

Low Carbon Technology Transfer and Diffusion in India through

Japan-India Technology Matchmaking Platform (JITMAP)



Achievements and Prospects



Supported by

Hyogo Prefectural Government

Background

In the Paris Agreement at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) in December 2015, strengthening the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius was agreed. Along with this, all Parties are to set their reduction targets and to take necessary domestic measures. **India has also set a goal of reducing emissions by 33 to 35% per GDP compared to 2005 by 2030.**

The UN Summit in September of the same year has adopted "the 2030 Agenda for Sustainable Development" and **the Sustainable Development Goals (SDGs)** aims to **double the rate of improvement of global energy efficiency by 2030**; to improve North-South cooperation on science and technology innovation and access to these; to promote knowledge sharing; to **promote the development, transfer, dissemination and diffusion of environment-friendly technology**; and to strengthen international support for effective capacity building to developing countries.

Along with these directions, Institute for Global Environmental Strategies (IGES) Kansai Research Center and The Energy and Resources Institute (TERI) of India have been promoting transfer and diffusion of Japan's low-carbon technologies in India.

Energy consumption in the industrial sector of India accounts for 58% and improving its efficiency has been one of the national concerns. Under the National Energy Efficiency National Plan (NMEEE) of the National Climate Change Action Plan (NAPCC), the scheme of **Perform, Achieve and Trade (PAT)** initiated in 2012 has been promoting energy-saving among the targeted large companies called Designated Consumers (DCs). **The Bureau of Energy Efficiency (BEE)** managing the scheme has also drawn up the **Energy Conservation Guidelines for Industries** in cooperation with the Energy Conservation Center, Japan (ECCJ). However, uptake of such measures is still limited among the small and medium-sized enterprises (SMEs).

India's manufacturing industry accounts for around 15% of GDP and over 10% for employment, which is lower compared to other middle-income Asian countries, including China and Thailand. It is a national priority to expand employment in this sector. In India, the **number of productive population who need to acquire skills has been increasing by 15 million every year**. It is said that 500 million people out of 700 million labor force expected by 2022 are **required some kind of training to improve their skills**. As such, one of the priority areas of the Japan's official development assistance to India is strengthening industrial competitiveness and training of management executives and engineers in the manufacturing industry in collaboration with Japanese private companies is one of such efforts.

Collaboration between IGES and TERI

IGES and TERI had jointly carried out "Research Partnership for the Application of Low Carbon Technology for Sustainable Development" in India under the Science and Technology Research Partnership for Sustainable Development (SATREPS) scheme from 2010 to 2014. In this research, **electric heat pump** and **gas heat pump** were introduced in four companies in India for the first time and each of them **achieved about 40% reduction of CO₂ emissions**. Better operational practices of **compressed air system** and **induction furnace** were also applied to other companies that resulted in **30-40% reduction of CO₂ emissions**.

From 2014, similar activities have been carried out under the schemes of "Joint Crediting Mechanism (JCM) feasibility studies on formulating large-scale project for the realization of a low-carbon society in Asia" and "Evaluation and verification of CO₂ emissions reduction technologies overseas" under the Ministry of the Environment, Japan. The main target technologies under these schemes were **compressed air systems, steam management systems, high-efficiency refrigeration systems, and energy-efficient transmission belts**, among others, which are highly versatile in the manufacturing industry.

Required supports for the technology transfer and diffusion

Through these activities, it was found that there is great potential for adopting low-carbon technologies in India's industrial sector. However, it has also become clear that the following points need to be addressed to accelerate it:

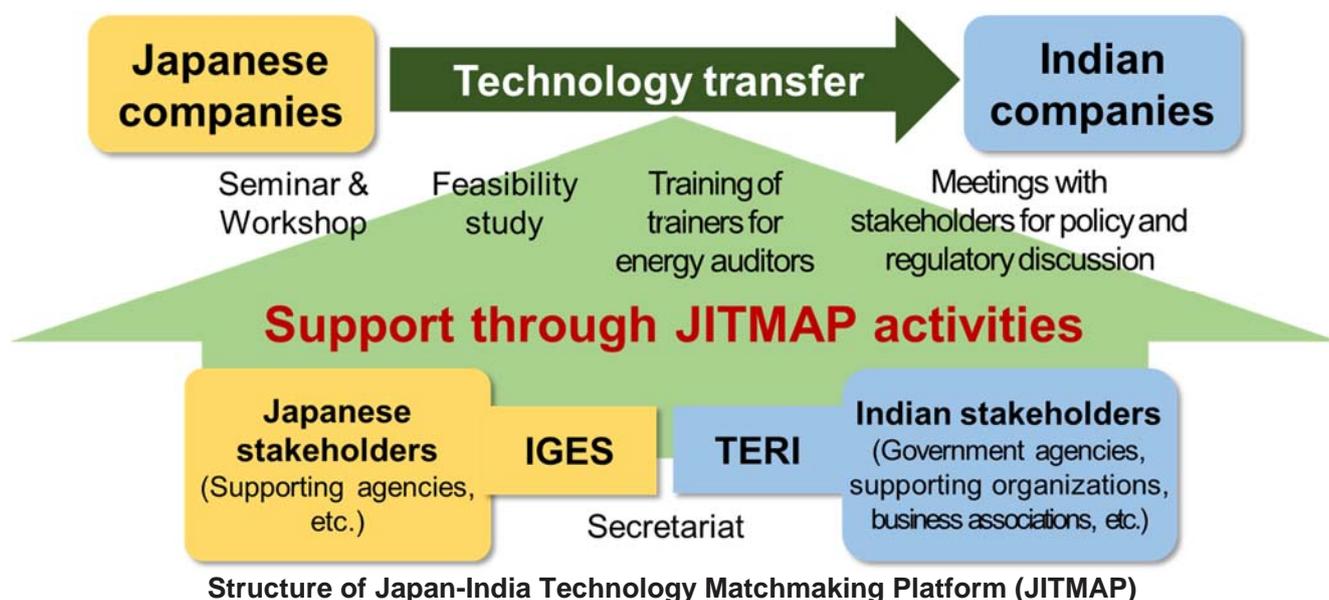
First is **the understanding of the low carbon technologies**. Many of the energy managers, business owners and energy auditors turned out to be not aware of the technologies and their effects, as well as the services provided by Japanese companies. Business owners often tend to choose cheaper equipment unless they know the long-term benefits of other options. Improving their awareness on the energy efficiency, durability, lifecycle cost and environmental performance of the available technologies and services is the first step and provision of such opportunities is highly needed.

Second is **the access to the potential Indian customers**. In general, Japanese companies have many business deals with other Japanese and related companies, but not many with Indian companies, especially with small and medium-sized enterprises. However, there is considerable room for improvement in energy and resource efficiency particularly in these companies, which is potentially a large market. Markets can also grow by having these companies understand the technologies and benefits of the products.

Third is **the difference in policies, regulations, standards and criterion between Japan and India**. For example, strict energy-saving regulations will help the adoption of energy-efficient equipment. Similarly, enforcement of strict environmental regulations will enable widespread use of environmentally effective equipment. Standards and criterion of some products as well as bidding and procurement procedures need to be understood by the service providers.

Structure of Japan-India Technology Matchmaking Platform (JITMAP)

In order to promote low carbon technology transfer and diffusion in India, IGES and TERI jointly launched Japan-India Technology Matchmaking Platform (JITMAP) in July 2016 with the support of the Ministry of the Environment of Japan with the following four functions:



First, JITMAP holds **seminars** and **workshops** for energy managers of targeted local companies and energy auditors to deepen their understanding of the technologies. Second, **preliminary energy audits (walk-through surveys)**, or **feasibility studies**, are carried out at selected local companies to confirm the applicability of the technology and its economic effect. Third, **training of trainers** for energy auditors who would be the propagators of the technology are also held. Engineers of Japanese service providers cooperate in these activities.

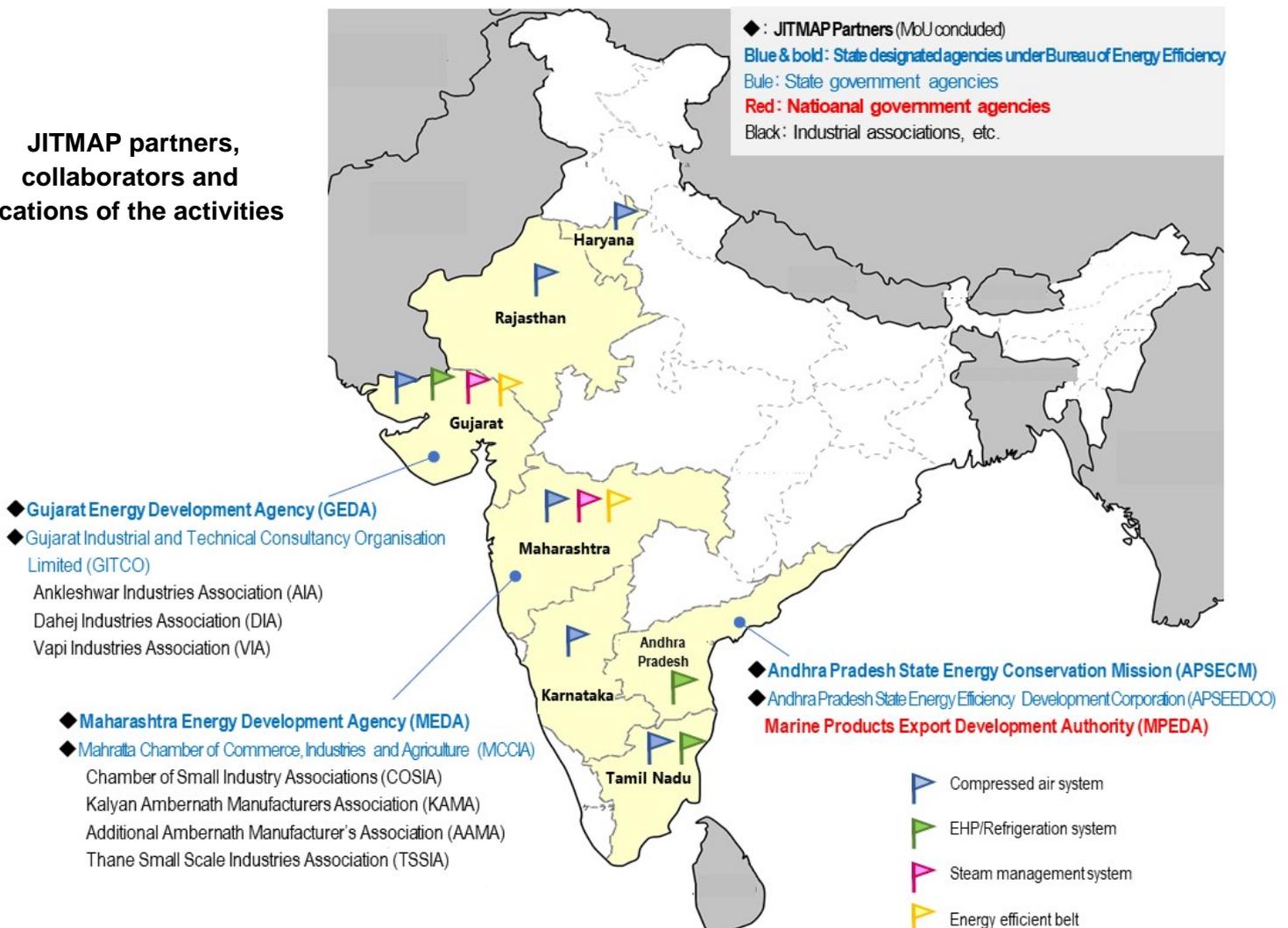
Selection and invitation of Indian companies to these events are managed by TERI in cooperation with related Indian organizations. For example, Japanese companies are invited to introduce their products and technologies at seminars co-organized with the state designated agencies of the Bureau of Energy Efficiency (BEE), Ministry of Power, and at the workshops for the affiliated companies of the industrial associations.

Companies subject for preliminary energy audit are selected from those recommended by these organizations, major companies of local industrial associations, and participants of seminars and workshops who showed interests in applying the technology. The survey results, including the potential economic and environmental improvement effects by introducing new equipment and improving the operational practices of the existing system, are shared not only with energy managers of the companies but also with the business managers.

Fourth, meetings with relevant agencies and associations are also arranged to discuss the possibility of modifying **relevant policies and regulations**, which have been identified from these field studies. For example, promotional measures of energy conservation for small and medium-sized enterprises are discussed with the Bureau of Energy Efficiency (BEE), Ministry of Power, and Ministry of Micro, Small and Medium Enterprises (MoMSME) and dissemination measures of refrigeration and freezing systems using natural refrigerants and construction of the cold-chain are discussed with Marine Products Export Development Authority (MPEDA).

So far, JITMAP's location of activities has been mainly in the vicinity of the capital city of Delhi, Gujarat and Maharashtra, where industrialization is advanced, and Andhra Pradesh, where seafood production and the demand for refrigeration equipment are high. **Gujarat Energy Development Agency (GEDA)**, **Maharashtra Energy Development Agency (MEDA)** and **Andhra Pradesh State Energy Conservation Mission (APSECM)**, state-designated agencies under Bureau of Energy Efficiency (BEE), and **Gujarat Industrial and Technical Consultancy Organization Limited (GITCO)**, **Mahratta Chamber of Commerce, Industries and Agriculture (MCCIA)** and **Andhra Pradesh State Energy Efficiency Development Corporation (APSEEDCO)** are official JITMAP partners with a memorandum of understanding for cooperation signed with TERI. Local industrial associations, such as the ones in Ankleshwar, Dahej and Vapi, are also important partners. Activities in Gujarat, specifically, are supported by Hyogo Prefectural Government, under a memorandum of understanding on mutual cooperation in the economic and environmental fields with the state government of Gujarat.

JITMAP partners, collaborators and locations of the activities



Flow of technology transfer and diffusion

Low-carbon technologies have been transferred and diffused through the following four steps:

First, in coordination with Japanese service providers, **target Indian industrial sectors are screened** in consideration of the company size, applicability of the technology and energy saving potential, etc. Among them, TERI selects suitable industrial associations and companies and coordinate with them.

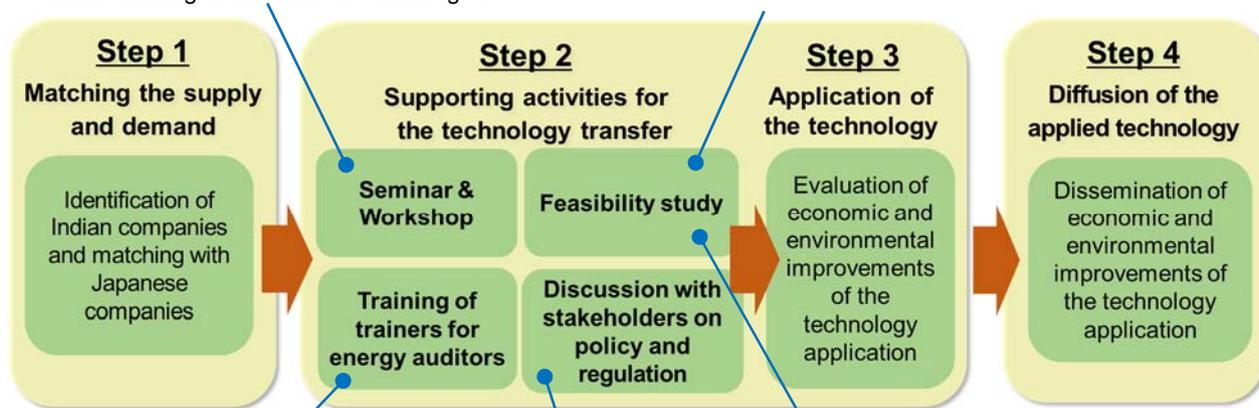
Second, in cooperation with state government agencies and industrial associations, **seminars and workshops** are held for target local companies to improve their understanding of the technologies. **Preliminary energy audits** are carried out by the experts from Japanese service providers at some Indian companies, often selected from the ones attended the seminars and workshops, to study the applicability of the technology and room for operational improvement of existing equipment. Then, the results are shared with the energy managers and business managers of the company, as well as with other people concerned at seminars and workshops, to help them understand the effects of applying the technology. Technical training sessions for energy auditors, or **training of trainers**, are also organized to deepen their understanding of the technology further and thereby to develop local human resources who can carry out preliminary energy audits at the same level as experts of Japanese companies. In addition, if **the discussion on related policies and regulations, standards and criterion, and bidding and procurement systems** is needed, TERI coordinates with relevant organizations and sets up a meeting.

As a result of these, **third, application of the technologies proceed**, and its economic and environmental improvement effects are analyzed. And, **fourth, to further diffuse the technology application**, these effects are further communicated with relevant stakeholders.



Seminars and workshops: Energy managers of Indian companies and energy auditors are invited to improve their understanding of low-carbon technologies

Feasibility study (preliminary audit): Experts study the applicability of the technology and point out the ways to improve current operational practices



Training of trainers: Energy auditors and managers deepen their understanding of low-carbon technologies to become influencers for the technology transfer



Discussion with stakeholders: Discussions on promotional measures for low-carbon technology application and possibilities to strengthen or ease related policies and regulations



Feasibility study: The economic and environmental improvement effect of the technology application is shared with the energy managers and business managers of the company for their decision-making

Main achievements

Compressed air system (In cooperation with Hitachi Industrial Equipment Systems Co., Ltd. and Kobelco Compressors India Pvt. Ltd.)

Case 1: Adoption of energy-efficient air compressor

Target industry: **Textile** Location: Surat, Gujarat
Feasibility study (November 2017), Follow-up survey (January 2018)

As a result of a preliminary energy audit, a potential of 1.7 million kWh annual energy-saving, which is equivalent to INR1.2 million (JPY1.7 million) and 160 tons of CO₂ emissions reduction, was found by replacing three existing compressors in a high-pressure line with one variable-frequency drive (VFD) screw air compressor with a 160kW capacity. The company's business managers and energy managers examined the result and decided to adopt it after few months.



Newly introduced air compressor

Case 2: 30% energy saving by improving the operating practices

Target industry: **Automobile parts** Location: Pune, Maharashtra
Feasibility study (September 2017), Follow-up survey (January 2020)

As a result of a preliminary energy audit, the expert of compressed air system recommended the company to replace an outdated reciprocating air compressor with an energy-efficient inverter type and to improve the operating practices such as detecting and reducing the air leakage and reviewing the piping network. A follow-up survey after few years revealed that the company had abandoned the old air compressor and had implemented most of the recommended operating practices. As a result, the company had reduced the annual power consumption by about 1.8 million kWh, which is equivalent to about INR16 million (JPY23 million).



Preliminary energy audit

“We wanted to report our achievement to the Japanese expert directly as we could make the great results (Note: the company staff visited the expert carrying out a preliminary audit in another company). After implementing the expert's recommendations, we could reduce energy consumption by about 30%. In addition, we are very grateful for raising energy-efficiency awareness of our staff. We hope you will continue visiting us for further follow-up as we will continue promoting energy efficiency.” (Technical consultant, Automobile parts company)

Case 3: In-house training on compressed air system

Target industry: **Automobile** Venue: Manesar, Haryana
Participants: Staff of energy, maintenance and utility divisions
Date: December 2018

A preliminary energy audit carried out by an expert of compressed air system at a leading automobile manufacturing plant in India revealed that already an efficient system was adopted there. As further possible options, the expert recommended replacing existing mechanical boosters with motor boosters and detecting air leakages. Later, an in-house training on further improvements and efficient operating methods was organized using the survey results as training materials, in which about 40 staff from three plants attended.



In-house training

“Our company's energy-saving efforts were objectively evaluated by the expert. It had led to our confidence by confirming that our efforts were on the right track (since we hardly have such an opportunity). It was also large benefit that we could share with our staff involved in plant energy management the result and raise their awareness of energy efficiency.” (2nd plant executive, Manesar factory)

Electric heat pump (EHP), Refrigeration system (In cooperation with Mayekwawa Co., Ltd.)

Case 4: Regulatory discussion with state government agencies

Target agencies: **Andhra Pradesh State Energy Conservation Mission (APSECM), Andhra Pradesh State Energy Efficiency Development Corporation (APSEEDCO)**

Venue: Vijayawada, Andhra Pradesh Date: December 2018



Consultation with the state government agencies

Preliminary energy audits carried out by an expert of refrigeration system at ten seafood processing companies in Andhra Pradesh revealed that most of the companies are using hydrofluorocarbon (HFC) such as R404A or ammonia (NH₃) as refrigerants and the policy on phasing out these ozone-depleting substances and concerns about the workers' safety of ammonia usage are not well recognized among them. Therefore, a consultative meeting was arranged with APSECM and APSEEDCO, which promote energy conservation and regulate refrigerants at the state level, to discuss possible regulatory measures to promote energy efficient and environmentally safer refrigeration technologies.

Steam management system (In cooperation with TLV International, Inc.)

Case 5: Introducing a steam management system in a state government seminar

Participants: **About 120 Energy auditors and energy managers**

Venue: Surat, Gujarat Date: February 2020



Participants in the seminar

Steam management system of TLV International, Inc. was introduced at a seminar titled "State Level Meet of BEE Certified Energy Auditors & Managers" organized by Gujarat Energy Development Agency (GEDA) and National Productivity Council (NPC) for about 120 energy auditors and managers. The expert from TLV explained the possibility of energy saving by using energy-efficient steam valves and traps and introducing a steam management system based on the results of feasibility studies conducted at some companies in the state. There was high interest from the participants that was confirmed by the fact that more than 90% of the respondents of a post-questionnaire survey answered that 'the content of the seminar was useful'. TLV followed up with the companies which showed interests in applying their products and technical services.

"The biggest benefit was the seminar of "State Level Meet of BEE Certified Energy Auditors & Managers" in Surat. We have been looking for this kind of opportunity. We would like to ask you to plan a schedule of on-site survey including such seminars in the future." (Expert, Steam management system)

Energy efficient transmission belt (In cooperation with Bando Chemical Industries, Ltd.)

Case 6: Adoption of energy efficient mechanical parts

Target industries: **Pharmaceutical, glass and comprehensive chemical**

Location: Ankleshwar, Gujarat Period: August-September 2018



Walkthrough survey

Following an introductory seminar of an energy efficient transmission belt for the Ankleshwar Industries Association in Gujarat, preliminary energy audits were carried out at selected companies which showed interest in its application. As a result, it was found that, although there are differences depending on the usage status, there are energy-saving potentials of about 5 to 15% with the investment payback period of several months by adopting it. It was also found that many of the equipment used at these companies were European standards, which differed from the standards of the company's products; thus, the company proposed to replace both the belt and pulley in such a case. As a result, two companies adopted it at a trial basis.

JITMAP website (<http://jitmap.org/>)

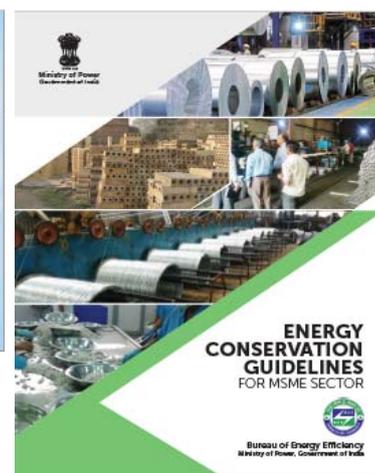
JITMAP website shares the results of the preliminary energy audits, workshops, technical trainings, and other information. SAMEEEKSHA (Small and Medium Enterprises: Energy Efficiency Knowledge Sharing), a platform for energy efficiency improvement for small and medium-sized enterprises managed by TERI with other partners, provides more detailed information of local companies.



Way forward

JITMAP will continue to promote adoption of low-carbon technologies by Indian companies. In coordination with the Blue Sky Initiatives promoted by the Embassy of Japan in India, the target technologies will be expanded to environmental technologies too, such as air pollution control.

The Bureau of Energy Efficiency (BEE) of the Ministry of Power is promoting energy efficiency in the SME sector by developing the Energy Conservation Guidelines for Micro, Small and Medium-sized Enterprises. In coordination with the Energy Conservation Center, Japan (ECCJ), JITMAP will also focus on its application at industrial association of SMEs and associated human resource development of energy managers and auditors who would be promoters of low-carbon technologies.



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