and economic crises that struck in autumn 2008 and the instability in a number of Middle Eastern countries since early 2011, and the negative effects of the Great East Japan Earthquake on the economy of developing countries. As globalization progresses, JICA supports developing countries in building their industrial bases, increasing job opportunities and creating societies that can reap the rewards of economic development through their own efforts.

1. Promoting Trade and Investment

By increasing trade and promoting investments, developing countries can create new markets, introduce expert knowledge such as finance and management know-how and technology, create jobs and strengthen international competitiveness.

JICA can provide comprehensive support that extends from industrial policies, a high-level form of cooperation, to the implementation of programs to increase exports and investments. Assistance is extended from three perspectives. First is aid for the development of industrial bases. This involves creating legislation in areas such as intellectual property rights and certification of standards that are needed to promote trade and investments. This perspective also includes establishing the physical infrastructure for industrial progress. Second is aid for organizational/institutional reinforcement, which covers institutions that play key roles in trade and investment promotion. Third is aid for capacity development for government officials who create and implement policies and for people in the private sector.

Recent successful projects include the Project on Enhancing

the Investment-related Services of Council for the Development of Cambodia, the Project for Strengthening Intellectual Property Rights Protection and the Project on Strengthening of the Utilization of the Indonesia-Japan Economic Partner Agreement in Indonesia, and the Project on Strengthening the System and Operation on Standards and Conformance in Viet Nam. Furthermore, to enable aid activities to assist the overseas operations of Japanese companies, JICA sends many investment policy advisers to provide advice to the investment promotion agencies of other countries.

In Cambodia, JICA has supported the establishment of a special economic zone (SEZ) on approximately 70ha of land near Sihanoukville Port, the country's only international port. The SEZ is expected to attract foreign direct investment for the

Case Study **Indonesia Project for Promotion of Clean Coal Technology (CCT)**

Aid for the Adoption of High-Efficiency, Low-Carbon, Low-Pollution Coal Power Generation Systems

While Indonesia is the second-largest supplier of coal to Japan, demand for coal is increasing within Indonesia as well due to rapid growth in demand for electricity resulting from the country's economic growth.

JICA is extending assistance for the introduction of Clean Coal Technology (CCT) that utilizes technologies for highly efficient coal power generation systems with the aim to assist Indonesia effectively use its coal resources while lowering GHG emissions and pollution.

Using Coal Efficiently with Minimal Environmental Impact

Coal accounts for about half of the world's energy. Demand for coal is growing rapidly in emerging countries and has reached the point where even China, the world's largest producer of coal, was also the world's largest coal importer in 2011.

Japan, formerly the world's largest coal importer, relied on coal for about 25% of its electricity. However, coal has become even more important to Japan due to increased dependency on coal-generated electricity following the Great East Japan Earthquake.

As Indonesia is the second largest supplier of coal to Japan, the governments of the two countries have established a close, multi-tier relationship through policy discussions and collaborative projects regarding the use of coal.

JICA has been extending cooperation in Indonesia for the efficient use of coal along with assistance for developing geothermal power plants and promoting energy conservation. In April 2011, JICA started implementing a project to promote the use of CCT that takes advantage of the Japan's latest technologies.

Incorporating Technologies of the Future for 50% Power Generation Efficiency

CCT encompasses a broad range of environmentally friendly coal use technologies for reducing CO_2 and other emissions from activities extending from coal mining to power generation and the disposal of waste materials. Reducing emissions from coal-fired power generation was the focus of this Technical Cooperation in Indonesia. The primary objective was to utilize technologies in the manner best suited to Indonesia for high-efficiency power generation that significantly cuts emissions of CO_2, oxides of sulfur and nitrogen, and other gases.

The thermal efficiency (net, LHV) of sub-critical coal-fired power plants, the primary means of generating electricity from coal, is about 36%. Ultra-supercritical coal-fired power plants, which generate electricity using steam with higher temperatures and pressure, have the potential of raising efficiency to 42%. Japan has the world's most advanced technologies and accomplishments in this field, and also leads the world in research involving integrated gasification combined cycle (IGCC) power generation, in which coal is turned into a gas for combustion and then both steam and exhaust gas are used to generate electricity. This technology of the future aims to boost thermal efficiency to 50%.

For the implementation of CCT in Indonesia, JICA has provided suggestions concerning the formulation of medium and long-term policies. This includes the establishment of a roadmap extending to the use of IGCC as well as basic studies for a model power plant development plan.

As part of these activities, a seminar was held in November 2011 at the JICA Research Institute International Conference Hall on Indonesia's electric power policies, electric power development plan and plan for promotion of the introduction of CCT. The seminar was attended by representatives of the Indonesian Ministry of Energy and Mineral Resources, State Electricity Company (known as PLN, Indonesia's government-owned power company), the Japanese government, and power companies in Japan. At the seminar, representatives of PLN stated that, based on the recommendations of this project, they plan to start ultra-supercritical thermal power generation in about 2016. They also have a plan to study the use of IGCC as early as 2025, depending on the status of commercial use of IGCC in other countries. JICA's suggestions are anticipated to be reflected in the official electric power development policy of the Government of Indonesia.

A seminar to discuss the latest developments in Indonesia regarding the implementation of CCT (November 2011)

JICA is also supporting the use of CCT through financial cooperation. One example is the provision of an ODA Loan for construction of the Indramayu coal-fired power plant (ultra-supercritical), which is scheduled to begin operations in about 2018. This cooperation facilitates the transfer of Japan's advanced technologies while also helping secure stable energy resources by strengthening the relationship between Indonesia and Japan.

A View from Our Partner

Indonesian official involved in policymaking

A reliable supply of electricity is vital to improving the living standards of the people of Indonesia. With our economy now posting strong growth (Indonesia's economic growth rate marked 7.5% in 2011), the importance of electricity is now even greater. Building coal-fired power plants is critical in Indonesia in order to meet this demand for electricity while using our natural resources effectively. However, we must also keep in perspective to reduce the environmental impact of these plants, such as by cutting down on CO_2 emissions.

Consequently, the cooperation for our formulation of a plan to start using CCT by about 2025 was very timely. I hope to see the results of this plan incorporated in upcoming activities to build coal-fired power plants. Using CCT will be important regarding the effective use of coal resources, lowering GHG emissions and maintaining a reliable supply of electricity, and I look forward to receiving continuous cooperation from Japan.

development of Cambodia's export-related industries, which can generate employment opportunities particularly for young people. The SEZ will also strengthen functions for attracting investments at many levels.

2. Promoting Small and Medium-Sized Enterprises

Small and medium-sized enterprises (SMEs) perform many functions and roles in society and the economy, such as conducting distinctive business activities, creating jobs, and helping form economic infrastructures. Consequently, many countries place priority on supporting these enterprises.

However, in developing countries, growth for SMEs has been stifled by the delayed development of policies and institutions that support SMEs, coupled with the lack of corporate networks, insufficient technical and managerial know-how, and poor access to finance. Efforts to train industry human resources that can work in these enterprises are also inadequate.

JICA provides cooperation for strengthening implementation capacity of the government institutions in charge of SME promotion as well as educational institutions, human resource development and improving the quality and productivity (*KAIZEN*) at enterprises. Moreover, since it is difficult for SMEs to receive financing, JICA aims to provide effective support with financial aid offered in the form of ODA Loans.

Recently, emphasis has been placed on extending cooperation for developing countries where large numbers of Japanese firms have established a presence, such as Thailand, Viet Nam and Mexico. This cooperation is aimed at creating a mutually beneficial relationship between the partner country and the Japanese firms operating there. In Viet Nam, for example, JICA is extending comprehensive support to government agencies that promote SMEs, educational institutions, financial institutions and other organizations with the cooperation of Japanese firms in the country, aiming to empower industries in Viet Nam to become supporting industries that supply parts and materials to local Japanese firms, and to cultivate industry human resources that can work at Japanese firms.

JICA also extends cooperation for strengthening of public institutions that provide companies with support services for Japanese business improvement techniques such as "5S" activities and the quality/productivity improvement *KAIZEN* methodologies. In Cambodia, for instance, policy dialogue regarding the roles of corporate support services was carried out in consideration of the results of a model corporation where the 5S and *KAIZEN* methodologies were applied, and these methods were reflected in governmental policy.

Furthermore, JICA is supporting careers at corporations and entrepreneurship for individuals placed in vulnerable positions, such as the families of surrendered soldiers in Colombia.

3. Promoting Local Industry and Vitalizing Local Economies

Regional disparities, as an impact of economic growth, have become an important issue in many developing countries. Developing countries face an increasing need to create local employment opportunities and to promote local industries by vitalizing their local economies. In response to this demand, JICA supports the development of local industry under a program called "One Village, One Product" and encourages the use of local resources in attempt to create employment and promote regional economies.

In Africa, in particular, JICA has announced that the "One Village, One Product" project will be implemented in 12 countries as part of the Yokohama Action Plan released at the 4th Tokyo International Conference on African Development (TICAD IV). Surveys and projects are being implemented in countries such as Malawi, Kenya, Uganda, and Nigeria, where efforts are now being carried out to develop governments' structures for assisting small local producer groups, provide support for accounting and other basic business skills as well as production technologies, and strengthening the collaborative structure that ties together markets and producer groups. Similar programs are also being carried out in Asia, Central America, and South America.

4. Tourism Development

Previously the tourism industry in developing countries was led by foreign-capital entities such as tourism developers, travel companies and hotel chains. This is regarded as heteronomous tourism. Although not necessarily adverse, it does not allow local people to fully reap the benefits of this sector.

JICA initiatives aim to promote autonomous tourism development, in which the local people develop the industry under their own steam and sustainably by utilizing their own resources.

JICA provides support in the following areas: (1) promotion of Public-Private Partnerships in which public institutions such as the Ministry of Tourism and local tourist bureaus, private enterprises such as travel companies and guide associations, and local people can work together; (2) nurturing of human resources to convey the necessary know-how to advance tourism; (3) development of tourism products using tourism resources such as places of historical importance or extraordinary scenic beauty in addition to locally produced items such as handicrafts and folk art unique to a region; and (4) strengthening tourism promotion and marketing capacity and the implementation system. Through such support, JICA aims to ensure sustainable tourism that helps realize regional advancement contributing to poverty reduction. This is attainable by increasing the income of local citizens, creating jobs and strengthening the impetus of social harmony.

For instance, in Palestine and El Salvador, JICA is providing support for developing tourism products using local resources and carrying out promotions for those products. In the Dominican Republic, a project called Sustainable Tourism based on Public-Private Partnership is being implemented, which aims to create foundations for tourism development that provide benefits to the local community in a sustainable manner [See the Case Study on page 55].

The Laos Pilot Program for Narrowing the Development Gap towards ASEAN Integration (LPP) (tourism promotion component) aims to rectify disparities among member states of the Association of Southeast Asian Nations (ASEAN). Under this project, JICA is providing support to promote tourism development for Laos, one of the least developed Southeast Asian countries, by utilizing natural, cultural, and historical tourism resources in an appropriate and sustained manner.

In this way, JICA assesses the needs of each country and the condition of local communities and supports tourism development that is necessary and suitable for each country or region.

Energy and Mining

Overview of Issue

Momentous changes on a global scale are occurring in the energy and mining sector. In the mining sector, the structure of the market has shifted completely from a buyers' to a sellers' market. Prices of many mineral resources are rising rapidly in response to economic growth in emerging countries and other events. Furthermore, purchasing rare earth metals and other scarce resources has become difficult for geopolitical reasons as well as because of the rapid increase in demand. Consequently, securing mineral resources has become a major issue for countries around the world.

In the energy sector, the world is shifting to low-carbon energy sources in order to achieve both sustainable economic growth and the reduction of GHG emissions. For example, the United Nations declared 2012 the International Year of Sustainable Energy for All and called on all nations to provide people with inexpensive and efficient access to advanced energy sources, which will also help achieve the Millennium Development Goals. Determining how to supply energy is clearly gaining recognition worldwide as a critical issue for fighting global warming and reducing poverty. However, while some developed countries have a strong commitment to increasing the use of renewable energy sources that are better for the global environment but relatively expensive and less reliable in terms of stable supply, many developing countries are seeking inexpensive and stable energy supplies in order to support steady and sustainable economic growth, revealing a significant gap in perception of the issue.

In Japan, the Cabinet approved the Strategies to Revitalize Japan in December 2011 with the objective to utilize Japan's advanced environmental and energy technologies as the world shifts to a "green" economy.

Assistance for securing low-cost, low-carbon and reliable

Case Study **Turkey Support for the Development of Pumped Storage Power Generation**

Japanese Technology in Variable-Speed Pumped Storage Power Generation to Accommodate Peak Demand

Electricity demand in Turkey is increasing at an annual rate of 7% as the economy continues to expand. There are fears that peak demand will exceed the supply of electricity as soon as 2015. Furthermore, due to the addition of substantial output from wind turbines, Turkey must also deal with AC frequency problems and other issues involving the stability of its electricity supply.

The Government of Turkey sought assistance from the Government of Japan, and in response, JICA performed a survey in 2010 to determine the proper composition of energy sources for electricity and create a plan. The survey showed the need to construct a pumped storage power generation system in Turkey. JICA began sending experts to Turkey in 2011 and accepting trainees from Turkey to learn the variable-speed pumped storage power generation system, which is a technology where Japan has a comparative advantage.

Pumped storage systems use surplus nighttime electricity to transfer water from a lower reservoir to an upper reservoir. During peak demand, water flows back down to generate more electricity, in effect, creating a "giant battery." In addition, supplying electricity to the generators transforms them into motors that drive the pumps. With a variable-speed system, the amount of output can be adjusted during power generation and water pumping, which helps maintain consistency of the AC frequency during peak and off-peak periods, and resulting in more efficient use of the power generation system.

Since the 1980s, Japan has been developing the world's most advanced variable-speed pumped storage generation systems, leading to Turkey asking Japan for assistance with this project.

JICA experts started performing a study in 2010. While most of Turkey's electricity came from thermal power plants, the country aimed to increase the use of wind, solar, and other renewable energy sources. However, the seasonal variations between the wet and dry seasons and between summer and winter weather posed challenges. The study concluded that pumped storage is the best

Electric power technicians from Turkey observing the Kazunokawa Pumped-Storage Power Station

choice with regard to meeting peak demand and maintaining the stability and quality of the electricity supply. Two locations were then chosen as potential site for the facility.

Government agencies in Turkey associated with electric power have high expectations for the country's first variable-speed pumped-storage power facility. Starting in 2011, Turkey has received technical advice from Japan regarding its provisional plan. In addition, power company personnel from Turkey were invited to Japan to participate in training sessions held at a variable-speed pumped storage facility. The Turkey Electric Power Seminar was held concurrently to forge relationships between the visitors from Turkey and Japanese power companies and power generation equipment manufacturers.

energy supply in developing countries is a very difficult task but a vitally important mission of a nation like Japan that has advanced and efficient technologies. JICA will provide extensive aid that can produce substantial benefits for developing countries and utilize Japan's strengths in order to achieve peace and sustained economic growth in the world.

JICA Activities

1. Electric Power and Energy

The key aspects of JICA's support in the energy and power sector are, 1) support for sustainable economic growth through the stable supply of electric power, 2) promoting the reduction of greenhouse gas (GHG) emissions by implementing optimal technologies, and 3) promoting rural electrification in view of reducing poverty.

In order to ensure the stable supply of electric power, it is important to develop the systems of power generation, transmission, and distribution facilities in a timely and coordinated manner, as well as to cultivate administrative and technical capacity of human resources. Taking this into account, it is possible to develop electric power facilities in a swift and integrated manner by providing Technical Cooperation for the development and planning of facilities in accordance with each country's unique circumstances and implementing financial cooperation via ODA Loans at the construction stage. Furthermore, providing technical training for the operation and maintenance of power generation equipment allows the people of developing countries to operate their new facilities in a sustainable manner, and realize further benefits from cooperation.

As the global community steps up efforts to reduce GHG emissions, developing countries have also started to increase the use of renewable energy sources such as solar, wind, and geothermal power generation, and high-efficiency thermal generation technologies. With extensive knowledge in these fields, Japan responds to calls to help developing countries reduce GHG emissions in their energy sectors.

Rural electrification projects must reflect the characteristics of people who benefit from these projects. Therefore, it is important to provide assistance for creating and implementing electrification plans that reflects the needs of residents from their viewpoint, the development of local industries and other development plans. Also, due to the shortage of technicians working in power generation and distribution in developing countries, the maintenance and management capacity must be enhanced at the same time.

JICA also implements cooperation in countries that are undergoing reconstruction, such as Rwanda and Sierra Leone, including human resource development that contributes to the management of electric power facilities.

2. Mining (Mineral Resources)

Demand for mineral resources has been increasing rapidly along with the economic development of medium-developed countries. A major structural shift has occurred in markets for these resources that gives sellers rather than buyers the upper hand. Prices are climbing fast and it has even become difficult to secure sufficient amounts of mineral resources without holding ownership of mines. From a different perspective, the boom in demand for mineral resources is creating an opportunity for developing countries with these resources to achieve sustained economic growth. JICA is conducting aid projects in a manner that creates a mutually beneficial relationship for developing countries and Japan. We support systems for the promotion of sustainable mining development and investments as well as for human resource development and the creation of master plans [See the Case Study on page 109]. We also advise on environmental countermeasures for mining, development plans for infrastructure taking into account the environment and related industries, and support plans for community development.

3. Energy Conservation

JICA provides assistance for the training of energy management technicians in order to support energy conservation efforts using sophisticated Japanese technologies. This program has produced many positive outcomes. For instance, JICA had provided support for the establishment of Energy Manager systems and the education of technicians that can manage thermal and electric power in Thailand, Turkey and Poland. Due to this cooperation in Turkey, the country is able to operate an energy-conservation training center on its own. This center is producing substantial benefits, including its use as a training facility the people of neighboring countries as well.

In ODA Loans, JICA is providing Two-Step Loans* in India and Viet Nam focused on energy conservation and renewable energies. Two-Step Loans strengthen financing and the ability to establish energy conservation projects, and increase the effectiveness of support by complementing Technical Cooperation. Through this scheme, it is easier to provide financial support for private-sector activities.

* Scheme where ODA Loan funds provided to development finance organizations of the borrowing nation are used for loans to small and medium-sized enterprises in the borrowing nation.

JICA Activities Involving Aid for Trade

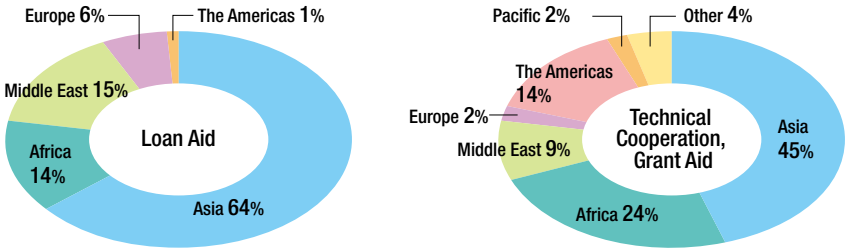
What is Aid for Trade (AfT)?

AfT refers to assistance provided to developing countries that helps to build supply-side capacity and trade-related infrastructure, so that these countries can benefit from trade expansion and reduce poverty. It will enable these countries to earn trade profits, and consequently, achieve economic growth through these profits.

JICA Activities

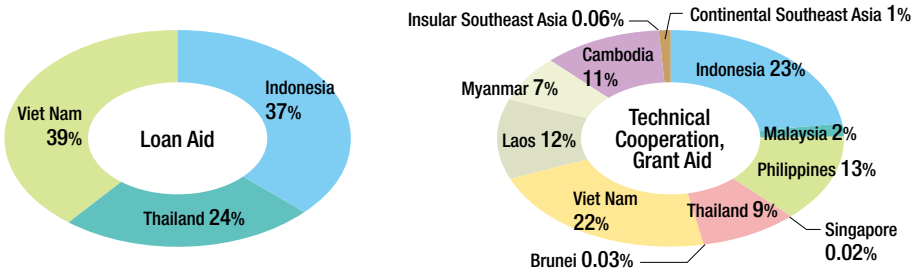
JICA is actively engaged in AfT. Approximately 54% of all ODA Loan projects were devoted to AfT in 2009.

Figure 1 Breakdown of AfT by Region (2010)



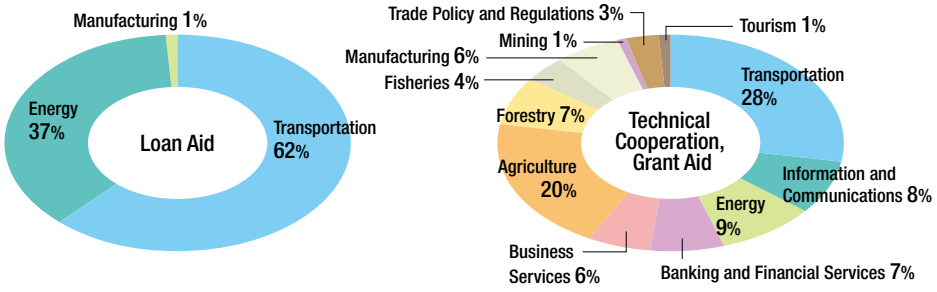
- AfT-related Loan Aid, Technical Cooperation and Grant Aid are concentrated in Asia. In 2010, Asia accounted for 64% of AfT-related Loan Aid and 45% of AfT-related Technical Cooperation and Grant Aid.
- Africa accounted for 24% of AfT-related Technical Cooperation and Grant Aid, second behind Asia.

Figure 2 Breakdown of AfT by ASEAN Country (2010)



- Over half of all AfT-related Technical Cooperation in the ASEAN region takes place in Cambodia, Laos, Myanmar and Viet Nam.

Figure 3 Breakdown of AfT by Industry in ASEAN Countries (2010)



- JICA focuses on development of economic infrastructure in the ASEAN region with the aim of promoting economic growth that will benefit the lives of every individual.

Note: Figures in the charts are rounded to the nearest whole number. Totals may not add to 100.

Case Study **Oman** **Project for Energy Conservation Master Plan in the Power Sector**

Cooperation for Electricity Suppliers Is Followed by Support for Energy Conservation Measures among Users

Demand for electricity in Oman is expected to increase at an annual rate of more than 10% as the country's population and economy expand.

JICA extended cooperation from 1997 to 1998 for rationalizing systems used by the country's electricity suppliers. Starting in 2012, JICA is providing assistance in creating a master plan for the promotion of energy conservation by users of electricity.

Thermal power plants fueled by gas produced in Oman accounts for more than 90% of the country's electricity. Since electricity rates are low, people have little interest in the conservation of power. However, electricity consumption has been rising rapidly in recent years because of population and economic growth, with demand increasing in Muscat, the capital, and other areas in Oman. During the summer, there are even rolling blackouts at times. As a result, energy conservation has become an important issue in Oman.

From 1997 to 1998, JICA performed a rationalized survey on the electricity supply and demand management system. In this study, JICA provided advise about a system to mange power in response to changes in the demand for electricity. However, there were no initiatives for the users of electricity.

The Oman Public Authority for Electricity & Water requested Japan's support in improving the management between the supply and demand of electricity by promoting energy conservation among users. In response, JICA started the Project for Energy Conservation Master Plan in the Power Sector in February 2012.

The purpose of the project is to study a Master Plan for energy conservation in Oman up to 2020.This plan is based on on-site surveys and energy diagnosis to determine electricity use at factories and other business sites, buildings, stores and homes. How to utilize Japan's experience and technologies in energy conservation will be determined. The recommendation may include 1) the creation of standards for energy-efficient products as well as promoting their use, and 2) activities to raise awareness of the need to conserve energy.

A survey to determine electricity use in Oman