JCM
JOINT CREDITING MECHANISM
INDONESIA SECRETARIAT

The Implementation *Joint Crediting Mechanism Scheme* in Indonesia Facts and Review

FOREWORD

Dear Readers,

The Government of Indonesia has stated its commitment in carbon emission reduction by ratifying their Paris Agreement Commitment in 2016. Through the commitment, Indonesia has a role to contribute in total global effort in carbon emission reduction and global climate change mitigation action. In the commitment, Indonesia stated that nationally Indonesia will reduce 29% of Greenhouse Gases (GHG) emission with their own effort and 41% Of GHG using the international support.

In 2013, The Government of Indonesia and The Government of Japan have established cooperation in the implementation of low carbon development in Indonesia through Joint Crediting Mechanism (JCM). Through this cooperation, The Government of Japan supported the implementation by giving a financial support for the implementation of low carbon technology, capacity building, as well as knowledge and technology transfer. Since its establishment, this cooperation has been able to attract several stakeholders including various Indonesian business entities to implement a low carbon technology within their area. Such activities are a solid proof that JCM is able to capture various contributions from several sectors and stakeholders to get involved in climate change mitigation action in Indonesia.

This book summarizes every aspects related to the implementation of JCM in Indonesia, starting with the background story of how the cooperation is established, the know-how of the JCM implementation, and also the entire summary of the JCM projects implementation in Indonesia. The information given in this book hopefully can trigger further low carbon development actions in Indonesia. The experiences and the financing scheme established within this cooperation can also be used as a blueprint for future sustainable financing scheme which will support the national target on emission carbon reduction and later establish a sustainable low carbon society in Indonesia.

The government of Indonesia and Japan are committed to continue the cooperation and also improve total investment and the development of the technical instrument, and the involvement of private sectors participation. Through the cooperation under the JCM scheme, Indonesia is expected to be able to contribute in achieving carbon emission reduction target both at the national level and globally.

Finally, I hope that this book will inspire the reader to continue and support low carbon activity in Indonesia.

Jakarta, June 2018

Deputy Minister for International Economic Cooperation

Coordinating Ministry for Economic Affair

Written by:

Dicky Edwin Hindarto

Vionita Rizqa Permana

Ratu Keni Atika

Rini Setiawati

Editor:

Dicky Edwin Hindarto

Lourensia Lim

Cover Photo:

Iwan Romadhona

Photo Contents:

Sekretariat JCM Indonesia

Table of Contents

List of Figures

List of Tables

Chapter 1
Introduction

1.1. National and Global Commitment Facing Climate Change

Indonesia and 194 other countries in the world currently have agreed on global emission reduction in through the *Paris Agreement* (PA). This Paris Agreement (PA) is binding every country to make global emissions reductions through voluntary but binding contributions. The number of commitment is voluntarily, but the target of the commitment is binding because of any proposal of commitment submitted will be regarded as the official document of the country.

The Paris Agreement is also an agreement that requiring commitment from each country that agreed to sign it, whether develop or developing country, or least developed countries, without exception. To fulfil this commitment, Indonesia has submitted its proposal in the form of NDC (Nationally Determined Contribution) which was submitted during the climate change negotiations in Marrakech in November 2016. Indonesia has a target for unconditional emission reduction that has been delivered in NDC for 29% by the year of 2030 and 41% subject to availability of international support, based on 2010 baseyear projection. The targets are as below.

"Indonesia has committed to reduce unconditionally 29% of its greenhouse gasses emissions against the business as usual scenario by the year of 2030. THE BAU scenario is projected approximately 2.869 GtCO2e in 2030 which is updated from the BAU scenario on the INDC due to current condition on energy policy development in particular in coal fired power plant" [1]). As for the conditional targets are as follows:

"Indonesia can increase its contribution up to 41% reduction of emissions by 2030, subject to availability of international support for finance, technology transfer and development and capacity building" [1]).

This target considered very ambitious due to the 35,000 MW power plant program from the government which is 80% (in addition to 29% of coal sector) will be conducted independently through the Indonesian budget and the participation of local government, the private sector, and SOEs (State-Owned Enterprises) without the availability of international support for financing. The implementation plan for this emission reduction activity should be sharpened and analysed, especially for funding.

Table 1.1 Targets per sector for emission reductions in Indonesia [1])

Source: *First Nationally Determined Contribution - Republic of Indonesia*, 2016

No	Sector	GHG Emission Level 2010*	GHG Emission Level 2030 (MTon CO_2e)			GHG Emission Reduction (MTon CO_2e)		GHG Emission Reduction % of Total BaU		Annual Average Growth BAU (2010-2030)	Average Growth 2000-2012*
		MTon CO_2e	BaU	CM1	CM2	CM1	CM2	CM1	CM2		
1	Energy*	453.2	1,669	1,355	1,271	314	398	11%	14%	6.7%	4.50%
2	Waste	88	296	285	270	11	26	0.38%	1%	6.3%	4.00%
3	IPPU	36	69.6	66.85	66.35	2.75	3.25	0.10%	0.11%	3.4%	0.10%
4	Agriculture	110.5	119.66	110.39	115.86	9	4	0.32%	0.13%	0.4%	1.30%
5	Forestry**	647	714	217	64	497	650	17.2%	23%	0.5%	2.70%
	TOTAL	**1,334**	**2,869**	**2,034**	**1,787**	**834**	**1,081**	**29%**	**38%**	3.9%	3.20%

* Including fugitive **Including peat fire

Notes: **CM1** = Counter Measure (*unconditional mitigation scenario*)
CM2 = Counter Measure (*conditional mitigation scenario*)

Target and NDC Indonesia has been approved by the president and the House of Representatives, meaning that it is legally valid to be implemented. Compared to other countries, Indonesia's target is also very ambitious, especially since there is no market-based financing mechanism that can be used.

In contrast to INDC documents submitted by Indonesia in November 2015, one of significant difference is in INDC there is still a market word, while in NDC the phrase is no longer [2]).

• **International Market Mechanisms**	Indonesia will meet its unconditional commitments regardless of the existence of international market mechanisms. Indonesia welcomes bilateral, regional and international market mechanisms that facilitate and expedite technology development and transfer, payment for performance, technical cooperation, and access to financial resources to support Indonesia's climate mitigation and adaptation efforts towards a climate resilient future.

Figure 1. 1 Understanding International Market Mechanisms

Source: *Intended Nationally Determined Contribution - Republic of Indonesia*, 2015

In climate change policy, the absence of phrase use of market mechanism will be very different from its implementation in achieving emission reduction target with country which is plan to use market mechanism, both domestic and international.

Indonesia includes 1 of 97 countries that are *"market friendly"* or countries that have plans to implement market-based mechanisms in achieve national emission reduction targets at the time of the INDC delivery in 2015. Currently there are more countries, although there are countries such as Venezuela and Bolivia, who clearly do not want to use market mechanisms to implement their national emissions reductions.

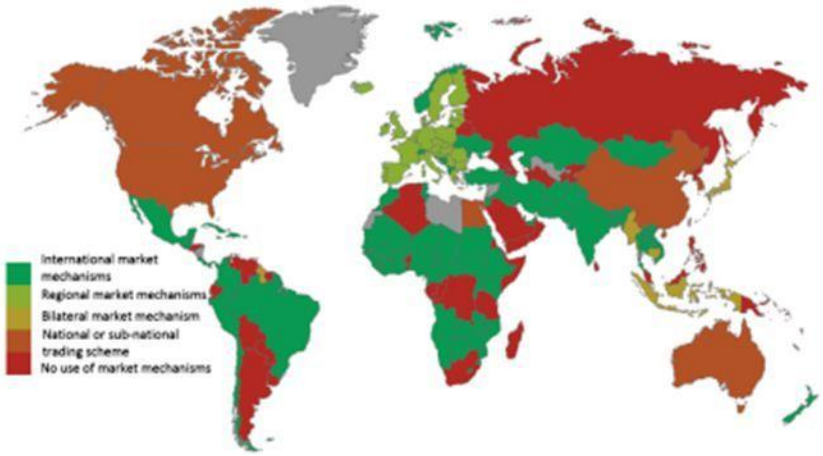

Figure 1. 2 Map of INDC and NDC globally; see which countries is "market friendly" [3)]

Source: IGES INDC & NDC Database, 2017 (https://pub.iges.or.jp/pub/iges-indc-ndc-database)

The illustration above describes that the countries within the INDC and the NDC has submitted will use international market mechanisms or consider using international, regional, and bilateral market mechanisms. In addition, countries that use emissions trading mechanisms at national and sub-national levels, such as the United States, Australia, Canada and China are also seen. For most European countries, though they do not use the market in their emissions reduction implementation plan in their NDCs, they use regional emissions trading such as the EU-ETS (*European Union Emissions Trading Scheme*) as their emissions reduction policy tool.

The total number of countries that claim to use market-based mechanisms is 97 countries and will be 133 countries if the countries that are considering using market-based mechanisms are taken into account. The number of countries that will use the market will be even greater in the coming years, given that market mechanism has proven to be one of the most *cost-effective* mechanisms of conventional mitigation financing.

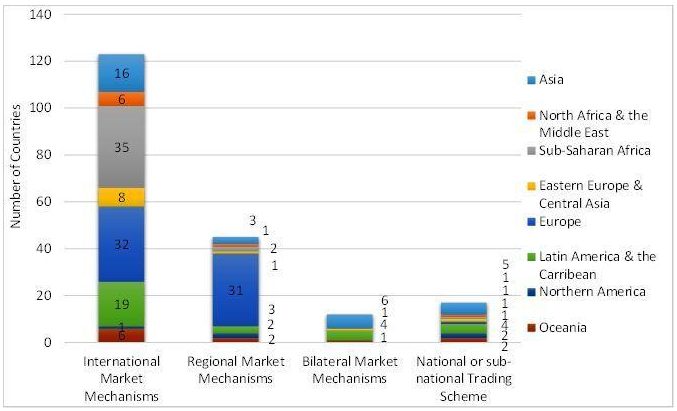

Figure 1. 3 The number of countries that will implement market-based implementation for its NDC [3)].

Figure above seen that the number of countries whose planning to make market-based efforts in its NDC implementation is varied and highly dependent on its domestic policies. The implementation of market-based mechanisms is also depending on funding mechanism that will be made by each country in conducting activities to reduce emissions.

1.2. International Agreement on Climate Change

As mentioned above, Indonesia is one of the countries that subsequently agreed to the climate change agreement at the Climate Change Summit in Paris 2015. This agreement categorized into a multilateral agreement on climate change.

Indonesia was also joined to another multilateral treaty besides Paris Agreement, which is Kyoto Agreement or Kyoto Protocol that was signed in 1997. The Kyoto Protocol is the first multilateral treaty on climate change that binds many countries, especially developed countries, to reduce emissions.

The implementation of this agreement include the first establishment of a carbon trading mechanism model in the world through the CDM *(Clean Development Mechanism),* among the developed countries to developing countries and the poor countries. In addition, *Joint Implementation* (JI) is also established, which is a cooperation that allows developed countries to reduce emissions together.

Regional agreements on climate change are also widely recognized by many. One of the most notorious regional treaties that still exist until today is cooperation between countries in the European Union (EU) to reduce their emissions. This regional agreement subsequently binds the region to better safeguard the earth by jointly reducing emissions and adapting to climate change.

The bilateral agreement is the last type of agreement that is then commonly used in the world to handle climate change. Although only followed by two countries, host countries and its partner, this bilateral cooperation and agreement are usually very effective and implemented. Indonesia has several cooperation agreements with several countries related to climate change. Cooperation agreements with Norway, Japan, South Korea, and several other countries are examples of this bilateral agreement.

Then, how about the implementation? Usually, an implementing team will be formed to implement the agreement. The implementing team is tasked not only with monitoring but also make some coordinating activities occasionally.

One of the most advanced bilateral cooperation agreements is the cooperation between Indonesia and Japan in emission reduction activities, namely scheme of JCM or *Joint Crediting Mechanism*. This mechanism allows Indonesian business and private parties to carry out the implement together with the assistance of grants provided by the Japanese government.

Chapter 2
JCM Bilateral Cooperation Agreement

2.1. The Signing of Bilateral Agreement between Two Countries

2.1.1. Japanese Cooperation Proposal to Indonesia

Japan has made an approach to Indonesia for the implementation of bilateral cooperation in reducing emissions since 2010. When the first proposal was submitted, the forms of its cooperation were the start-up cooperation and just basic idea and technology transfer only.

The bilateral cooperation subsequently becomes strengthened after the National Council for Climate Change officially took the initiative to become the focal point of the Indonesian government in this negotiation. Then, the negotiation also involves related ministries such as the Coordinating Ministry for Economic Affairs, the Ministry of Environment, the Ministry of Forestry, the Ministry of Energy and Mineral Resources, the Ministry of Foreign Affairs, the Ministry of Industry and the DNPI itself as the coordinator.

The proposal name of this bilateral cooperation has also changed from BOM (Bilateral Offset Mechanism) to BOCM (Bilateral Offset Crediting Mechanism) during period 2010-2013 and the end of the year 2013 was agreed that the name changed became JCM (Joint Crediting Mechanism).

The Government of Japan (MOE) and the Ministry of Economy, Trade, and Industry (METI) had proposed to the government of Indonesia to undertake a feasibility study for bilateral cooperation plan initiated since 2010. The feasibility studies were conducted by Indonesia and Japan consultants, universities, and various institutions in Indonesia, as well as Japanese companies that financed by the Government of Japan itself.

Negotiations between two countries had concluded the result after the Japanese government proposed a draft agreement that had been discussed for the last two years between the two countries. The draft agreement has evolved from a very general document into a very specific bilateral cooperation document for JCM implementation in Indonesia.

2.2. Signing MOU of Cooperation between Indonesia and Japan

The cooperation agreement for the implementation of low carbon development was finally signed separately by the Minister of Foreign Affairs of Japan and the Coordinating Minister for Economic Affairs of Indonesia on 26th August 2017.

The signing of this agreement has an implication to bind both countries for the implementation of low-carbon development in Indonesia with Japan-based finance and technology assistance. Japan has also pioneered a pattern of cooperation similar to some other developing countries in besides Indonesia.

Therefore Indonesia is the fifth country that signed the bilateral agreement with Japan related to JCM implementation.

After the signing of bilateral cooperation between the two countries, Indonesia and Japan formally have their respective obligations in the implementation of low-carbon development in Indonesia. There are also obligations from each country besides that was written in the agreement documents in JCM technical documents, such as *Rules of Implementation* and various *guidelines.*

2.3. Subject Matter of JCM Agreement

2.3.1. Agreement Document

This Agreement was signed in duplicate three languages, English, Japanese, and Indonesian, and legally as a state document. Here are the documents as originally.

Bilateral Cooperation on the Joint Crediting Mechanism for the Low Carbon Growth

Partnership between Japan and the Republic of Indonesia

The Japanese side and the Indonesian side (hereinafter referred to as "both sides"), in pursuit of the ultimate objective of the United Nations Framework Convention on Climate Change (hereinafter referred to as the "Convention") as stated in its Article 2 and of achieving sustainable development, and in order to continue to address climate change in cooperation beyond 2012, promote the Low Carbon Growth Partnership as follows.

Both sides hold close policy consultations at various levels for cooperation toward low carbon growth under the United Nations, at the regional and bilateral frameworks, including the East Asia Low Carbon Growth Partnership.

Both sides, in order to promote investment and deployment of low carbon technologies, products, systems, services and infrastructure to achieve low carbon growth in Indonesia, establish a Joint Crediting Mechanism (hereinafter referred to as the "JCM") and implement it in accordance with the relevant domestic laws and regulations in force in respective countries.

Both sides establish the Joint Committee to operate the JCM, which consists of representatives from both sides.

The Joint Committee receives an appropriate guidance on the implementation of the JCM from the relevant ministries and ministers.

The Joint Committee decides rules and guidelines for the JCM.

Both sides mutually recognize that verified reductions or removals from the mitigation projects under the JCM can be used as a part of their own internationally pledged greenhouse gases mitigation efforts.

Both sides ensure the robust methodologies, transparency and the environmental integrity of

the JCM and maintain the JCM simple and practical, to promote concrete actions for global greenhouse gases emissions reductions or removals.

Both sides ensure the avoidance of double counting on greenhouse gases emission reductions or removals by not using mitigation projects registered under the JCM for the purpose of other international climate mitigation mechanisms.

Both sides work in close cooperation to facilitate financial, technological and capacity building support necessary for the implementation of the JCM.

The JCM starts its operation as the non-tradable credit type mechanism. Both sides continue consultation for the transition to the tradable credit type mechanism and reach a conclusion of such consultation at the earliest possible timing.

Both sides aim for concrete contributions to assisting adaptation efforts of developing countries through the JCM upon the operationalization of its tradable credit type mechanism.

This partnership covers the period from the signing of this document until the operationalization of a new international framework under the Convention. Both sides consider possible extension of this partnership and reach a conclusion before its termination, taking into account, inter alia, and the progress of negotiations under the Convention.

Any content of this document may be modified upon written mutual consent of both sides.

Signed in duplicate in Tokyo on 26 Agustus 2013 by the Japanese side and in Jakarta on 7 Agustus 2013 by the Indonesian side, in the Japanese, Indonesian and English languages. All texts have equal values. In case of any divergence of interpretation of the texts, the English text will be referred to.

For the Indonesian side	For the Japan side
[Signed]	*[Signed]*
M. Hatta Rajasa	**Fumio Kishida**
Coordinating Minister for Economic Affairs	Minister for Foreign Affairs

Figure 2. 1 The Document of JCM Bilateral Cooperation Agreement

This Agreement hereinafter referred to as "Bilateral Cooperation on Joint Crediting Mechanism for the Low Carbon Growth Partnership between the Republic of Indonesia and Japan" consists of 14 articles resulting from simultaneous discussions for nearly two years between two countries.

This agreement has a strong permanent legal force due to two ministerial-level officials have signed it.

2.3.2. The contents of Agreement Document

The following is an explanation of the 14 articles of chapters that were approved in the treaty.

- Article 1. The main purpose of this agreement is article number 2 from UNFCCC convention in 1992, which is to carry out GHG actions in the atmosphere. It is also mentioned that the objective of the agreement is to achieve sustainable development and continue climate change mitigation efforts, especially since the end the first period of Kyoto Protocol in 2012.
- Article 2. Establishment of a Low Carbon Growth Partnership between the Republic of Indonesia and Japan and its implementation that is done by a policy consultation method between the two governments.
- Article 3. JCM or Joint Crediting Mechanism is further developed to increase investment and utilization of low carbon technologies, products, systems, services and infrastructure to achieve the objectives of low-carbon development in Indonesia. To implement this objective, both Indonesia and Japan will apply it in accordance with the applicable legal and regulatory framework in each country.
- Article 4. Joint Committee which is the representative of each country to operate the JCM is then must be formed.
- Article 5. The Joint Committee consists of the officials who will get direction from ministries and ministers who have positions related to JCM.
- Article 6. One of the tasks of the Joint Committee is to establish the rules and guidelines for JCM implementation.
- Article 7. The final outcome of JCM implementation is GHG emission reduction, and GHG emissions obtained will serve as fulfillment of commitments from each country.
- Article 8. A transparent, credible, and high integrity methodology will be made to implement emission reduction activities. However, the methodology is also flexible to be implemented by both countries.
- Article 9. Double counting of emissions reductions are the most prohibited thing, therefore, JCM will avoid them by not using the JCM project to be acknowledged in other activities.
- Article 10. The keys to the sustainability of climate change activities lie in financial support, technology, and capacity building, therefore both countries will work together in the implementation of JCM.
- Article 11. GHG emission reductions that subsequently will be certified under the JCM scheme are not for trading unless the two countries agree to give some price to the carbon-reduction credits and trades them.
- Article 12. If the JCM carbon credits agree to be traded, the two countries will use some of the proceeds to make some adaptations in developing countries, including Indonesia itself.
- Article 13. The expiry of this low-carbon partnership agreement comes after the entry into force of the new agreement under the full convention, and for that matter, the new agreement is the Paris Agreement which will begin in 2020. This partnership agreement will be renewable before the term of the agreement expires.

- Article 14. This partnership agreement may be amended by agreement between the two countries.

Based on the 14 treaty provisions above, it is subsequently broken down into the various infrastructure of JCM scheme and some decisions regarding the implementation of JCM issued by the Coordinating Ministry for Economic Affairs.

There are many interesting and new things for Indonesia after the signing of this cooperation agreement, those are:

1. This bilateral cooperation agreement is the first bilateral agreement for Indonesia which clearly states the technical GHG emission reduction should be done transparently, reliably, and using a clear methodology.
2. A statement stating that implementation of the agreement will use applicable laws and regulations in Indonesia is of great benefit to Indonesia because of the regulations, standards, and if there is a common practice already common undertaken in Indonesia, the scheme of JCM activities must comply with and implement them.
3. JCM is the first bilateral carbon emission reduction scheme that was implemented after the end of the first phase of the Kyoto Protocol. Unlike the carbon trading scheme under the Kyoto Protocol, namely CDM and JI, the scheme of JCM is more flexible and easier to be implemented.
4. The final result of the implementation of the JCM scheme is the carbon credits which under this agreement cannot be traded and only used to meet the emission reduction targets of both countries, but in the future development, if both countries agreed, carbon credits could be traded and have value prices.

The scheme of JCM is the first bilateral agreement model that conducted in Indonesia. This model is also expected for being applicable in bilateral agreements with other countries, so there is a guarantee for technology transfer and knowledge, improved environmental quality, the inclusion of investment, and subsidies from partner countries to Indonesia.

In climate change activities, this thing is a new breakthrough because it uses a transparent, measurable, and accountable scheme to be accounted for and reported.

2.4. Objectives and Scope of JCM Implementation

2.4.1. Objective of JCM Implementation

As mentioned in the previous chapters, JCM is a bilateral cooperation between the Indonesian Government and Japan Government. The implementation of that cooperation involves 4 main parties, those are Indonesia Government, Japan Government, Indonesian private sector, and Japan private sector as shown in **Figure 2.2.**

Figure 2. 2 The JCM scheme between Japan and host country

As mentioned in the rules of JCM implementation, this cooperation aims:

1. Japan will be facilitating diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as the implementation of mitigation actions, and contributing to sustainable development of developing countries; in this case in Indonesia.
2. Evaluate appropriately the entire contribution to the reduction or removals of GHG emissions (GHG) from the host country (in this case, Indonesia) quantitatively, through mitigation measures that are implemented in the host country and using the reduction or removals of these emissions to achieve emission reduction targets from host countries
3. Contributing to the ultimate objectives of the UNFCCC by facilitating global measures for reducing or removals emissions.

Briefly, this joint credit mechanism or JCM pronounce that the Japanese government will provide aid by facilitating the diffusion of technology, products, systems, services, and infrastructure, through incentives or project funding for participatory projects that were approved for funding through the JCM scheme. The financing mechanisms under the JCM scheme will be discussed in Chapter 5

2.5. Scope of JCM Implementation

The scope of JCM implementation is related to the distribution of carbon credits which is one of the outputs of JCM activities. The carbon credits referred to here are the amount of carbon successfully reduced through the application of technology implemented in the JCM project. Carbon credits generated under the JCM agreement at the beginning of its implementation are non-tradable carbon, but the Indonesian Government and the Japan Government can discuss in the future to be able to use carbon trading mechanisms for carbon credits generated.

The carbon credits made as a result of this JCM activity are the reduction of greenhouse gases (GHG) emitted from the implementation of JCM projects. The types of GHG measured are CO2 (Carbon dioxide), CH4 (Methane), N2O (Nitrous oxide), HFCs (Hydrofluorocarbons), PFCs (perfluorocarbons), SF6 (Sulfur hexafluoride), and NF3 (nitrogen trifluoride).

The illustration of JCM credit distribution can be shown in Figure 2.3 as follows:

Figure 2. 3 Illustration of JCM credit distribution

As mentioned before, the cooperation between the Japan Government and Indonesia Government parties can be explained more by the scheme as shown in Figure 2.4 below:

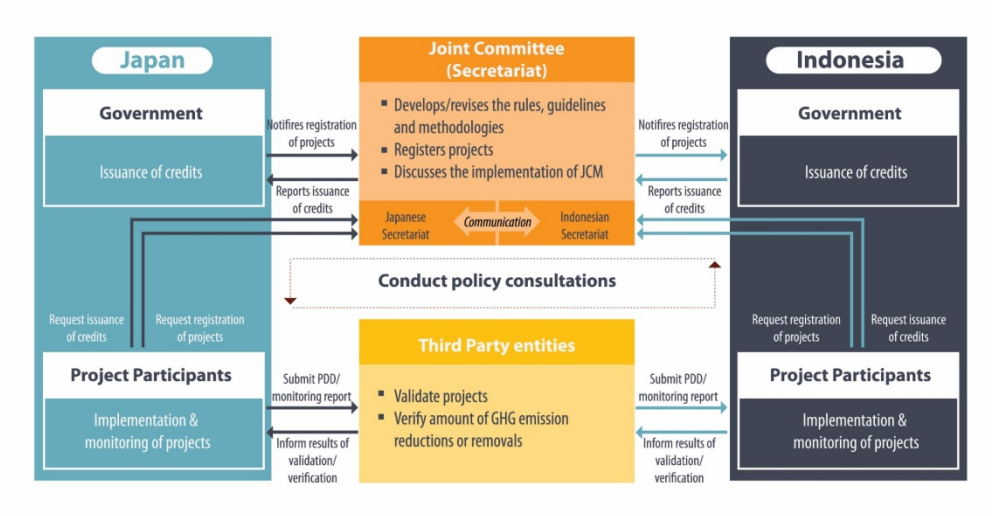

Figure 2. 4 JCM Implementation Cooperation Scheme

Based on **Figure 2.4**, it can be seen that in JCM cooperation there are 7 (seven) elements involved in the bilateral cooperation those are the Indonesian government and project participants Indonesia (hereinafter referred to as the Indonesian side), the Japanese government and the project participants of Japan (hereinafter referred to as the Japanese), Joint Committee which includes in the secretariat of JCM Indonesia and Japan, the technical team for the needs of Indonesian joint committees and third-party entities.

Each entity involved in JCM cooperation has its respective roles regulated in accordance with the explanation of JCM implementation rules as mentioned in the Standard Procedure Manual (SOP) or JCM project implementation manuals in Indonesia.

Chapter III
Organization and Institutional JCM in Indonesia

3.1. Coordination Team for Interstate Carbon Trade

3.1.1. Duties of Coordination Team for Interstate Carbon Trade

As the coordinator of JCM scheme, The Coordinating Ministry for Economic Affairs has initiated to form a steering committee for JCM implementation called the Implementation team for International Negotiations of Trade Carbon (TKPPKA).

TKPPKA was formed based on the Decree of Coordinating Minister for the Economy. For the initial establishment of TKPPKA, the Decree of the Coordinating Minister for Economic Affairs number 63 of 2017 became the basis of its formation.

The Decree declares that TKPPA divides into 2 teams, those are Implementation team for International Negotiations of Trade Carbon (The Steering Team of PPKA) and Implementation team for International Negotiations of Trade Carbon (The Implementing Team of PPKA).

The tasks of the PPKA Steering Committee are as follows:

> *"Providing guidance in the implementation of negotiations and follow-up on the results of the International Carbon Trade Scheme with partner countries interested to cooperate with Indonesia."*

The tasks of the PPKA Implementing Team are as follows:

1. Conducting negotiations on the International Carbon Trade Scheme with partner countries interested to cooperate with Indonesia.
2. Taking steps to resolve the problems and obstacles in the implementation of negotiations on the International Carbon Trade Scheme.
3. Preparing and submitting the necessary policy recommendations in the implementation of negotiations on the International Carbon Trade Scheme.
4. Coordinating the implementation of the results of carbon trade between countries.
5. Carrying out any other related tasks assigned by the Steering Committee.

The two PPKA teams are interconnected through meetings and reporting conducted by the PPKA Implementing Team.

3.1.2. Member of Coordination Team for Interstate Carbon Trading is based on the ministerial decree of Coordinating Minister of Economic Affairs number 6 of 2016.

The members of Coordination Team for Interstate Carbon Trading are ministerial level officials. In full, the members are follows:

1. Chairman: Coordinating Minister for Economic Affairs.
2. Member: Minister of Foreign Affairs
3. Members: State Minister for Chairperson of the National Development Planning Agency / Head of Bappenas
4. Member: Minister of Trade
5. Members: Minister of Finance
6. Member: Minister of Environment and Forestry
7. Member: Minister of Energy and Mineral Resources
8. Member: Minister of Industry
9. Member: President's Special Envoy on Climate Change

Meanwhile, the members of the Implementing Team are more than the Steering Team due to in line with the nature of the task that is more technical. Members of this team are as follows:

1. Chairman: Deputy for Co-ordination of International Economic Cooperation
2. Chair of Alternate: Special Staff of President of Climate Change Sector
3. Members: Head of Fiscal Policy Office, Ministry of Finance
4. Members: Deputy Minister for Natural Resources and Environment, BAPPENAS
5. Members: Director General of International Trade Cooperation, Ministry of Trade
6. Members: Director General Multilateral, Ministry of Foreign Affairs
7. Member: Director General of Law and International Agreement, Ministry of Foreign Affairs
8. Member: Expert Staff Minister for Environment and Climate Change, Ministry of Forestry
9. Member: Deputy for Environmental Damage Control and Climate Change, Ministry of Environment
10. Member: Director General of Oil and Gas, Ministry of Energy and Mineral Resources
11. Members: Director General of New Renewable Energy and Conservation Energy, Ministry of Energy and Mineral Resources
12. Members: Head of the Agency for Climate Policy and Industrial Quality Assessment, Ministry of Industry.

This Coordinating Minister for Economic Affairs Decree has several times been renewed due to the extension of the term of the decree. In addition, there are also some revisions of this decree which is due to some changes in organizational structure of ministries such as the removal of the National Council on Climate Change and the merger of the Ministry of Forestry and the Ministry of Environment.

3.2. The Joint Committee

3.2.1. Basis of Establishment and Task of the Joint Committee

The Joint Committee is established by a decree from the Deputy for Coordination of International Economic Cooperation based on a decree forming the previous TKPPKA. The Joint Committee is also required in the Rules of Implementation document for the implementation of the JCM project.

This Joint Committee was formed based on a decree from the Deputy for Coordination of International Economic Cooperation based on the previous TKPPKA decree. The Joint Committee is also required in the Rules of Implementation document for the implementation of the JCM project. In the Decree of Deputy for the Coordination of International Economic Cooperation, Coordinating Ministry of Economic Affairs No. 2 the year 2016 mentioned that the Joint Committee Team has a series of tasks are as follows:

a. Representing the Indonesian Government in realization the implementation of the Joint Credit Mechanism with the Japan Government and related parties;
b. Conducting regular meetings at least once a year or at a later time that agreed with the Joint Committee Team of Japan to discuss the implementation of the Joint Credit Mechanism;
c. Receiving information from interested parties in the development of the Joint Credit Mechanism project;
d. Develop and modify the documents, guidelines, and rules that will be used for the implementation of the Joint Credit Mechanism in accordance with the Implementation Rules document of the Joint Credit Mechanism;
e. Establishing a third-party institution to validate and verify project activities of the Joint Credit Mechanism;
f. Registering a Joint Credit Mechanism project that has been validated by a third party
g. Determining the number of carbon credits that have been obtained by the Joint Credit Mechanism project and make notification and announcement of the number of carbon credits according to the verification results by third parties;
h. Discussing the proposed Credit Mechanism project;
i. Making an implementation status report of the Collective Credit Mechanism periodically and reporting it to the Chief Executive of the TKPPKA Team if required;
j. Making a necessary analysis and proposals policy for the implementation of the Joint Credit Mechanism in Indonesia if required.

3.3. JCM Secretariat

3.3.1 Basis for Establishment and Task of the JCM Secretariat

The JCM Secretariat was formed based on the decree of the deputy after the formation of the Joint Committee Team. The Secretariat serves to assist the Joint Committee Team in performing its duties. The Secretariat is in charge of running operational activities that support the Joint Committee Team for decision making. Based on its organizational structure, secretariat is headed by a Head of Secretariat

who is appointed by the Chairman of the Team of the Coordinating Team for International Trade Negotiations (TKPPKA) with the assistance at least two staffs appointed by the Head of the Secretariat.

In the documents of the decree of the deputy and the Rules of Implementation for the Joint Crediting Mechanism, the duties of JCM secretariat include:

1. Together with Japan's Joint Credit Mechanism Secretariat:
    a. Prepare the design of the Joint Credit Mechanism methodology, rules and guidelines, and submit it to the Joint Committee if necessary;
    b. Receive and undertake a review of new initiatives from prospective project developers;
    c. Monitor the development of activities and programs related to the Joint Credit Mechanism, including the implementation of sustainable development criteria and environmental integrity criteria agreed upon in Indonesia;
    d. the existence of double counting by prioritizing transparency and information disclosure in the execution of implementation.
2. Independently or together with the Secretariat of Japan's Joint Credit Mechanism:
    a. Develop communication and information strategies and capacity building, including developing websites to communicate the implementation of the Joint Credit Mechanism;
    b. Develop criteria's for sustainable development and environmental integrity as well as identify capacity building needs, and submit them to the Joint Committee.
    c. Monitoring the development of feasibility studies conducted by relevant parties;
    d. Facilitating project developers in capacity building
    e. Developing, creating and running the project registry system and carbon credits generated from the activities of the Joint Credit Mechanism;
    f. Establish and allocate the amount of carbon credits in accordance with the decision of the Joint Committee, as well as record it in the registry system;
    g. Accept and review the methodology, project design document (PDD), verification and validation results, plans and reports on sustainable development criteria, and submit the results to the Joint Committee;
    h. Conducting meetings and facilitation with related parties on the implementation of Joint Credit Mechanism;
    i. Assist in the regular meeting of the Joint Committee; and
    j. Assist the Joint Committee in disseminating information and dissemination to stakeholders, ministries, and related institutions.
    k. Appoint a third party entity to validate and / or verify the implementation of the JCM project.
    l. Prepare reports on the status of the project implementation if needed.

3.4. Technical Team

3.4.1. Basis for Establishment and Task of the JCM Secretariat

The Technical Team has a function as an institution that provides recommendations and reports to the Joint Committee of Indonesia. The Technical Team is representatives of ministries and/or institutions

directly involved in the implementation of JCM. In performing its functions, the Technical Team can be assisted by the JCM Secretariat of Indonesia. Generally, the relationship between the Technical Team and the Joint Committee and the JCM Secretariat of Indonesia can be explained in accordance with Figure 3.1.

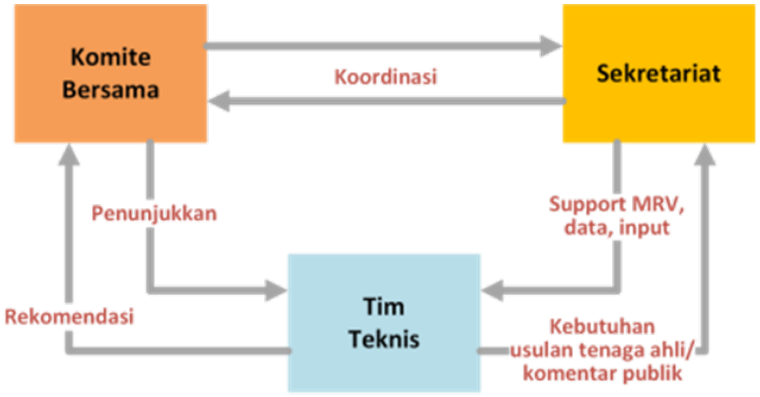

Figure 3. 1 Relationship of Technical Team with organ of JCM Indonesia

Figure 3.1 shown that the positions and members of the Technical Team are appointed and approved by the Joint Committee. The work of the Technical Team is a list of recommendations that can be used by the Joint Committee in carrying out its functions and roles in making decisions. In general, the main function of the Technical Team can be formulated as follows:

- Provide recommendations to the JCM methodology proposal.
- Provide recommendations to decide whether or not JCM project candidates will be implemented in Indonesia.
- Provide feedback and suggestions on implementation of sustainable development reports.
- Provide recommendations for credit issuance decisions on projects shown positive evaluation results.

In performing its functions the Technical Team has the role that can be formulated as follows:

- Recommendations on proposed methodologies
  - Reviewing the proposed methodology
  - Provide assessment and preparation of recommendations for conclusions on proposed methodology
- Recommendations on project registration
  - Reviewing the Project Design Document (PDD), modalities, communications, validation documents and supporting documents
  - Provide recommendations on whether a project can be registered as a JCM project
- Recommendations on implementation reports
  - Evaluating SDIR (Sustainable Development Implementation Report)
  - Delivering evaluation results

- Recommended credit issuance
  - Conducting discussions on credit distribution with PP
  - Conduct analysis and provide advice related to credit issuance

3.5. Third Party Entities

A Third Party Entity selected by the project participant to validate the PDD and verify the emission reduction activities already performed. The validation process is intended to determine whether a project has formulated an emission reduction measurement methodology formulated in the PDD (Project Design Document) correctly and determines whether the values of the parameters mentioned in the monitoring plan template are appropriate and can be used ex-ante. For the verification process, a third party entity determines whether the project has complied with the requirements listed on the submitted methodology, guidelines and decisions submitted by the Joint Committee and provides an assessment of its implementation.

To become a TPE, a Validation and Verification Agency must meet the following criteria:

- Candidate candidates are:
  (a) Accredited to ISO 14065; or
  (b) Designated Operational Entities (DOEs) for Clean Development Mechanism (CDM) under the UNFCCC
- Candidates have sufficient knowledge of JCM cooperation between the Government of the Republic of Indonesia and Japan by reading and understanding JCM rules and guidelines.

The Government of Indonesia in cooperation with the Institute for Global Environmental Strategies (IGES) has organized several ISO 14065 training sessions for third party institutions which interested in obtaining accreditation, enabling them to enroll as Third Party JCM.
Candidates who have not been eligible to become TPE of JCM may be appointed temporarily by the Joint Committee if the candidate has made an official registration for accreditation to the Accreditation Agency and the Accreditation Agency has initiated the candidacy accreditation process as outlined in Paragraph 41 (a) and (b) from the Guidelines for TPE. The Joint Committee can only make temporary appointments to 2 candidates from Indonesia and 2 candidates from Japan each year.

3.6. Role of Project Participant in JCM Activities

As shown in Figure 3.2, in the implementation of JCM there is a role mandated by the project participants. In the implementation of JCM, project participants consist of Indonesian project participants (business actors with head offices in Indonesia) and Japanese project participants (business actors headquartered in Japan), both project participants then work together and have a role as defined in the following:

- Prepare the draft methodology and submit the draft to the JCM secretariat for further review before being approved by the Joint Committee.

- Prepare the SDIP (Sustainable Development Implementation Plan) by completing the SDIP form and reporting the SDIP proposal to the JCM secretariat.
- Prepare a draft of the PDD (Project Design Document) and submit the draft to a third party entity for validation and notify the process to the JCM secretariat in order to be informed to the Joint Committee.
- Submit a PDD document that has been validated by a third party entity to the Joint Committee to be able to register.
- Implement JCM projects for monitoring emissions reductions in accordance with the methodology and project steps mentioned in the PDD.
- Prepare SDIR (Sustainable Development Implementation Report) by filling out the SDIR form for each monitoring period and submit the SDIR to the JCM Secretariat.
- Prepare a monitoring report for each monitoring period for subsequent submission to a third party entity for verification of the number of carbon credits being reduced.
- Submit verification reports prepared by a third-party entity to the Joint Committee, and requests a notification for the issuance of a reduced carbon emissions credit on the project.

Basically, the role of the participant project is a description of what will be done in implementing the JCM project within the JCM project cycle as shown in Figure 3.2.

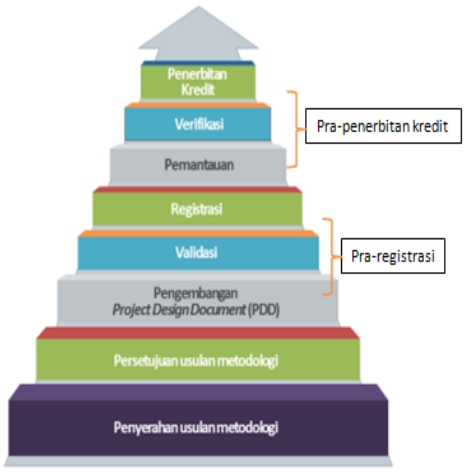

Figure 3. 2 JCM Project Cycle

CHAPTER 4
Feasibility Study for JCM Project Implementation

4.1. Reasons Required a Feasibility Study

There have been 115 feasibility studies under the JCM scheme since 2010. This feasibility study is facilitated and funded by the Japanese government with financing through the Ministry of Environment, Ministry of Economy, Trade and Industry, and Japan Forestry Agency.

The feasibility study that has been done in Indonesia until now is a form of cooperation not only between the consultant from Japan with its ministry but also more with Indonesian side, from ministry, local government, university, to private and NGO.

The objective of the feasibility study initially was to calculate and analyze the feasibility of an appropriate emission reduction opportunity to become a JCM project. Emissions reduction opportunities have been identified first then through this feasibility study will be analyzed feasibility of implementation.

In the process, the feasibility study in the JCM scheme is not only for technical and economic analysis but also a means to convince Indonesian partners to do projects with their partners, especially Indonesian partners from local government or ministries. This development is in line with the increasing number of feasibility studies conducted by the consultants from Japan in cooperation with the Indonesian government.

4.2. The Party Involved in the Feasibility Study

Feasibility studies which amounts about 111 undertaken in Indonesia were mostly financed by the Japanese government through its ministries and agencies. Costs that have been incurred in this feasibility study vary widely depending on the type of project, but in total approximately USD 10 million which are all grants from the Government of Japan.

There are several feasibility studies conducted by private Japanese independently without involving government budget. There are also feasibility studies conducted in cooperation with other parties and other countries.

The examples feasibility studies undertaken independently are feasibility studies conducted by parties who are later involved and related to the feasibility study activities include the following:

The Japanese consultant:

- Mitsubishi Research Industries
- Mitsubishi Heavy Industries
- Itochu Corporation
- Yokogawa Co. LTD.
- NTT Facilities

- JFE Engineering

Indonesian government agencies:

- Ministry of Energy and Mineral Resources
- Ministry of Environment and Forestry
- Ministry of Industry
- Local Government of Jambi Province
- Provincial Government of Gorontalo Province
- Central Kalimantan Provincial Government
- The Government of the Capital Region of Jakarta
- Municipality of Surabaya

Private parties, associations, and Indonesian state-owned enterprises

- PT. Adib
- PT. Fajar Surya Wisesa
- Asosiasi ESCO Indonesia
- PT. PLN (Persero)
- PT. Pertamina (Persero)

Universities in Indonesia involved in the feasibility study include:

- Universitas Lampung
- Institut Teknologi Bandung
- Universitas Lambung Mangkurat
- Universitas Jambi
- Universitas Sriwijaya

4.3. Types of JCM Feasibility Studies

Based on the agreement between Indonesia and Japan, feasibility studies conducted by stakeholders involved in Indonesia include 13 sub-sectors, namely:

1. Energy industry (renewable / non-renewable sources);
2. Energy distribution;
3. Energy demand;
4. Manufacturing industry;
5. Chemical industry;
6. Construction;
7. Transportation;
8. Mining / mineral production;
9. Metal production;
10. Fuel emissions from fuels (solid, oil and gas);
11. Fugitive emissions from production and consumption of halocarbon and sulfur hexafluoride;
12. Use of solvent;
13. Handling and disposal of waste;

14. Reducing emissions from deforestation and forest degradation in developing countries, as well as the role of conservation, sustainable forest management and enhancement of forest carbon stocks in developing countries (REDD-plus);
15. Agriculture.

Not all of sub-sector types are then conducted feasibility studies, some more than others, including energy industry and emissions reduction from deforestation and degradation. The feasibility studies undertaken for these two sectors have been each performed over twenty times. Sub-sectors that have never conducted feasibility studies include leakage emissions from fuel and leakage emissions from production and consumption of halocarbons and sulfur hexafluoride.

All feasibility studies were undertaken subsequently reported and presented to the Government of Indonesia through annual reporting activities. Each year since 2011 this activity is conducted with the consideration of all stakeholders involved and not involved.

4.4. Some examples of interesting feasibility studies

The feasibility study undertaken in Indonesia under the JCM scheme has much more uniqueness than any other activities it has done. Its uniqueness among others is:

- The type of technology used. Although JCM requires technology to be proposed it must be technically proven technically and economically, or technology that has been implemented commercially. But compared to the type of technology that exists in Indonesia, the technology implemented through JCM is still the latest technology.
- Type of study object. The type of feasibility study object is very diverse, from coal power plant, forest, hydropower, building, industry, waste, to the transportation system.
- Results and processes from feasibility studies. Whether or not a feasibility study is feasible depends on technical, financial, emission and social factors. From several feasibility studies conducted in Indonesia, there are some that cannot be implemented with various causes, but at a more conducive environment will be implemented.

Examples of feasibility studies that are interesting and beneficial are as follow:

Avoidance of Peat Aerobic Degradation by Peat land Rewetting and Rice Husk-based Power Generation Associated with Rice Production Increase in Jambi Province

This feasibility study has been done by the Shimizu Corp, University of Jambi, and Jambi Civil Works Unit at Jambi Province. Based on the FS results there are some significant potencies to reduce the emission and paddy crop harvesting enhancement by repairing and remote controlling the water canal in peat land area. Based on the FS, approximately 160.000 ton CO2 equivalent per year will not be emiited to the atmosphere if this project will be done.

Figure 4. 1 The feasibility study conducted by Shimitzu and Jambi University in Tanjung Jabung Timur.

This feasibility study takes place over 2 years and receives significant support from the community and local government. However, because of the need for funds and investment is large enough for the implementation, then the study is not financially feasible.

Leveraging Bilateral Offset Credit Mechanism to Improve Efficiency of PLN's Hydro Power Plants Through Rehabilitation

This feasibility study is very interesting because of the activities can give immediate result and high benefits to the project participants, especially PT. PLN. By conducting audits and special surveys on several large PLN power plants, there are some opportunities to reduce emissions through only minor maintenance and repair programs. This activity is carried out by Toshiba-company.

Based on the 6 hydroelectric surveys, energy efficiency improvements can be made with an investment IRR of 11.8%, equivalent to approximately 113,000 tons of CO2 per year.

Figure 4. 2 Conditions before and after rehabilitation**.**

This activity produces excellent information for PT. PLN then they finally follow up the results of this study by using financing from PLN without any support from JCM financing scheme.

Indonesia Sumatra Substitute Natural Gas Project

The idea to conduct this feasibility study is from the difficulty of PLN to obtain sufficient gas supply. This project is done by Mitsubishi Heavy Industries in cooperation with the Directorate General of Oil and Gas.

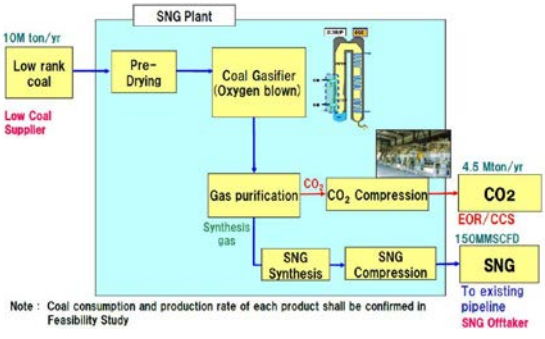

Figure 4. 3 Schematic diagram of substitute natural gas project.

This feasibility study examines the relationship between the availability of low-quality coal, the need for gas for the PLN power plant, and the need to increase the production of petroleum. Low-quality coal is converted to gas which is then used for PLN power plants, while CO2 or processed carbon dioxide is then injected into the gas or oil wells to increase the pressure so that it will produce greater production.

This study was conducted in detail and comprehensive for 2 years but ultimately the implementation was less feasible financially due to the decline of world oil price.

Project Development of Mass Rapid Transit (MRT) System in Jakarta

This feasibility study is related to the construction of MRT in Jakarta using Japanese loan funds through JICA cooperation. In this feasibility study, the methodology for calculating emission reduction is done through MRT development from south to north of Jakarta.

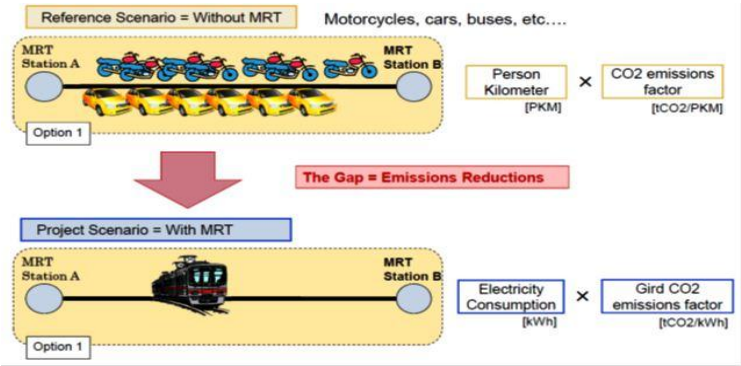

Figure 4. 4 Scenarios and constraints are developed within the methodology**.**

Survey activities are then carried out, especially for transportation of highway, motorcycle, and car transport modes, which will be sub-disaggregated by MRT. The calculations performed are then based on scenarios built on the methodology.

This feasibility study was finally conducted for 2 years, the methodology still not feasible to be used as the basis for calculation of emission reduction due to too many assumptions used.

Feasibility study of GHG Reduction Project through Forest Conservation in Peat land in Central Kalimantan

This feasibility study was conducted for two years in the concession area of ecosystem restoration owned by PT. Rimba Makmur Utama in Katingan area, Central Kalimantan. The parties from Japan

involved include Marubeni Corp., while from Indonesia werePT. Rimba Makmur Utama, Ministry of Forestry, Central Kalimantan Local Government, and several other related parties.

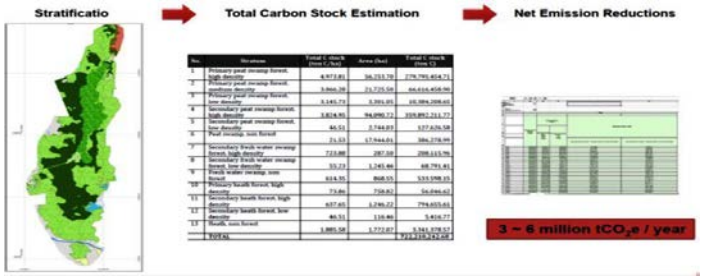

Figure 4. 5 Emission reduction model with REDD + methodology

This feasibility study aimed at designing a REDD + emission reduction measurement methodology is conducted over 3 years with the final outcome of a detailed methodology and calculation of emissions reductions for the Katingan project.

The Katingan feasibility study is not only a methodology but also produces a detailed safeguard and implementation plan. This is one of the most detailed feasibility study projects ever undertaken under the JCM scheme.

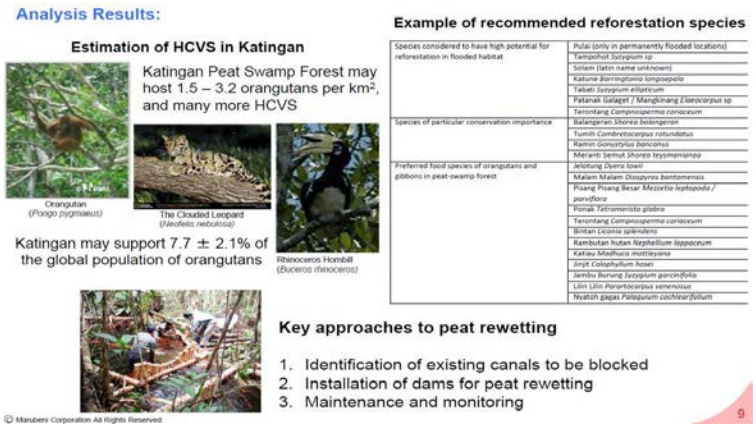

Figure 4. 6 Safeguards plan from Katingan project implementation.

Due to political and policy changes, especially with the incorporation of the Ministry of the Environment with the Ministry of Forestry, as well as the unclear issue of REDD + issues in UNFCCC and global negotiations, the Indonesian government is unwilling to adopt REDD + as an emission reduction instrument under the JCM scheme.

Methodologies and safeguards and other plans and documents that have been developed are finally used by project participants to register this project under the Voluntary Carbon Standard (VCS) scheme. Already millions of tons of VER credit has been generated by this project until now.

Feasibility Study on Financing Scheme Development Project for Promoting Energy Saving in Indonesia

The Mitsubishi Research Institute in collaboration with ESCO (Energy Services Company) association conducted a feasibility study to improve energy efficiency by energy users in Indonesia. The target of this study is creating a scheme of financing and cooperation with ESCO while offering technological products to the intended energy users, in this case, are malls and shops.

Technologies that are subsequently offered to energy users include energy management, solar rooftop, replacement chiller with a high efficiency, utilization of exhaust generator set, LED, and several other technologies.

This feasibility study was unsuccessful to be implemented into a project due to the reluctance of the facility owners to use the offered ESCO financing scheme.

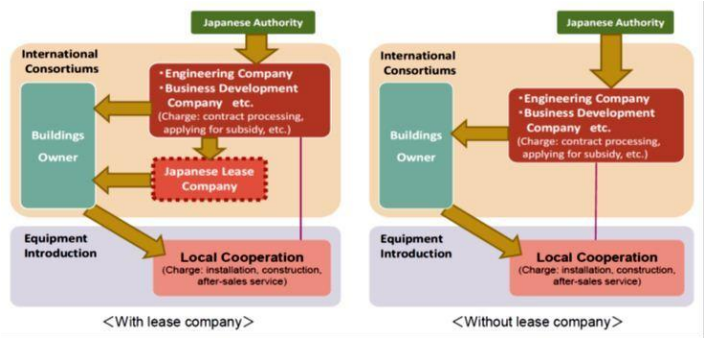

Figure 4. 7 Financing model offered by feasibility study result.

Pilot Study on for Carbon Sequestration and Monitoring Gundih Area, Central Java, Indonesia

This study is the most complex study of all feasibility studies undertaken in Indonesia under the JCM scheme, at most parties involved, and one of the longest-running and time-span. The parties involved in the feasibility study are as follows.

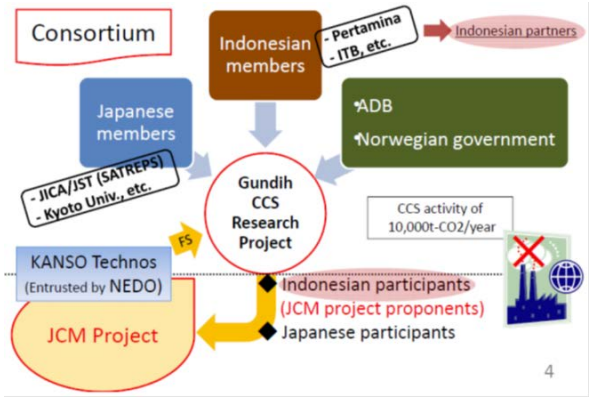

Figure 4. 8 Parties involved in financing and study work The financing model offered by the results of a feasibility study.

In a project based and in comparison with other feasibility studies, these actively involved parties are quite numerous, even at most compared to other feasibility studies. In the feasibility study for CCS Gundih, the involved parties are Kanso Technos, JICA, ITB, Directorate General of Oil and Gas, Pertamina, ADB, UKCCU (from the British embassy), and the Norwegian government. Many parties are directly involved in this activity because of the complexity of the activities and the wide scope of the area, technical, and political.

This Feasibility Study gives more detail knowledge about carbon captured and storage (CCS) which is planned to be implemented in Exxon Mobil's oil and gas mining concession in Gundih field, Cepu area. The high CO2 content in mined natural gas causes the effectiveness of this implementation is expected to be achieved through increased oil and gas production due to increased pressure from oil and gas wells.

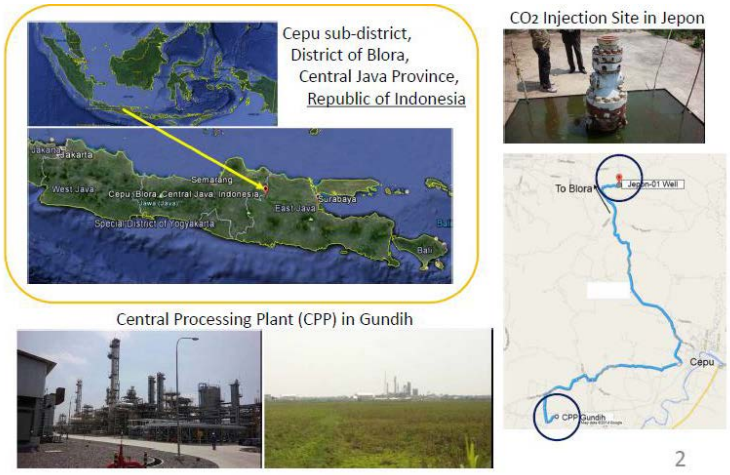

Figure 4. 9 Location and condition of Gundih Field now.

Technically, the feasibility study conducted by CCS is feasible to be implemented in order to increase the production of oil and gas wells. It was agreed to build dwell test or test well in 2016 with financing from a consortium of companies in Japan. This activity was then postponed due to the decline in world oil prices so that it became financially less attractive and less feasible to implement.

CHAPTER 5
JCM Financing Model

To implement the JCM project, previous candidate participants must be registered as recipients of Japanese government assistance for JCM schemes. There are 3 financing schemes offered by the Japanese government that can be followed by the Indonesian side to date, namely: Model Project, Demonstration Project, and Japan Fund for JCM - ADB.

5.1. JCM Model Project

The Model Project scheme is a financing scheme of the Ministry of Environment Japan (MoEJ) that finances part of the capital cost of a low carbon project in the form of subsidies. Projects financed by the Model Project must be able to complete the project for a maximum of 3 years from the subsidy. In return, the Government of Japan expects at least half of the emission reductions credited to JCM credit.

In implementing the Model Project scheme, the MOEJ appoints the Global Environment Centre Foundation (GEC) as the organization responsible for managing subsidy funds, running call-for-proposal processes, and conducting monitoring and evaluation of subsidized projects.

One of the conditions for obtaining a Model Project subsidy is that both entities from Indonesia and Japan must establish an international consortium or joint venture under a business to a business agreement. Generally, the representative of this consortium is the Japanese entity due to some administrative requirements in Japanese. Therefore, the consortium's representatives are recognized as Japanese entities if they are:

i. Private companies;
ii. Independent institutions;
iii. Association;
iv. Organizations established under Japanese regulations; or
v. An organization deemed appropriate by the GEC in accordance with the direction of the MOEJ.

The maximum subsidy given by the Model Project scheme is 50%, and the percentage will decrease if the proposed project uses technology that has been subsidized by Model Project. The large percentage of subsidies obtained can be seen in Table 5.1.

Table 5. 1 Large subsidy of the Model Project scheme.

Number of Model Projects that have used the same technology in host country	Percentage of subsidies
None (0)	Up to 50%
1-3 projects	Up to 40%
More than 3 (>3)	Up to 30%

5.2. Japan Fund for JCM (JFJCM)

The JFJCM scheme is a trust fund of MOEJ managed by ADB and in 2014-2016, the amount of funds granted to ADB is $ 42.6 million. This scheme provides funding incentives from adoption of cutting-edge carbon technologies on ADB-financed projects (see Figure 1).

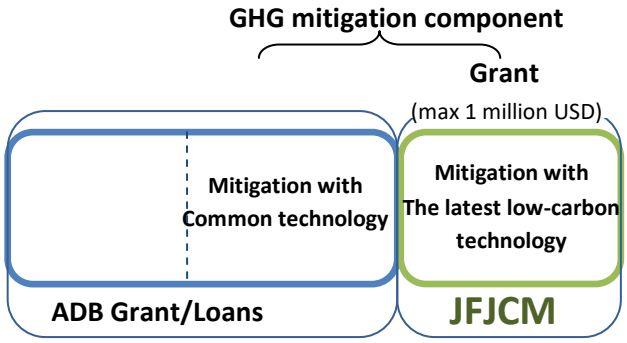

Figure 5. 1 JFJCM financing scheme.

Funding support through JFJCM can be provided to sovereign projects or non-sovereign projects with different financing schemes:

i. Sovereign project

The sovereign funding assistance project is provided in the form of a grant of additional costs for cutting-edge low carbon technologies (see Figure 2). Parties that can get this funding are government entities and SOEs. Grants granted are 1) 10% of project cost (maximum cost 10 million USD); or 2) for five (5) million USD if the project cost is less than 50 million USD.

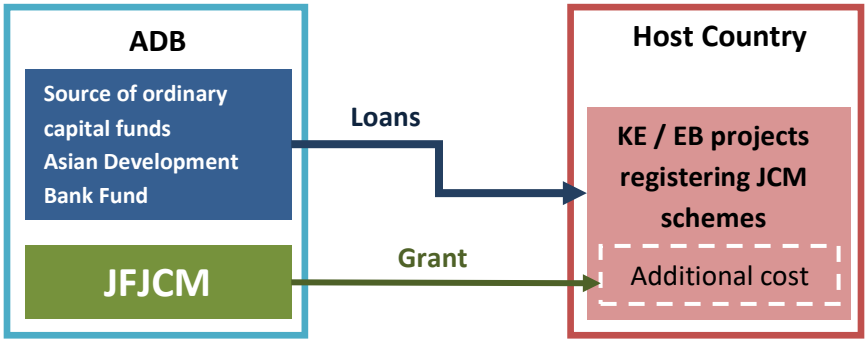

Figure 5. 2 JFJCM funding for sovereign project.

ii. Non-sovereign project

Non-sovereign funding assistance projects are provided to private parties who have borrowed ADB funds to implement energy conservation or renewable energy projects. By this JFJCM, the private sector will receive a subsidy for the ADB loan rate shown in Figure 3. The amount of interest subsidy granted is 10% of the project cost (with a maximum amount of 10 million USD).

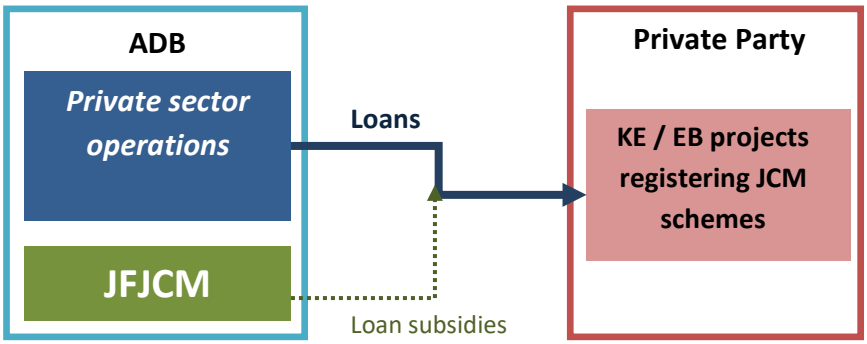

Figure 5. 3 JFJCM funding for non-sovereign projects.

.

5.3. Demonstration Project

Demonstration Project Scheme is a financing scheme of the Ministry of Economy, Trade, and Industry (METI) of Japan and the New Energy and Industrial Technology Development Organization (NEDO) of Japan to provide grant for the implementation of low-carbon technologies to host countries. As one of the requirements in this scheme is the need for a Memorandum of Understanding (MoU) on each of the NEDO project with one of the Indonesian government institutions (see Figure 5.4). NEDO have an interest to do the MoU with the Indonesian government institution to establish lines of communication with project participants, coordinate the relevant ministries in Indonesia to carry out a demonstration of the technology, and to provide a solution if there are problems during the project.

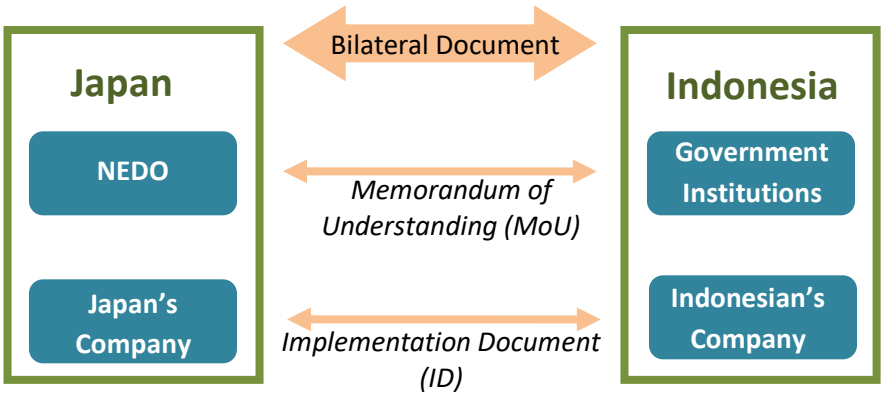

Figure 5. 4 Demonstration Project Scheme.

In accordance with Japanese Government regulations, each technology has a product depreciation age at which the price of a technology will be zero (0) in year n. Under this regulation, then when the technology for JCM with Nation Technology Demonstration Project ownership is owned by NEDO, but after the price of zero technology (0) then the goods will be transferred to Indonesian companies.

CHAPTER 6
JCM Implementation Infrastructure

In the implementation of JCM cooperation, its implementation is closely related to rules, JCM project cycle implementation procedures, and JCM project implementation methodology. The implementation of the three things must be in accordance with ISO 14065 standards. The JCM implementation guidelines are also the infrastructure of JCM implementation. The instructions are explained in detail in several documents agreed upon by the Joint Committee. In addition to JCM infrastructure, it is also important to note the carbon credit registration system derived from the implementation of the JCM project. In general, the JCM implementation infrastructure can be shown in **Figure 6.1.**

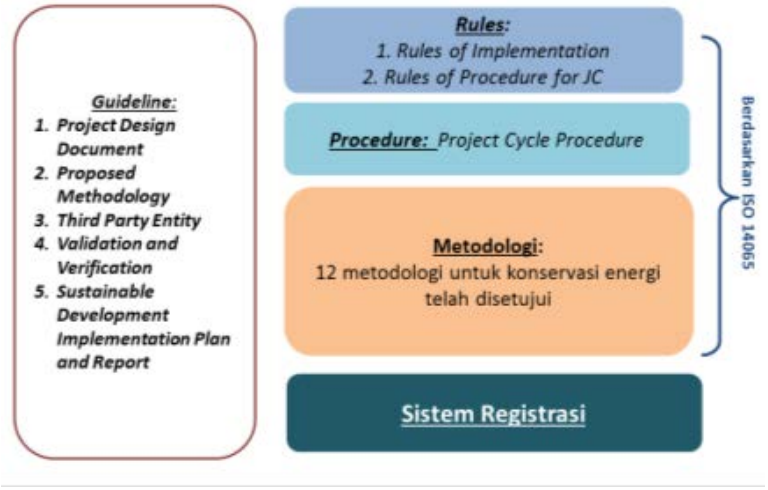

Figure 6. 1 . JCM Implementation Infrastructure

6.1. JCM Implementation Rules

The JCM implementation rules refer to bilateral cooperation between the Government of Indonesia and Japan in Joint Crediting Mechanism cooperation. The JCM implementation rules refer to the Rules of Implementation for The Joint Crediting Mechanism (JCM) ver_2.1 document. The things that become the main rules of this JCM implementation are:

1) The purpose of the Joint Credit Mechanism cooperation
2) The scope of cooperation of Joint Credit Mechanism
3) The roles and responsibilities of the Joint Committee
4) Roles and responsibilities of both parties in the implementation of JCM (including the scope of work of the secretariat)
5) Third Party Roles and Responsibilities (Third-Party Entities)
6) Roles and responsibilities of project participants
7) Mechanism of methodology
8) The mechanism of appointment of a third party registered in JCM cooperation
9) Explanation of validation implementation

10) A description of the Sustainable Development Implementation Plan (SDIP)
11) Explanation of the registration process
12) An explanation of the monitoring and measurement process for carbon emissions being reduced based on the project being implemented
13) Explanation of the verification process of the monitoring results and the measurement of carbon emissions reduced by the implemented project.
14) Explanation for the evaluation process of the sustainable development report that has been implemented
15) Explanation for the credit issuance process and the distribution of carbon credits

6.2. Rules of Procedures for Joint Committee

The rules for procedures of the Joint Committee shall govern matters relating to membership, decision-making processes whether derived from joint meetings or teleconferences or electronics such as emails and activities of the Joint Committee such as meetings, reporting, and other related activities. This rule is described in detail in the Rules of Procedures document for the Joint Committee ver _020.

6.3. Project Cycle Procedure

JCM implementation procedures are designed to allow JCM project implementation to be consistent with the JCM project cycle to run consistently and in accordance with the objectives of the JCM project implementation. This JCM implementation procedure is an administrative step that should be undertaken by JCM project participants, third party entities, Joint Committee, JCM Secretariat, Technical Team and stakeholders related to JCM project implementation. As mentioned earlier, JCM implementation procedures are made for JCM projects to run according to the JCM project cycle. This project cycle procedure refers to the Joint Crediting Mechanism Project Cycle Procedure document. The JCM implementation procedure is closely related to the JCM project cycle as shown in **Figure 3.2.**

6.4 Methodology

Methodology is a method of calculation and measurement such as a carbon emissions reduction measurement formula of a JCM project that can be measured and applied. The preparation of the methodology must be in accordance with ISO 14065. For each new methodology submitted must be approved by the Joint Committee. A JCM project can use a methodology with similar technology and has been approved by the Joint Committee. To date for the implementation of the JCM project in Indonesia, there are 12 approved methodologies.

There are two types of emission reductions recorded in JCM: **reference emissions & project** emissions as shown in **Figure 6.2.**

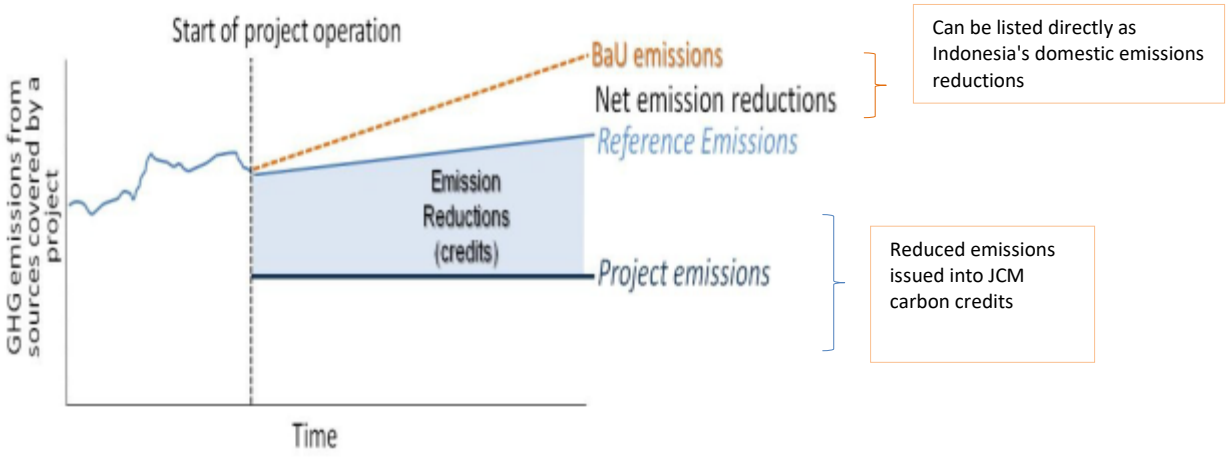

Figure 6. 2 The relationship between BaU emissions, reference emissions and project emissions

The main things have to be noted include:

1) Baseline emission equivalent to BaU and/or Reference Emissions.
2) The mitigation emission is equivalent to Project Emissions
3) Reference Emissions are reasonable emissions in pre-project conditions and the amount under the BaU emission
4) Reference Emissions on JCM can be the same or different from the baseline emissions, depending on the methodology for calculating the emission reductions used.
5) GHG emissions listed in the system may be equal to or greater than JCM credits.

Calculation cases:

1. The latest chiller technology has been installed at Tunjungan Plaza Surabaya.
2. Coefficient of Performance (COP) of old chiller is 4.6 (0.77 KW / Ton Ref), new chiller 6.28 (0.56 KW / Ton Ref).
3. COP from the most circulating chiller in the market in Indonesia based on the survey is 5.94 (0.59 KW / Ton Ref). Without JCM, Tunjungan Plaza will select this type of chiller.
4. Reduction of emissions in JCM is a comparison between project emission and reference emission (not with baseline emission)
5. Reference emission - Project emission = 996 ton CO2 / year
6. Baseline emission - Reference emission = 3.925 ton CO2 / year. This can be reported directly as emissions reductions for Indonesia.

6.5. Registration

The JCM Indonesia registry system is a system developed to ensure the recording of JCM's issuance, ownership, transfer, receipt, cancellation and retirement credit. The components that exist in the JCM registry system as shown in Figure 6.2, include:

1) "Master Operation sheet" to register the JCM project and the new account in the system and to modify the registered information
2) "Credit Related Operation sheet" to manage JCM credit in the registry system
3) "Master sheets" for the data center and store each operation or input done inside
4) "Account sheets" to manage the amount of credit owed by each account

Figure 6. 3 . JCM Registry System

Each JCM host country is free to develop their registry system. However, this registry system must still follow and conform to the Common Specifications of the JCM Registry ver_01.0 document. In this document defined the following:

1) Issuance,
2) Transfer
3) Acquisition
4) Cancellation
5) Retirement.

As mentioned in the Common Specifications of the JCM Registry documents, both parties create a registration system that explains the accurate calculation of the number of credits including issuance, transfer, acquisition, cancellation, and retirement. The registration system should also avoid double counting.

The registration system must have the following accounts:

1) A government account
2) Participant's account
3) Cancellation account
4) A "retirement" account

Both parties must also prepare a platform that can help the public to access or query the data.

6.6. JCM Implementation Guidelines

In the JCM infrastructure there are documents that support the implementation of JCM. Instructions are organized into the following activities:

6.6.1. Guidelines for Project Design Document (PDD) and Monitoring Report

PDD is a document prepared by project participants that is useful for assisting project participants in implementing the project and delivering project monitoring results. In detail, the guidelines for the preparation of the PDD and the monitoring report are described in the document Joint Crediting Mechanism Guidelines for Developing Project Design Document and Monitoring Report ver 02.0. As for the preparation of the PDD and the monitoring report, the project participants should use the instructions described in the document and approved methodologies.

6.6.2. Methodology Guidelines

The methodology guidelines are used by the project participants in the preparation of the methodology for the Joint-Crediting Mechanism project and for the Joint Committee in compiling or assessing the proposed methodology. The instructions for this process are summarized in the Joint Crediting Mechanism Guidelines for Developing Proposed Methodology ver_1.1 document. The main things that are arranged in the PDD are:

1) Completed PDD form
2) Monitoring and monitoring plan and report consisting of monitoring plan sheet and monitoring structure sheet

6.6.3. Third Party Entities Guidelines

These guidelines are used as guidance relating to the third party entity involved in the JCM project as the party conducting validation and verification of JCM activities. This Directive consists of criteria and procedures for the mechanism of appointment, resignation and suspension or re-registration of a third party entity. These guidelines apply to the Joint Committee, secretariat, and project participants. In detail, the guidance on determining third-party entities is listed in the Joint Crediting Mechanism document Guidelines for Designation of a Third-Party Entity ver 3.1

6.6.4. Validation and Verification Guidelines

These validation and verification guidelines is intended for third party entities contracted by project participants to carry out validation and verification of projects that previously possessed a methodology approved by the joint committee. Detailed instructions on this activity are described in full in the Joint Crediting Mechanism Guidelines for Validation and Verification ver_01 document. In the implementation there are documents that must be considered including:

1) ISO 14964-3: 2006; Greenhouse gases - Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions
2) Joint Crediting Mechanism Project Cycle Procedure
3) Joint Crediting Mechanism Guidelines for Developing Project Design Document and Monitoring Report

6.6.5. Guidelines for the Sustainable Development Implementation Plan and Report

Guidelines for the preparation of the Sustainable Development Implementation Plan and Report (SDIP and SDIR) are demonstrated for project participants in order to assist in the preparation of SDIP and SDIR required in the JCM project cycle. The guidelines for the preparation of SDIP and SDIR are detailed in the document of the Joint Crediting Mechanism Guidelines for Developing Sustainable Development Implementation Plan and Report ver_01.0.

CHAPTER 7

JCM Project and Status

7.1. List of JCM Projects and Status

There have been 34 projects under the JCM pipeline scheme in Indonesia with 31 projects using project model financing mechanism (including 1 LULUCF project in it) and 3 projects using demonstration project financing mechanism.

Briefly, based on the implementation cycle of the JCM project, in December 2017 there were 2 projects that have applied for carbon credits with 9 projects that have been registered as JCM projects, both projects that have been registered and applied for credit are projects using project model funding. Table 7.1 shows a summary of the JCM project in Indonesia and its status:

Table 7. 1 The JCM Project and its Status in Indonesia

NO	PROJECT NAME	LOCATION	INDONESIAN PARTICIPANTS	JAPAN PARTICIPANTS	JCM PROJECT STATUS UNDER THE PROJECT CYCLE	TOTAL OF EMISSION REDUCTION EXPECTATIONS
MODEL PROJECT						
1	*Power Generation by Waste-heat Recovery in Cement Factory*	Tuban, Jawa Timur	PT. SEMEN INDONESIA Tbk	JFE Engineering Corporation	Not Registered yet	122,000 tons CO_2/year
2	*Installation of Solar Power System and Storage Battery to Commercial Facilities*	Jakarta Garden City, Cakung Jakarta Timur	AEON MALL INDONESIA	ITOCHU CORPORATI-ON	Not Registered yet	549 tons CO_2/year
3	*Co-generation System and Absorption Chiller to Motor Parts Factory*	Cikarang Pusat, Bekasi	PT.DENSO INDONESIA (DNIA)	DENSO CORPORATION	Not Registered yet	5049 tons CO_2/year

NO	PROJECT NAME	LOCATION	INDONESIAN PARTICIPANTS	JAPAN PARTICIPANTS	JCM PROJECT STATUS UNDER THE PROJECT CYCLE	TOTAL OF EMISSION REDUCTION EXPECTATIONS
4	*Roof Top Self Consumption Solar Power Generation Project for Food Ingredients and Aroma Ingredients Factory, Indonesia*	Cileungsi, Bogor, Jawa Barat	INDESSO AROMA	NEXT ENERGY AND RESOURCES CO	Not Registered yet	469 tons CO_2/year
5	*Installation of Gas Co-generation System for Automobile Manufacturing Plant*	Karawang Jawa Barat	PT. TOYOTA MOTOR MANUFACTURING INDONESIA	TOYOTA TSUHO CORPORATION	Not Registered yet	20,310 tons CO_2/year
6	*Introduction of High Efficient Old Corrugated Cartons Process at Paper Factory*	Bekasi, Jawa Barat	PT. FAJAR SURYA WISESA	KANEMATSU COOPERATION	Registered as ID011	14,884 tons CO_2/year
7	*Energy Saving through Introduction of Regenerative Burners to the Alumunium Holding Furnance of Automotive Components Manufacturer*	Karawang, Jawa Barat	PT. YAMAHA MOTOR PARTS MANUFACTURING INDONESIA PT. TOYOTA TSUSHO INDONESIA	PT. TOYOTA TSUSHO INDONESIA	Not Registered yet	865 tons CO_2/year
8	*Reducing GHG Emission at Textile Factories by Upgrading to Air-saving Loom*	Banten, Jakarta, & Jawa Timur	PT. EASTERNTEX PT.. INDONESIA SYNTHETIC TEXTILE MILLS PT. CENTURY TEXTILE INDUSTRY TBK	TORAY INDUSTRIES, INC. TORAY INTERNATIONAL, INC	Not Registered yet	566 tons CO_2/year
9	*Introduction of High Efficiency Looms in Weaving Mills*	Karawang, Jawa Barat	PT. NIKAWA TEXTILE INDUSTRIES	NISSHINBO TEXTILE INC	Not Registered yet	1,317 tons CO_2/year

NO	PROJECT NAME	LOCATION	INDONESIAN PARTICIPANTS	JAPAN PARTICIPANTS	JCM PROJECT STATUS UNDER THE PROJECT CYCLE	TOTAL OF EMISSION REDUCTION EXPECTATIONS
10	*Energy Saving for Textile Factory Facility Cooling by High Efficiency Centrifugal Chiller*	Karawang, Jawa Barat	PT. NIKAWA TEXTILE INDUSTRIES PT. EBARA INDONESIA	EBARA REFRIGERATION EQUIPMENT SYSTEM CO.,LTD	Registered as ID004 Have not applied for credit	118 tons CO_2/year
11	*Energy Saving for Air Conditioning and Process Cooling by Introducing High-efficiency Centrifugal Chiller*	Batang, Jawa Tengah	PT. PRIMATEXCO	EBARA REFRIGERATION EQUIPMENT SYSTEM CO.,LTD; NIPPON KOEI	already registered ID001 Have not applied for credit	114 tons CO_2/year
12	*Energy Saving for Air Conditioning and Process Cooling at Textile Factory*	Batang, Jawa Tengah	PT. PRIMATEXCO	EBARA REFRIGERATION EQUIPMENT SYSTEM CO.,LTD; NIPPON KOEI	already registered ID005 Have not applied for credit	117 tons CO_2/year
13	*Energy Saving for Air-Conditioning at Shopping Mall with High Efficiency Centrifugal Chiller*	Surabaya Jawa Timur	PT. PAKUWON JATI,Tbk	NTT FACILITIES,INC	Registered as ID009	966 tons CO_2/year
14	*Energy Saving for Industrial Park with Smart LED Street Lighting System*	Karawang Jawa Barat	PT. HARAPAN ANANG BAKRI & SONS, PT.. KARAWANG TATABINA NDUSTRIAL ESTATE PT.. MALIGI PERMATA	NTT FACILITIES,INC	Not Registered yet	900 tons CO_2/year

NO	PROJECT NAME	LOCATION	INDONESIAN PARTICIPANTS	JAPAN PARTICIPANTS	JCM PROJECT STATUS UNDER THE PROJECT CYCLE	TOTAL OF EMISSION REDUCTION EXPECTATIONS
			INDUSTRIAL EST			
15	*Introduction of High Efficiency Once-through Boiler System and RO Pure Water System in Golf Ball Factory*	Karawang Jawa Barat	PT. SUMI RUBBER INDONESIA	SUMITOMO RUBBER INDUSTRIES, ltd	Not Registered yet	329 tons CO_2/year
16	*Introduction of High Efficiency Once-through Boiler System in Film Factory*	Merak Banten	PT. MC PET FILM INDONESIA	MITSUBISHI PLASTIC,INC	Not Registered yet	428 tons CO_2/year
17	*Solar PV Power Plant Project in Jakabaring Sport City*	Palembang Sumatera Selatan	PDPDE SUMATERA SELATAN	SHARP CORPORATION	Not Registered yet	1,303 tons CO_2/year
18	*Energy Saving by Installation of Double Bundle-type Heat Pump*	Cikarang Jawa Barat	PT. TTL RESIDENCE PT. TOYOTA TSUHO INDONESIA	TOYOTA TSUHO CORPORATION	Not Registered yet	170 tons CO_2/year
19	*Energy Saving for Industrial Wastewater Treatment for Rubber Industry*	Gandus, Palembang, Sumatera Selatan	PT. ANEKA BUMI PRATAMA	EMATEC, SUZUKI SANGYO CO.LTd., MITSUBISHI UFJ RESEARCH AND CONSULTING	Not Registered yet	546 tons CO_2/year
20	*Energy Saving at Convenience Stores*	12 ALFAMIDI JAKARTA, BEKASI, TANGERANG, DEPOK	PT. MIDI UTAMA INDONEISIA Tbk	LAWSON, INC	already registered ID006 Already applying for credit	28,5 tons CO_2/year/ store
21	*10 MW Mini Hydro Power Plany Project in North Sumatera*	Humbang Hasunduran, Sumatera Utara	PT. CITRA MULTI ENERGI	TOYO ENERGY FARM CO.,LTD	Not Registered yet	42,700 tons CO_2/year/ Store

NO	PROJECT NAME	LOCATION	INDONESIAN PARTICIPANTS	JAPAN PARTICIPANTS	JCM PROJECT STATUS UNDER THE PROJECT CYCLE	TOTAL OF EMISSION REDUCTION EXPECTATIONS
22	*Introduction LED Lighting to Sales Stores*	Jakarta Indonesia	PT. FAST RETAILING INDONESIA	FAST RETAILING CO.,LTD	Not Registered yet	2,617 tons CO_2/year
23	*Small Hydro 10MW power plant LAE ORDI project*	Phakphak Barat, Sumatera Utara	PT Phakphak Bumi Energi	Chodai,co.ltd	Not Registered yet	46,520 tons CO_2/year
24	*Energy Saving by Introducing High Efficiency Autoclave to Infusion Manufacturing Factory*	Lawang, Malang East Java	PT. Otsuka Indonesia	Otsuka Pharmaceutical Factory	Not Registered yet	1667 tons CO_2/year
25	*Introduction of Absorption Chiller to Chemical Factory*	Karawang, Jawa Barat	PT. Timur Raya Tunggal	Tokyo Century Corporation	Not Registered yet	1,084 tons CO_2/year
26	*Introduction of 2.8 MW Solar Power System in Healthcare and Food Factories*	Kebayoran Baru, Jakarta Karawang, Jawa Barat	PT. Engie Indrastructure Indonesia P&G Indonesia dan PT. Indolakto	Takasago Thermal Engineering Corporation	Not Registered yet	2,168 tons CO_2/year
27	*Introduction of CNG-Diesel Hybrid Equipment to Public Bus in Semarang*	Semarang, Jawa Tengah	BLU UPTD Trans Semarang	Hokusan Corporation	Not Registered yet	819 tons CO_2/year
28	*Energy Saving for Air-Conditioning System of Shopping Mall by High Efficiency Centrifugal Chiller and Air-conditioning Control System*	Batam, Kepulauan Riau	Mega Mall Batam Centre (PT. Federal Investindo)	iFORCOM Corporation	Not Registered yet	1,501 tons CO_2/year
29	*Introducing High Efficiency Refrigator to a Food Industry Cold Storage in Indonesia*	Karawang, Jawa Barat	PT. ADIB GLOBAL FOOD SUPPLIES;	MAYEKAWA MANUFACTURING CO Ltd	Already registered ID002	29 tons CO_2/year

NO	PROJECT NAME	LOCATION	INDONESIAN PARTICIPANTS	JAPAN PARTICIPANTS	JCM PROJECT STATUS UNDER THE PROJECT CYCLE	TOTAL OF EMISSION REDUCTION EXPECTATIONS
			PT. MAYEKAWA INDONESIA		Already applying for credit	
30	*Introducing High Efficiency Refrigator to a Frozen Food Processing Plant in Indonesia*	Bekasi, Jawa Barat	PT. ADIB GLOBAL FOOD SUPPLIES; PT. MAYEKAWA INDONESIA	MAYEKAWA MANUFACTURING CO Ltd	Already registered ID003 Already applying for credit	11 tons CO_2/year
DEMONSTRATION PROJECT						
31	*Energy Saving by Optimum Operation at Oil Refinery*	Balikpapan, Kalimantan Timur	PT. PERTAMINA (REFINERY UNIT V)	YOKOGAWA ELECTRICITY CORPORATION	Not Registered yet	3.400 tons CO_2/year
32	*Utility Facility Operation Optimization Technology*	Cilacap, Jawa Tengah	PT. PERTAMINA AZBIL BERCA INDONESIA	AZBIL CORPORATION	Not Registered yet	58.000 tons CO_2/year
33	*Installation of Tribrid System to mobile communication's Base Transceiver Stations in Republic of Indonesia*	TBA; *trial test* sudah dilaksanakan di Pulau Puri Jakarta	PT. PACKET SYSTEM INDONESIA;PT. HUAWEI SERVICE	KDDI COPORATION ERNST &YOUNG SUSTAINABILITY CO LTD	Not Registered yet	163 tons CO_2/year
REDD+ MODEL PROJECT						
34	*REDD+ Project in Boalemo District*	Boalemo, Gorontalo	Gobel Group DKM (PT. Dharma Karyatama Mulia)	Kanematsu Corporation	Not Registered yet	86.520 tons CO_2/year

7.2. Implementation of JCM Project

7.2.1. Model Projects

7.2.1.1 Power Generation by Waste-heat Recovery in Cement Factory

Figure 7. 1 Power Generation by Waste-heat Recovery in Cement Factory project

The Project of Waste Heat Power Plant 32 MW PT. Semen Indonesia in Tuban, East Java which is collaborate between Indonesia and Japan with the participation of JFE Engineering Corporation. 4 units utilized exhaust gas that still has a temperature of about 4000 C. Waste heat from exhaust gas are captured and utilized to heat the boiler and generate electricity. The system is capable to produce the electricity up to 25% of the total electricity needed for the whole plant requirement. Total Expected Emission Reduction from this project amounted to 122,000 tons CO2 / year.

The project (**Figure 7.1**) was approved in 2014. The design and manufacturing and installation process for this project began in 2015. The project consortium has just implemented Local Stakeholder Consultation (LSC). Total Expectations Emission Reduction 122,000 tons CO2/year. The project is expected to be completed by the end of 2017 or early 2018.

7.2.1.2 Installation of Solar Power System and Storage Battery to Commercial Facilities

Figure 7. 2 Installations of Solar Power System and Storage Battery to Commercial Facilities Project

The 500 kW Project on Solar System Installation and Battery Storage to Commercial Factory has been done through the installation of solar power plants above the roof of the commercial area of AEON Mall Jakarta Garden City in Cakung as shown in Figure 8.2. The project is a joint venture with Itochu Corporation of Japan, and has been completed in July 2017 and will be operational by the end of September 2017. Total Expectations of Emission Reduction is 549 tons CO2 / year.

7.2.1.3 Co-generation System and Absorption Chiller to Motor Parts Factory

The project that will be implemented in this commercial building applied a co-generation gas system consisting of a turbine gas that generated electricity. Emission Reduction is 5049 tons CO2/year. This project is collaboration between PT. Denso Indonesia (DNIA) with DENSO Co., Ltd. (Japan).

7.2.1.4 Roof Top Self Consumption Solar Power Generation Project for Food Ingredients and Aroma Ingredients Factory, Indonesia

Figure 7. 3 Roof Top Self Consumption Solar Power Generation Project for Food Ingredients and Aroma Ingredients Factory Indonesia

The project is being implemented with the installation of a solar power plant on the roof of the Aroma Indesso plant in Cileungsi, Bogor, West Java at 572 KW. The project is expected to be completed in October 2017. Total expected Emission Reduction 469 tons CO2 / year. This project is a collaboration between Indesso Aroma (Indonesia) with NEXT ENERGY AND RESOURCES Co. (Japan).

7.2.1.5 Installation of Gas Co-generation System for Automobile Manufacturing Plant

Figure 7. 4 Installation of Gas Co-generation System for Automobile Manufacturing Plant

This project was implemented at PT. Toyota Mobile Manufacturing Indonesia in Karawang, West Java, which is cooperation between PT. Toyota Motor Manufacturing Indonesia and Japan with participation from Toyota Tshuho Corporation. The purpose of this project is to generate electricity and steam for its own use by installing a co-generation system. The installed system also reduces emissions and saves energy. The co-generation system is able to meet the needs of 30% of total electricity consumption. The installation of the project is completed in April 2017. Total expected Emission Reduction is 20,310 tons CO2 / year.

7.2.1.6 Introduction of High Efficient Old Corrugated Cartons Process at Paper Factory

Figure 7. 5 Introduction of High Efficient Old Corrugated Cartons Process at Paper Factory

Installation of paper making machine for Old Corrugated Cartons (OCC) -line at PT. Fajar Surya Wisesa, Bekasi, West Java, in collaboration with Kanematsu Cooperation (Japan). The project is able to save up to 10% of factory electricity usage. The system is built using the latest technology that is more energy efficient than previous systems. The project was completed in November 2016. Total Expected Emission Reduction is 14,884 tons CO2/year.

7.2.1.7 Energy Saving through Introduction of Regenerative Burners to the Aluminums Holding Furnace of Automotive Components Manufacturer

Figure 7. 6. Energy Saving through Introduction of Regenerative Burners to the Aluminums Holding Furnace of Automotive Components Manufacturer Project

This project was implemented at PT. Yamaha Motor Part Manufacturing in Karawang, West Java, and cooperated between Indonesia and Japan with the participation of PT Yamaha Motor Parts Manufacturing Indonesia and PT. Toyota Tsusho Indonesia. This project replaced conventional burners with burners that have higher efficiency. This combustion engine used for die casting process. Total Expected Emissions Reduction is 856 tons CO2/year.

7.2.1.8. Reducing GHG Emission at Textile Factories by Upgrading to Air-saving Loom

Figure 7. 7. Reducing GHG Emission at Textile Factories by Upgrading to Air-saving Loom Project

The "JAT 810" system, this spinning machine has the ability to reduce compressed air consumption by 20% which also directly consumes electricity on its air-compressor system. This system is implemented in 3 textile factories Indonesia in Banten, Jakarta, and East Java, namely PT. Easterntex, PT. Indonesia Synthetic Mills, PT. Century Textile Industry Tbk. and the participation of Toray Industri Tbk. Japan. Total Expectations of Emission Reduction is 566 tons CO2/year.

7.2.1.9 Introduction of High Efficiency Looms in Weaving Mills

Figure 7. 8. Introduction of High Efficiency Looms in Weaving Mills

In this project, the JAT810 spinning machine is not only for the energy efficiency enhancement but also produces much better and modern quality textiles than previous generations. This project is implemented in textile factory of PT. Nikawa Textile Industries in Cikampek West Java and the participation of NISSHINBO TEXTILE INC from Japan. Total Expected Emission Reduction is 1.317 tons CO2/year.

7.2.1.10 Energy Saving for Textile Factory Facility Cooling by High Efficiency Centrifugal Chiller

Figure 7. 9. Energy Saving for Textile Factory Facility Cooling by High Efficiency Centrifugal Chiller

In this project implemented energy-efficient cooling machine for the textile factory in PT. Nikawa textile Industries and PT. Ebara Indonesia in Karawang, West Java. This centrifugal chiller machine replaces the previous refrigeration (5000 Ton ref) which has 2 efficient compressor stages, economizer, and sub-cooler system. This project is a collaboration between PT. Nikawa textile Industries, PT. Ebara Indonesia from Indonesia with Ebara Refrigeration Equipment System Co. Ltd. from Japan. Total Expectations of Emission Reduction 118 tons CO2 / year.

7.2.1.11 Energy Saving for Air Conditioning and Process Cooling by Introducing High efficiency Centrifugal Chiller

Figure 7. 10. Energy Saving for Air Conditioning and Process Cooling by Introducing High-efficiency Centrifugal Chiller

In this project the old refrigeration machine was replaced by an energy-efficient centrifugal cooling machine to produce cold air and room humidity greatly affected the quality of textile production. This project is the first project to be registered as a JCM project and implemented at PT. Primatexco in Batang, Central Java, This is a joint venture between PT. Primatexco with Ebara Refrigeration Equipment System Co., Ltd. and Nippon Koei Japan. Total Expected Emission Reduction 114 tons CO2 / year.

7.2.1.12. Energy Saving for Air Conditioning and Process Cooling at Textile Factory

Figure 7. 11. Energy Saving for Air Conditioning and Process Cooling at Textile Factory

In this project the old cooling machines (230 USRt and 250 USRt) were replaced by energy-efficient centrifugal cooling machines for space conditioning at the PT Primatexco textile factory, Batang, Central Java. Total Expected Emission Reduction 117 tons CO2 / year. This project is a collaboration between PT. Primatexco (Indonesia) with Ebara Refrigeration Equipment System Co., Ltd. and Nippon Koei (Japan).

7.2.1.13. Energy Saving for Air-Conditioning at Shopping Mall with High Efficiency Centrifugal Chiller

Figure 7. 12 Energy Saving for Air-Conditioning at Shopping Mall with High Efficiency Centrifugal Chiller Project

NTT Facilities (Japan) and PT. Pakuwon Jati Tbk, cooperate to implement energy saving project by applying centrifugal chiller at Tunjungan Plaza Surabaya, East Java. The project is efficient and capable of saving up to 1,136 MWh of electricity annually. Chiller is implemented as many as 5 units to supply cold air for the purposes of shopping center operations. Total Expected Emissions Reduction 966 tons CO2 / year.

7.2.1.14. Energy Saving for Industrial Park with Smart LED Street Lighting System

Figure 7. 13. Energy Saving for Industrial Park with Smart LED Street Lighting System Project

Replacement of sodium street lamps in KIIC area, Karawang, West Java with LED lamps using smart control system can reduce electricity consumption up to 1106 MWh per year is also able to reduce carbon emissions of 900 tons of CO2 each year. This project is a collaboration between PT. Harapan Anang Bakri & Sons, PT. Karawang Tatabina Industrial Estate, PT. Maligi Permata Industrial Estate from Indonesia with NTT Facilities, Inc. from Japan.

7.2.1.15. Introduction of High Efficiency Once-through Boiler System and RO Pure Water System in Golf Ball Factory

Figure 7. 14 Introduction of High Efficiency Once-through Boiler System And RO Pure Water System in Golf Ball Factory

Once-through boiler installations that replace conventional smoke tube boilers can increase production efficiency from 87% to 96%. This system also applies RO for feeding water for industrial water treatment used in water supply for this heating process. This project was implemented at PT. Sumi Rubber Indonesia, Karawang, West Java and cooperation with Sumitomo Rubber Industries, Ltd. Japan. Total Expected Emission Reduction 329 tons CO2 / year.

7.2.1.16. Introduction of High Efficiency Once-through Boiler System in Film Factory

Figure 7. 15 Introduction of High Efficiency Once-through Boiler System in Film Factory Project

Mitsubishi Plastic, Inc. with PT. MC PET Film Indonesia collaborated in implementing this project with the goal of saving energy by installing once-through boilers that replaced the previously used water tube boiler. This process can improve efficiency from 87% to 96%. Total Expected Emissions Reduction 428 tons CO2 / year. This project is implemented in PDPDE South Sumatra.

7.2.1.17. Solar PV Power Plant Project in Jakabaring Sport City

Figure 7. 16 Solar PV Power Plant Project in Jakabaring Sport City

The development of 1.6 MW Solar Power Plant is used to supply electricity in Jakabaring Sports Area, Palembang, South Sumatra. This project is cooperation between PDPDE South Sumatra (Indonesia) with SHARP CORPORATION (Japan). This project is also prepared to answer the challenge of electricity demand in the 2018 Asian Games grand event as well as making this event as Green Asian Games. The project is targeted for completion in January 2018. Total Expected Emission Reduction 1,303 tons CO2 / year.

7.2.1.18. Energy Saving by Installation of Double Bundle-type Heat Pump

Figure 7. 17. Energy Saving by Installation of Double Bundle-type Heat Pump

This project is implemented to reduce the consumption of boiler natural gas by using a double bundle type-heat pump as a water heater to replace the boiler. The system is capable of generating heat up to more than 600C. Total Expected Emissions Reduction 170 tons CO2 / year. This project is implemented in Axia Hotel, Cikarang, West Java and is a cooperation between PT. TTL Recidence, PT. Toyota Tsusho Indonesia from Indonesia with Toyota Tsusho Corporation from Japan.

7.2.1.19 Energy Saving for Industrial Wastewater Treatment for Rubber Industry

Figure 7. 18. Energy Saving for Industrial Wastewater Treatment for Rubber Industry

The project applies energy-efficient aerators for the processing of liquid waste in the rubber industry. This waste water treatment is implemented at a rubber plant in Palembang South Sumatra with a system prepared by Suzuki Corp. Installation of this project is expected to reduce electricity consumption by 30-50%. Total Expectation of Emission Reduction is 546 tons CO2 / year. This project is cooperation between Indonesia and Japan with the participation of PT. Aneka Bumi Pratama with Ematec, Suzuki Sangyo Co. Ltd., Mitsubishi UFJ Research and Consulting.

7.2.1.20 Energy Saving at Convenience Stores

Figure 7. 19 Energy Saving at Convenience Stores

PT. Midi Utama Indonesia Tbk and Lawson, Inc. Japan cooperate are developing the energy-efficient refrigeration, air-conditioning and lighting (LED lamp) system at 12 Alfa Midi stores in Jakarta, Bekasi, Tangerang and Depok. This project is able to significantly reduce electricity consumption compared to previous technologies and equipment, about 25%. Total Expected Emission Reduction 28.5 tons CO2 / year per store.

7.2.1.21. 10 MW Mini Hydro Power Plant Project in North Sumatera

Figure 7. 20 10 MW Mini Hydro Power Plant Project in North Sumatera

Toyo Energy Farm Co., Ltd. Japan and PT. Citra Multi Energi Indonesia cooperates to produce clean electric energy by building 10 MW Mini Hydro Power Plant in Humbang Hasundutan area, North Sumatera. The project is expected to complete the installation process in December 2018. Total Expected Emission Reduction 42,700 tons CO2 / year per store.

7.2.1.22. Introduction LED Lighting to Sales Stores

Figure 7. 21 Introduction LED Lighting to Sales Stores

PT. Fast Retailing Indonesia and Fast Retailing Co., Ltd. Japan are working with the goal of reducing carbon emissions and making energy savings by replacing conventional lamps with LED lights in 11 stores for clothing retailers PT. Fast Retailing in Indonesia. The project is expected to be completed in January 2019. Total Expectations of Emission Reduction 2,617 tons CO2/year.

7.2.1.23 Introduction of 10 MW Hydro Power Plan in North Sumatera

Figure 7. 22 *Introduction of 1 MW Solar Power System in North Sulawesi*

The objective of the project is to utilize the potential hydro power of Lae Ordi river in order to provide the electricity for North Sumatera. This 2x5 MW hydro power project can generate about 75 GWh of electricity production. By contributing the electricity supply, the project can support North Sumatera's development acceleration and economic growth. The location of the project is in Kecupak Village, Pergetteng Getteng Sengkut Sub-District, Pakpak Barat Regency, North Sumatera Province.

7.2.1.24 Introducing High Efficiency Refrigerator to a Food Industry Cold Storage in Indonesia

Figure 7. 23 *Introducing High Efficiency Refrigerator to a Food Industry Cold Storage in Indonesia*

This project has been published the results of its emissions reduction. This project is implemented in PT. Adib Global Food Supplies in Bekasi, West Java, in cooperation with PT. Mayekawa Indonesia with Mayekawa Manufacturing Co., Ltd. Japan. In this project, the factory installed a cooling system that uses natural refrigerant (NH3 and CO2) that can save energy significantly, between 20-30% of total energy consumption. Total Emission Reduction is 29 ton CO2/year.

7.2.1.25 Introducing High Efficiency Refrigerator to a Frozen Food Processing Plant in Indonesia

Figure 7. 24 Introducing High Efficiency Refrigerator to a Food Industry Cold Storage in Indonesia

This project has been published the results of its emissions reduction. This project is implemented in PT. Adib Global Food Supplies in Bekasi, West Java, in cooperation with PT. Mayekawa Indonesia with Mayekawa Manufacturing Co., Ltd. Japan. In this project, the factory installed a cooling system that uses natural refrigerant (NH3 and CO2) that can save energy significantly, between 20-30% of total energy consumption. Total Emission Reduction is 11 tons CO2/year.

7.2.1.26 Energy Saving by Introducing High Efficiency Autoclave to Infusion Manufacturing Factory

This project is going to be implemented in Pharmaceutical factory in Malang, East Java Province. The project is going to utilize a highly efficient autoclave machine for their sterilization procedure in the factory so that the energy consumption during this procedure could be significantly reduced. The project is expected to reduce carbon emission of 1667 tons CO_2/year. The project participants of this project are Otsuka Pharmaceutical Factory Inc (Japan) and PT. Otsuka Indonesia (Indonesia).

7.2.1.27 Introduction of CNG-Diesel Hybrid Equipment to Public Bus in Semarang

This project is part of the city-to-city cooperation project between Semarang and Toyama city. The project will introduce the CNG-Diesel Hybrid Equipment for the fossil-based public buses in Semarang so that the buses will reduce the diesel consumption hence reduce the GHG emission through the modification of gas engine. This project which is established based on the cooperation between Hokusan Co., Ltd (Japan) and BLU UPTD Trans Semarang as the project participants is expected to be able to reduce 819 tons CO_2/year.

7.2.1.28 Energy Saving for Air-Conditioning System of Shopping Mall by High Efficiency Centrifugal Chiller and Air-conditioning Control System

This project is part of the city-to-city cooperation between Batam and Yokohama City. The objective of the project is to introduce energy saving system as well as to install high-efficiency centrifugal chiller in the shopping area in Batam City, Mall Batam Centre. The project which is cooperation between iFORCOM (Japan) and Mall Batam Centre as project participants is expected to be able to reduce 1,501 tons CO_2/year.

7.2.1.29 Introduction of Absorption Chiller to Chemical Factory

PT Timurraya Tunggal (Indonesia) and Tokyo Century Corporation (Japan) as the JCM project participants, implement steam driven absorption chiller made in Japan by Kawasaki Thermal Engineering to replace turbo chiller in order to reduce energy consumption in the factory. The project is expected to be able to reduce carbon emission of 1,084 tons CO_2/year.

7.2.1.30 Introduction of 2.8 MW Solar Power System in Healthcare and Food Factories

Takasago Thermal Engineering and PT. Engie Infrastructure Indonesia as the project participants implement 2.8 MW Solar Power Generation for two different factory location in PT Indolakto and PT. P&G Indonesia factory plants. The project is expected to be able to reduce 2,168 tons CO_2/year.

7.2.2. Demonstration Projects

7.2.2.1 Energy Saving by Optimum Operation at Oil Refinery

Figure 7. 25. Energy Saving by Optimum Operation at Oil Refinery

PT. Pertamina (Refinery Unit V) and Yokogawa Electricity Corporation work together on this project with APC (Advanced Process Control) system that has been proven capable of controlling energy consumption so as to increase efficiency of oil production process and save energy significantly. This project is implemented in Pertamina Refinery Unit V in Balikpapan. Total Emission Reduction is 3,400 tons CO2 /year.

7.2.2.2. Utility Facility Operation Optimization Technology

Figure 7. 26 Utility Facility Operation Optimization Technology Project

PT. Pertamina Azbil Berca Indonesia and Azbil Corporation Japan are working together to apply the "RENKEI control" system which is an automatic control model to control the energy use of 5 boilers in the oil processing unit so as to save significant energy usage. This project is implemented in PT. Pertamina Azbil Berca Indonesia in Cilacap. Total Emission Reduction is 58,000 tons CO/year.

7.2.2.3 Installation of Tribrid System to mobile communication's Base Transceiver Stations in Republic of Indonesia

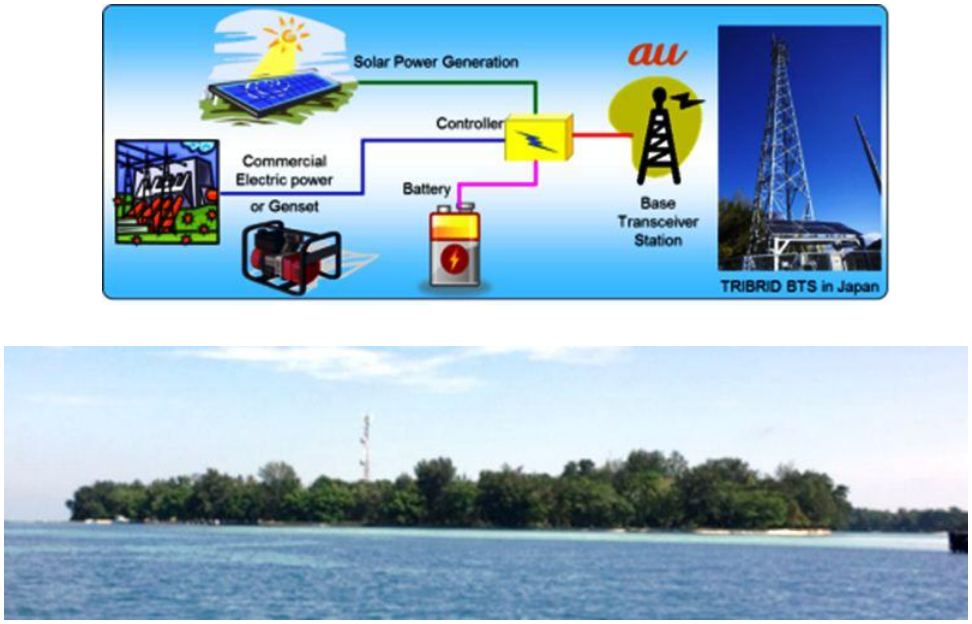

Figure 7. 27 Installation of Tribrid System to mobile communication's Base Transceiver Stations in Republic of Indonesia

PT. Packet System Indonesia and PT. Huawei Service (Indonesia) with KDDI Corporation Ernst & Young Sustainability Co. Ltd. (Japan) are working on this project and TRIBRID System regulates the use of diesel in BTS systems in off-grid / poor grid areas so that energy use can be more efficient and efficient. In addition, the system also utilizes solar power generation technology and stored powers in batteries as another power source. The test has been conducted in Pulau Puri, Jakarta. Total Emission Reduction is 163 tons CO2/year.

7.2.3. REDD+ Model Projects

7.2.4. 7.2.3.1. REDD+ Project in Boalemo District

Figure 7. 28 REDD+ Project in Boalemo District

The project is a joint venture between Gobel Group DKM and Kanematsu Corporation to prevent slash-and-burn deforestation by improving the existing cocoa production in Boalemo, Gorontalo. Total Emission Reduction is 86,520 tons CO2 /year.

CHAPTER 8
Assessment of JCM Project Implementation

8.1. JCM Technology Transfer

Technology plays a vital role in climate change mitigation since it remarkably reduces the difficulties and costs of addressing climate change mitigation. The Japanese Prime Minister Shinzo Abe stated at the COP21 that the key to acting against climate change without sacrificing economic growth is the development of innovative technologies. He further iterated that many of the advanced low-carbon technologies do not generally promise investment return to developing countries. Japan will, while lowering burdens of those countries, promote diffusion of advanced low carbon technologies particularly through implementation of the JCM.

The technologies deploy under JCM are Japanese advanced low-carbon technologies covering areas such energy efficiency, biogas, biomass, renewable energy (hydro, solar, wind, tidal, geothermal), transportation, co-generation, waste gas/heat utilization, LULUCF/REDD+, fuel switching, Methane recovery & utilization such as Coal Mine Methane (CMM)/Coal Bed Methane (CBM) or landfill gas recovery & utilization, etc.

The Institute for Global Environmental Strategies of Japan (IGES) has developed the JCM database, where it shows the distribution of JCM technologies in the various partner countries**.** In the case of Indonesia, the JCM projects implementation mainly under energy efficiency sector. The remaining projects covered renewable energy, LULUCF/REDD+, waste gas/heat utilization and co-generation (Figure 8).

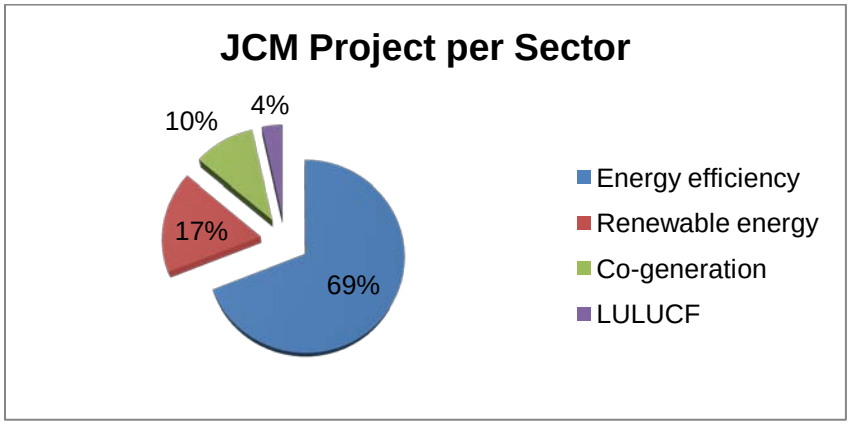

Figure 8. 1. JCM Projects by sector

Source: Indonesia JCM Secretariat, 2017

Most of the energy efficient technologies introduced by JCM relates to cooling system in industries and commercial buildings such as food industries, textile, convenience stores and shopping mall. It covers technologies such as high-efficient centrifugal chillers, high efficient refrigerators, and air-conditioners.

Others include LED lighting, high efficiency loom, high efficient boilers, heat pump, etc. For renewable energy projects, it covers hydro and solar energy power generation. The JCM solar power generation includes the mega solar power system in Jakabaring sport centre, South Sumatera, mall solar rooftop, and the roof top solar power generation in a food industry in West Java.

Installation of a Waste Heat Recovery system for power generation (WHRPG) in the cement industry will contribute the largest CO_2 emission reduction within JCM. The JCM WHRPG project in Tuban, East Java will be the second cement factory of PT Semen Indonesia to use the system. The first WHRPG was installed in the Semen Padang factory, West Sumatera through CDM scheme.

Regarding to the installation difficulties, some technologies such as boilers, heat pumps, chillers, refrigerators, inverter AC, and LED lights, need no long construction time to be installed. However, technology such as waste heat recovery for power generation in cement industry requires some years for construction time before it is in operation.

Related to the innovativeness of the technologies, Japan is well known for its energy innovation expertise, particularly in high-efficiency technologies. After the 1970s oil crises era, Japan established the New Energy and Industrial Technology Development Organization (NEDO) as a semi-governmental organization to research new energy technologies. NEDO researches photovoltaic solar, wind, and geothermal power, biomass and waste energy, thermal utilization, fuel cells, and energy conservation technologies. NEDO verifies technical results and conducts international demonstration projects to disseminate the research.

JCM leverages Japan's technological expertise to facilitate diffusion of low carbon technologies to developing countries. Thus, JCM projects use Japanese technological expertise to deploy various approaches to reducing greenhouse gas emissions.

JCM aims to facilitate the diffusion of leading low-carbon technologies, and through JCM projects some of these technologies are already installed in Indonesia. Diffusion of these technologies, undeniably, has helped developing countries achieve "Leapfrog" development towards low carbon society.

Regarding feasibility studies, the selected studies also include financing scheme for promoting energy efficiency equipment installation in Indonesia, Eco-Lease Scheme for Low Carbon Vehicle towards JCM Projects Expansion, Utility Operational Optimization (U-OPT), and District energy business.

8.2. Financial Contribution of JCM

Since its first implementation in 2010, JCM has proven to be one of important funding mechanism for low-carbon technology project. It has funded 115 feasibility studies from 9 out of its 15 sectorial scopes. The signing of "Bilateral Cooperation on the Joint Crediting Mechanism for the Low-carbon Growth between Republic of Indonesia and Japan" in 2013 further strengthened JCM's position to become the leading market-based initiative in Indonesia. However, unlike other market based initiative, JCM credit is currently non-tradable thus it only can be used to fulfil the national target.

8.2.1. JCM Financing Scheme

The JCM aims to facilitate the diffusion of leading low-carbon technologies, products, systems, services, and infrastructure resulting in the mitigation of greenhouse gas (GHG) emissions and contributing to the sustainable development of developing countries. It seeks to contribute to the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC) by facilitating global actions for emission reductions or removals, complementing the Clean Development Mechanism (CDM). The GHG emission reductions or removals achieved through JCM projects can be used by Japan and the host countries to achieve their respective GHG emission reduction targets.

In order to achieve these objectives, Japan as developed country has taking the role as an accelerator for the low-carbon technology diffusion by providing funding for developing countries to adopt low-carbon technologies. Since 2013, JCM has disbursed subsidy estimated more than US$ 36 million to the Indonesian private sectors to adopt low-carbon technologies in their facility. The subsidy from the Japanese Government has leveraged around US$ more than US$ 98 million, thus the total JCM project portfolio is up to US$ 135 million.

8.2.2. Feasibility Study Support

Before JCM has officially implemented, since 2010 it has been providing grant in feasibility studies in Indonesia. The objective of feasibility studies includes elaboration of investment plan on JCM project, development of MRV methodologies and investigation of feasibility on potential JCM projects.

To date there are 115 feasibility studies from 9 sectorial scope. The amount of grant disbursed for feasibility studies is estimated of more than US$ 10 million. The feasibility studies financing scheme is currently provided by the Ministry of Environment Japan and Ministry of Economy, Trade and Industry Japan through NEDO.

The feasibility study financing support is provided in the form of grant and grant providers have their own requirements. Since financial year 2016, the Ministry of Environment of Japan required that only project under City-to-City cooperation may apply for the grant. In addition, it is also provided funding for project which potentially generated emissions reduction beyond 100,000 tCO_2 or large-scale project.

JCM feasibility study has generated several flagship projects both for JCM and Indonesia, i.e. feasibility study on waste heat recovery in cement industry in 2013, followed by the project implementation in 2014 by PT Semen Indonesia Tbk, and JFE Engineering. This project is currently the biggest project in JCM in terms of emissions reduction, whereby it is estimated to reduce 122,000 tCO_2 annually and in terms of investment value of around US$ 50 million.

Several feasibility studies under JCM financing support has also generated flagship projects in Indonesia, for example feasibility study on development of monitoring reporting and verification (MRV) of Mass Rapid Transit (MRT) system in Jakarta. The feasibility study of MRT system was conducted under JCM financing support from 2011-2012. However, due to the complexity of the MRV methodology, the project was eventually implemented without JCM's support. In addition, JCM also contributed to the development of feasibility studies for deployment of advance low-carbon technology such as carbon capture and storage in Indonesia. Figure 18 shows the FS distribution throughout 2010-2016.

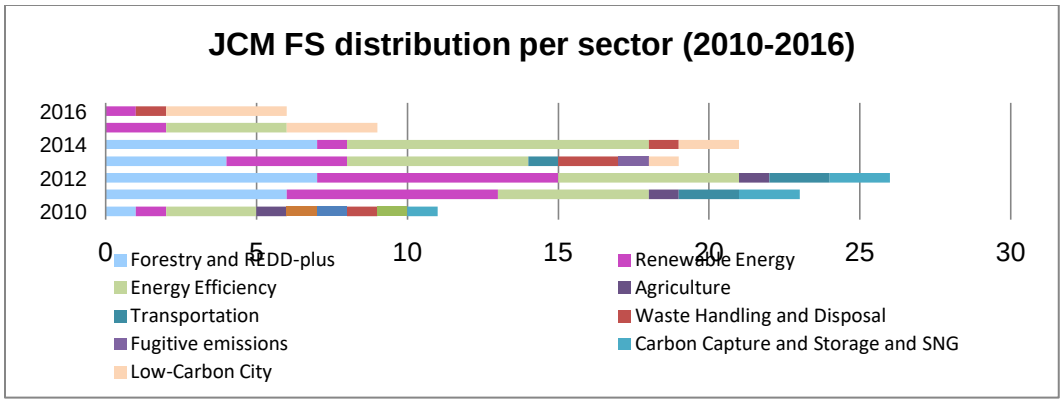

Figure 8. 2. JCM Feasibility Study distribution per sector (2010-2016)

Source: Indonesia JCM Secretariat 2017

8.2.3. JCM Model Project by Ministry of Environment Japan

One of the main financing support schemes by the Government of Japan is the JCM Model Project. Initiated by the Ministry of the Environment of Japan (MOEJ), it provides a subsidy to cover up to 50% of the project's initial investment costs. The scope of financing includes facilities and equipment, which reduce carbon dioxide (CO_2) from fossil fuel combustion as well as construction costs for installing such facilities.

The scheme requires an international consortium to be formed between project participants of Japan and the host country. The international consortium is required to apply for JCM project registration; conduct monitoring, reporting, and verification (MRV); and deliver at least half of the credits to the Japanese government, when JCM credits are issued. The Japanese entity within the international consortium is eligible to submit the application, receive the subsidy, and is responsible to MOEJ for implementing the project.

Applications for subsidy are received multiple times a year on an irregular basis. The feasibility of the application is evaluated as well as the amount of greenhouse gas (GHG) emission reductions, cost effectiveness, possibility of technology diffusion, and maturity of JCM methodology, among others. The process is competitive, for example, 28 out of 52 projects were chosen in the latest round of selection whose results were announced in June and July 2016 (ADB 2016b).

The Japanese government has been increasing the budget for the JCM Model Project since its inception in fiscal year (FY) 2013 from ¥1.2 billion ($12.7 million equivalent) to ¥3.6 billion ($34.8 million equivalent) in FY2014 and ¥7.2 billion ($59.9 million equivalent) in FY2015. The budget for FY2016 which begins in April 2016 is ¥6.7 billion ($59.5 million equivalent) while the budget for FY 2017 is ¥6 billion ($53.2 million equivalent). For FY2014, FY2015 and FY2016, the budgeted amount is to be disbursed in 3 years from the year of selection (for example, ¥1.2 billion is to be disbursed every year between FY2014 and FY2016 for projects selected in FY2014) (ADB 2016b). Up to January 2017, around 93 JCM Model Projects in Bangladesh, Cambodia, Costa Rica, Ethiopia, Indonesia, Kenya, the Lao PDR, Malaysia, the

Maldives, Mexico, Mongolia, Myanmar, Palau, Saudi Arabia, Thailand, and Viet Nam have been selected (GEC 2017).

In the case of Indonesia, JCM Model Project financing consisted the biggest portfolio of the project. Since 2013, there are 25 JCM projects under Model Project financing (excluding REDD+), with total value of more than US$ 130 million. The detail on the amount of subsidy and total investment is shown in Figure 19.

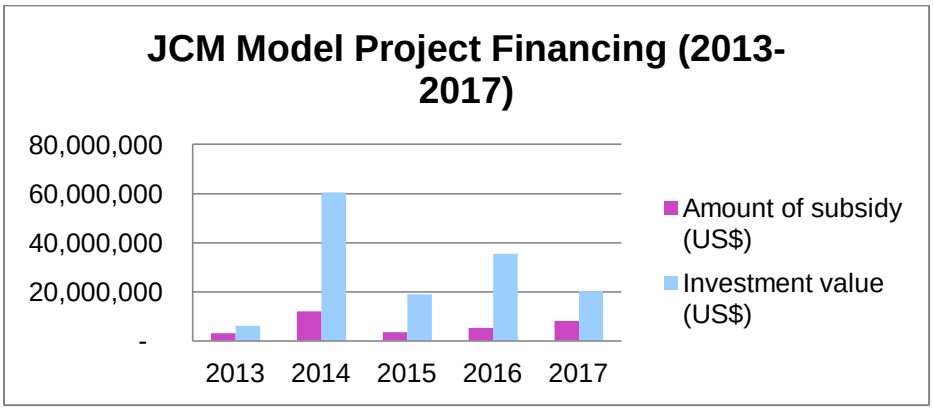

Figure 8. 3. JCM Model Project financing support in Indonesia (2013-2017)

In regard to the type of project implemented, JCM Model Project portfolio consists of energy efficiency, renewable energy, and co-generation projects. Energy efficiency projects currently hold the biggest share of the portfolio. Figure 20 shows the distribution of Model Project per sector.

i. Requirements in JCM Model Project

There are several requirements and guidelines in the selection and funding of the JCM Model Project.

A. Maximum percentage of financial support

Number of already selected project(s) using a similar technology in each partner country	Percentage of financial support
None (0)	Up to 50%
Up to 3 (1 – 3)	Up to 40%
More than 3 (>3)	Up to 30%

B. Cost effectiveness of emissions reduction is desirable at the amount of 4,000 JPY/tCO_2e.
C. Payback period is desirable for longer than 3 years (GEC 2017).

ii. Project type in JCM Model Project

In JCM project implementation, there are several types of implementation, which are conducted by the participants.

A. **Manufacturer sells facilities/equipment to local entities.**
   Majority of the project in Indonesia adopted this type of project, e.g. project of "Introducing High Efficiency Refrigerator to a Food Industry Cold Storage in Indonesia" between PT Adib Global Food Supplies and Mayekawa Manufacturing Co. Ltd.
B. **Trading/engineering companies sell facilities/equipment to the local entities**.
   Representative participant buys facilities from manufacturer and sells them to local entity, or intermediate between manufacturer and local entity e.g. "Introduction of High Efficient Old Corrugated Cartons Process at Paper Factory" between PT Fajar Surya Wisesa and Kanematsu Cooperation.
C. **Establish a Special Purpose Company (SPC)**.
   Representative participant and partner participant establish a new SPC （special-purpose company） and invest in it. SPC installs facilities and implements project.

8.2.4. JCM Demonstration Project by Ministry Economy Trade and Industry Japan

The New Energy and Industrial Technology Development Organization (NEDO), an affiliate agency of the Ministry of Economy, Trade and Industry of Japan, provides part of the initial investment costs to implement advanced low-carbon technologies and the cost for MRV. The scope of financial support includes basic design cost, manufacturing cost of equipment, cost of international transport, and cost for MRV, and the third party entity (TPE). Project participants will be required to return part of the equipment cost back to NEDO after a designated period of time. The host country participants are required to bear the cost for activities within the host country, such as domestic transport, civil works, installation, and operation of the facility or equipment (ADB 2016b).

Under this scheme, a memorandum of understanding (MoU) between NEDO and the host country ministry, and an implementation document between the project participants from Japan and the host country project participants are to be established to formally start the project. Launched in FY2013, 10 JCM Demonstration Projects in Indonesia, the Lao PDR, Mongolia, and Viet Nam have been selected and contracted. The FY2016 budget is approximately ¥2.4 billion ($21.3 million equivalent) (ADB 2016b).

In Indonesia, the implementation of JCM Demonstration Project is not as progressive as JCM Model Project. Since 2013, there are only three projects under this financing scheme. This is due to the fact that projects under this scheme are involving state owned company and there are several regulations which hindered the development of MoU particularly in asset transfer aspect.

8.2.5. Japan International Cooperation Agency Collaborative Financing Programme

In addition to the JCM Model Project, MOEJ provides funds to projects that receive investment or loans from the Japan International Cooperation Agency or other Japanese government financial institutions such as Japan Bank for International Cooperation. Similar to the JCM Model Project, it can cover up to 50% of the initial investment cost for the GHG emission reduction component of the project.

This scheme also requires an international consortium to be formed between project participants of Japan and the host country, and at least half of JCM credits are required to be delivered to the Japanese government. The selection process and criteria are similar to the JCM Model Project, however relatively larger projects with GHG emission reduction of more than 100,000 ton of carbon dioxide equivalent (tCO_2e) per year from fuel combustion are given priority. The scheme was launched in 2014 and the budget for project(s) selected in FY2015 is ¥7.2 billion ($59.9 million equivalent), which would be disbursed by FY2018 (ADB 2016b).

8.2.6. Asian Development Bank Japan Fund for Joint Crediting Mechanism (ADB-JFJCM)

The Japan Fund for the Joint Crediting Mechanism (JFJCM) is one of ADB's trust funds that provide financial incentives for the adoption of advanced low-carbon technology to projects that are financed by the ADB. The JFJCM provides support in the form of grant and technical assistance to projects in ADB's developing member countries (DMCs) which have signed bilateral agreements for the JCM with Japan. Both sovereign and non-sovereign projects are eligible for support under the JFJCM.

Established in June 2014 by ADB, the JFJCM aims to facilitate the diffusion of advanced low- carbon technologies, products, systems, services, and infrastructure as well as to encourage the implementation of mitigation actions. The Japanese government has been making annual contributions and its cumulative support amounts to ¥4.8 billion ($42.6 million equivalent) to date, with further contributions expected in subsequent years (Asian Development Bank 2016).

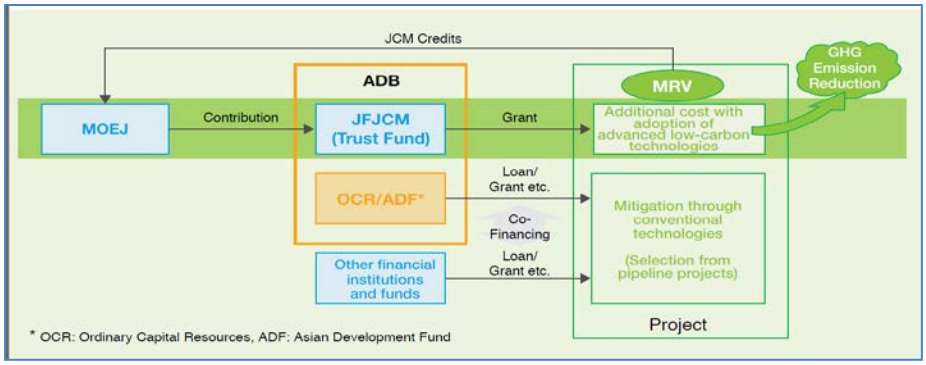

Figure 8. 4 The ADB JFJCM

General requirements for the JFJCM are:

- **Eligible countries**. ADB DMCs that have signed bilateral agreements with Japan are all eligible for support.
- **ADB financed project.** To receive support from the JFJCM, the projects also have to be financed by ADB or ADB administered funds. Projects that are co-financed by other banks or donors as well as ADB are also eligible, but only the ADB financed portion is eligible for a grant from the JFJCM
- **Advanced low-carbon technologies.** Since one of the important objectives of the JFJCM is to promote the use of advanced low-carbon technologies, the project must include the adoption of

technology that reduces GHG emissions. In particular, it is a requirement that the project supported by the JFJCM contributes to the reduction of CO_2 from fuel combustion.

- **Application of the JCM.** Recipients of the JFJCM grant will need to apply the project for the JCM,
- **Environmental and social impact.** The project should have additional environmental and social benefits such as reduction of pollution and waste, natural resources conservation, increased job opportunities, and better access to infrastructure.

There are several options for the JFJCM funds use, which are:

A. **Sovereign projects.** For projects where the government of one of ADB's DMCs is the borrower, JFJCM resources will mainly be used to finance the incremental cost of deploying advanced low-carbon technologies with a "business as usual" technology cost and the cost related to meeting the requirements for JCM application. For this type of project, ADB will provide a grant of up to $5 million for a project cost of less than $50 million; or 10% of the project cost or $10 million (whichever is smaller), for projects exceeding $50 million.
B. **Non-sovereign projects.** For projects in which the borrower is in the private sector or the project is not guaranteed by the DMC government, the JFJCM grant is used as an interest subsidy to soften the relevant ADB loan of the project. The grant can reach up to 10% of the project cost and $10 million (whichever is smaller).
C. **Technical assistance.** With a maximum eligible amount of $2 million per technical assistance project, the JFJCM can be used for technical assistance projects that intend to provide technical support to operate and manage the eligible JFJCM project e ciently and e ectively. Eligible expenditures for technical assistance projects include goods, equipment, consulting services, and other expenses for:
    - Capacity building and support for development of the JCM methodology, preparation and validation of the PDD, registration of the project with the relevant JCM Joint Committee, monitoring and verification of GHG emission reduction of JFJCM projects under the JCM;
    - Capacity building and analytical work to prepare the technical specifications and evaluation and qualification criteria regarding advanced low-carbon technologies in eligible DMCs;
    - Project preparation for JFJCM financing; and
    - Activities for the promotion of the JFJCM, knowledge sharing, and the publication of the results and outcomes of projects supported by the JFJCM.

JFJCM has funded several projects in Maldives and Vietnam, however, currently there is no project in Indonesia conducted under this financing scheme.

8.3. JCM Benefit

8.3.1. Survey on JCM's Benefit

Since 2010, JCM scheme has attracted many Indonesian private sector, state owned companies; local government owned companies as well as local governments. To date there are around 34 Indonesian companies have joined JCM scheme. In addition, there are 2 state-owned companies and 1 local government owned companies have listed as JCM project participant. JCM offers range of financing support for institutions to adopt low-carbon technologies. Its cumulative investment reaches more than US$150 million.

Survey was conducted to obtained information on how JCM implementation benefits the institutions. The survey was conducted on 16 participants. It aims to understand the contribution of JCM financing support in the adoption of low-carbon technologies and GHG emission reductions activity.

Based on the survey response, 93% of the respondents have previously conducted GHG emission reductions related activity such as energy efficiency and/or renewable energy project. In addition, 13% company mentioned that they have involved in the CDM implementation.

Related to emissions reduction activity (including JCM project), 75% of the respondents mentioned that their main financial sources coming from their own capital and JCM funding support, while 13% also included CDM and foreign grant on top of equity and JCM funding as part of their funding source. While combination of bank loan and JCM support has been reported by 6% of participants.

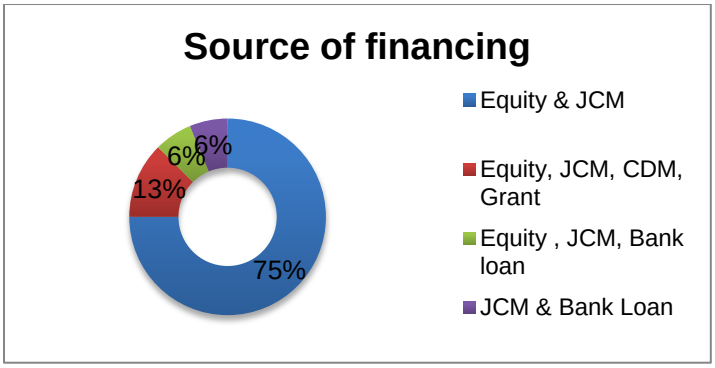

Figure 8. 5 Source of financing for low-carbon project

In regard to JCM financial benefit, there has been varied response given by the respondents. 6.3% of the respondents mentioned that JCM financial support brings little benefit for the project implementation. On the other hand 31.3% and 18.8% participants responded that JCM financial support is beneficial and really beneficial for their project. In addition, 43% of the respondent mentioned that their project will not be implemented without JCM financial support.

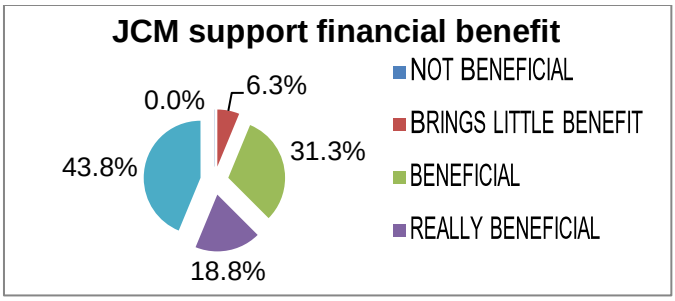

Figure 8. 6 Response on the JCM support financial benefit

When asked if there is any financial challenge in implementing JCM project, 25% of the respondents encountered quite difficult financial challenge when implementing JCM project. In a contrary, around 57% of respondent mentioned that they have no financial difficulties when implementing JCM project. In regard on the financial benefit gained through JCM support, all respondents responded that JCM subsidy and reduction of investments cost are the essential benefit of JCM financial support.

JCM benefit form of contribution also gained varied answer. Majority of participants stated that JCM implementation helped company to save costs due to increase efficiency. Other responses including reducing GHG emission and improve company's image, etc. Figure 24 shows the distribution of JCM benefit contribution in general.

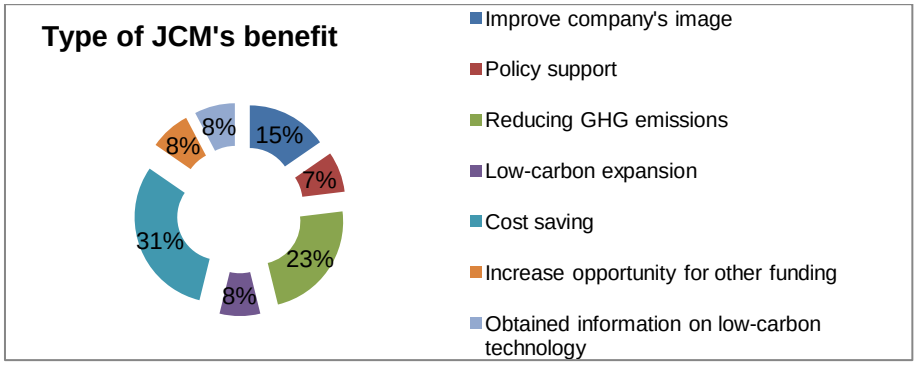

Figure 8. 7 Form of JCM benefit contribution

To analyse the added-value aspects of JCM, the survey also seeks the information if the project would still be implemented without financial support from JCM. 31% of respondents stated that they will still implement the project without JCM, however, they also stated that the project's progress will not be as progressive as with the JCM support. On the contrary, 31% of the project participants mentioned that the project would not be implemented without financial support from JCM.

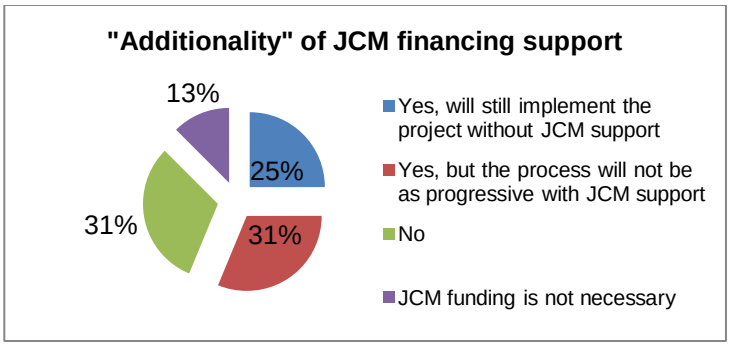

Figure 8. 8 Impact of JCM financing support

The survey provided some substantial information to mapping the benefit of JCM scheme. The subsequent sub-chapter will provide analysis on the benefit of JCM implementation.

8.3.2. Analysis and Discussion on JCM's Benefit

The implementation of JCM scheme has provided alternatives financing for private sector in low-carbon technology adoption. It was mentioned before that Indonesia is one of the countries which received the highest climate finance assistance, however the finance flow are considerably low and only focus in specific area.

The role of national banks which are very important in leveraging private sector involvement are far from optimum, due to lack of expertise in integrating sustainability into their core business as well as to evaluate the novel, green technology. This is a draw back as with the current commitment, Indonesia will require US$7.5 – US$9 billion annually to be invested in climate change related activities. Government budget solely will not be able to cover this amount, thus it requires involvement from private sector.

In regards to the mitigation focus, land use change and forestry still become the priority of climate finance flow. In the energy sector, the focus of the funding is still in the renewable energy sector particularly geothermal. Sectors such as energy efficiency and waste are only received a tiny fractions of the funding. This is alarming considering there is huge energy efficiency potential in Indonesia. Based on data from ADB, energy efficiency market potential in Indonesia is up to US$ 4 billion, yet mainstreaming energy efficiency in Indonesia has been a slow process (ADB 2015). The 2005 National Energy Conservation Master Plan identified an energy saving potential of 15%–30% in the industrial sector; 25% in commercial buildings; and 10%–30% in the household sector. An update to this master plan, drafted in 2011, established a new energy savings target of 17% by 2025. Further, the government is targeting a decrease in energy intensity by 1% per year until 2025 and an improvement in energy elasticity (ADB, 2016a). However, there are couple things to do in order to be able to tap these potential.

JCM, in the contrary has well positioned itself as one of the alternative funding for increasing efficiency and saving costs through adoption of low-carbon technologies. Its financial support enables companies and local governments to be more ambitious in attaining their environmental target and at the same time improving their performance and competitiveness. JCM has able to fill the empty spot in the

energy efficiency and renewable energy development for industrial and commercial sector, which when both sector are combined, it becomes the highest energy consumption sector in Indonesia (MEMR 2016). Based on the data and information gathered from the JCM implementation, there are several benefits gained from JCM implementation, which are as follow:

8.3.3. JCM Subsidy Increases the Financial Viability of the Project

Some project participants reported that by utilizing subsidy from JCM, it has substantially reduced their project's payback period thus enable the company to continue with the investments decision. In the case of "Installation of LED Street Lighting Smart System", PT Karawang International Industrial City (KIIC) reported that without JCM subsidy, the initial payback period to implement the project is 7 years which beyond the company threshold of 5 years. Thus the project proposal is not viable for execution. With JCM subsidy, the project is more financially sound with only 3.5 years of payback period.

JCM subsidy increases the viability of the project through reducing the amount of investment required to implement the project. This has been identified as the main benefit of the JCM scheme. Based on the survey, it is found that the majority of the JCM project participant utilizing their own capital in combination with support from JCM financing to implement the project. It is unclear why the project participants do not utilize bank loan, which normally happened when obtaining work capital.

This could possibly related to the fact that banks require substantial amount of collateral compare to the project value, which sometimes cannot be fulfilled by the project participant (APEC, 2017). In addition, bank loan can be difficult to obtain due to most bank considers investing in green projects are too risky due to its longer tenor (renewable energy case) and it lacks of competencies to assess risk for novel, green technologies (UNEP, 2015).

JCM provides support, which can reduce the cost of investments. Unlike other carbon market scheme such as CDM, VCS and Gold Standard, JCM support comes at the early stage of the project development. Carbon market scheme such as CDM, VCS, and Gold Standard provide revenue stream from the trade of carbon credit, which usually come once the project has been running. While JCM provides fix amount of subsidy at the initial stage of the project, the revenue from carbon credit in other crediting schemes are fluctuated based on its market value.

In the case of other alternative funding such as venture capital and private equity, in Indonesia, these investments often favor late stage projects where the risk is small and earning are fast. This creates problem as low-carbon project required support urgently at the initial phase of the project (Asmalina, 2017).

8.3.4. Cost Savings due to Efficiency Improvement

The implementation of JCM project has quickly generated positive results. During the implementation phase, PT Adib Global Food Supplies reported 25-30% of electricity savings from the utilization of high efficient natural refrigerant. In addition, PT Midi Utama, Tbk also reported that the installation of the natural refrigerant system, LED lighting and Inverter type AC has increase their profit by 15%, saving energy by 20% and has make the store's ambience more comfortable.

Cost savings is also estimated for PT Semen Indonesia, Tbk, which is currently in the commissioning stage of waste heat recovery power generation installation for its Tuban factory. The 28 MW waste heat recovery installation is expected to reduce 25% of its current electricity bill.

PT. Yamaha Motor Parts Manufacturing Indonesia reported reduction in energy intensity since the JCM project implementation. The replacement of conventional burner with regenerative burner has reduced the company's energy intensity of each product from 5.5 $kgCO_2$/pieces to 4.8 $kgCO_2$/pieces, consequently, the company saving delivered through the reduction of natural gas consumption.

All projects under JCM financing support has reported increase in efficiency and simultaneously operational costs savings due to deployment of advanced low-carbon technology in their installations.

8.3.5. Increase Competitiveness and Profitability

Besides increasing the viability of the project and contributing to costs saving, several JCM project participants also reported increased in their overall performance, which positively impact their competitiveness. PT Adib Global Food Supplies reported that there is increase in the demand for their service (refrigeration) due to the utilization of highly efficient refrigerator. In addition, it is also reported that there has been production output improvement due to the utilization of highly efficient refrigerator in their frozen food processing plant. Simultaneously, it has reported that there is 133% increase of workforce at PT Adib Global Food Supplies' facility in Karawang.

The survey also recorded that some companies such as PT Semen Indonesia, Tbk, PT Fajar Surya Wisesa, Tbk and PT Adib Global Food Supplies consider that good image as one of the benefit of the JCM energy efficiency project. This is in line with the findings from Hohnen (2007), which stated that corporate sustainability delivered several benefits to company such as, among others, improved reputation management and consequently can improve innovation, market positioning and competitiveness. Reputation, or brand equity, is founded on values such as trust, credibility, reliability, quality and consistency. Even for firms that do not have direct retail exposure through brands, their reputation for addressing CSR issues as a supply chain partner—both good and bad—can be crucial commercially (Hohnen, 2007).

8.3.6. Increase Opportunities for further Access to Capital

Implementing low-carbon project under JCM can be used as a way to increase access to capital. This is particularly relevant for public listed companies such as PT Semen Indonesia, Tbk and PT. Fajar Surya Wisesa, Tbk. Hohne (2007) also stated that financial institutions are increasingly incorporating social and environmental criteria into their assessment of projects. When making decisions about where to place their money, investors are looking for indicators of effective CSR management. A business plan incorporating a good CSR approach is often seen as a proxy for good management.

8.3.7. Leverage Investments in Low-Carbon Technology (National Level)

JCM scheme has proven to be able to increase the participation of private sector in low-carbon investments. It has positioned itself as one of the alternative funding to promote climate change mitigation action through provision of subsidy. Within 4 years of implementation, it has been able to

leverage more than US$150 million of low-carbon investments. In addition, there is potential of multiplier effect for the nation's economy due to the adoption of these low-carbon technologies. However, it requires a complete different study to determine the effect. In addition, the implementation of low-carbon project in industry and commercial sector can reduce government's burden in the effort of achieving the NDC target. Thus to maximize the result, it is important to establish incentive mechanisms in order to further increase the appetite of private sector on investing in green project.

8.4. Capacity Building in JCM

JCM aims to facilitate the diffusion of leading low-carbon technologies, products, systems, services, and infrastructure resulting in the mitigation of greenhouse gas (GHG) emissions and contributing to the sustainable development of developing countries. In the context of contributing to sustainable development, JCM aims to go beyond reducing GHG emissions through the capacity improvement of human resources.

To ensure that the capacity building activity is conducted in every JCM projects in Indonesia, project participant requires disclosing the information in the Project Idea Note (PIN) and in the Sustainable Development Implementation Plan and Report (SDIP and SDIR).

8.4.1. Capacity Building by JICA-CMEA Cooperation

Under JICA-CMEA cooperation project on JCM and low-carbon development, JICA has conducted substantial capacity building activities, particularly to promote low-carbon development by strengthening capacity to effectively perform and implement JCM in Indonesia. Its main activities including operationalize JCM Indonesia Secretariat enhance the capacity to monitor and evaluate the implementation of JCM, promote JCM for low-carbon growth to potential project proponents and the related stakeholders, and enhance the capacity to assess policy issues relevant to JCM for low-carbon growth. In order to achieve these objectives, JICA-CMEA cooperation project has conducted several activities such as national seminars and joint studies to assist government of Indonesia in transforming to low-carbon development.

8.4.2. Study for Policy and Financial Analysis of Biogas Power Plant in Palm Oil Mills

This study conducted under the "Technical Cooperation Project of Capacity Development Assistance for Low-Carbon Development in Republic of Indonesia" in cooperation with JICA and CMEA. It aims to provide analysis on the potential of reducing emissions in palm-oil sector mainly focusing on the development of Palm Oil Mill Effluent (biogas) to generate electricity and at the same time reducing methane emissions. The study also provides recommendation on the policies, technologies and the required capital to deploy the project.

8.4.3. CMEA-MOEF Joint Study on Proposal for Technical Guidelines in Developing Methodology for the Baseline Emission Calculation

The study conducted jointly between JICA, CMEA and MOEF to analyse the potential policy development, which ensures the effective and robust monitoring, reporting, verification and registration of its mitigation outcomes. The study also focused on providing recommendation for options to incorporate mitigation outcomes from market-based mechanisms in the national registration system.

8.4.4. Study on JCM Financing Barrier

The study was conducted to analyse the proper financial scheme to support the JCM implementation in Indonesia for the low-carbon growth development based on JCM Indonesia stakeholder perceptions and expectations. It provided recommendation on the most suitable financing solution based on its finding of the JCM's implementation barrier. This study would also be useful for the related ministries, e.g. Ministry of Finance and Ministry of Environment and Forestry as a policy maker as a based in developing future policy

8.4.5. Study on Linkage between JCM and Other Climate Change Mitigation Related Issues

The objective of this assessment is to provide draft policy recommendations on the strategy for possible linkages between the JCM and other climate change mitigation related initiatives in Indonesia such as INDCs, RAN-GRK, National MRV System, NAMAs, BURs, and REDD+ based on assessment of current situation framework. Capacity building by IGES supported by MoEJ

Since 2013, there have been several capacity building conducted by JCM scheme. This capacity building aims to develop capability/ expertise, which can create enabling environment for the JCM implementation.

8.4.6. Capacity Building for Validator and Verificator

The provisional designation of JCM Third Party Entity (TPE) capacity building for local entities, which were conducted in January 2015 and was given for the validation and verification agency candidates, is one of the examples. This training, which was conducted with support from IGES and funded by Ministry of Environment Japan, provided for non-accredited local entities that have made application for ISO 14065 to Komite Akreditasi Nasional (KAN). This is a very important step as by then, there is no single local entities holding ISO 14065 accreditation. After the program, eventually a local company, PT Mutu Agung Lestari becomes the first Indonesian company accredited with ISO 14065.

8.4.7. Capacity Building for Related Government, Business and Private Sector

IGES, with support from Ministry of Environment Japan, have conducted several capacity building activities in the form of workshop, to disseminate the information regarding the implementation of JCM globally and particularly in Indonesia as well as the development of international climate policy related to implementation of market mechanism. In 2016, a workshop on JCM: "Accelerating Private Sector Participation towards Low Carbon development in Indonesia" was conducted jointly with CMEA and Indonesia JCM Secretariat. While, previously in the same year, a workshop on "Green Investments Incentive for Low-Carbon Indonesia: Workshop on the Joint crediting Mechanism" was conducted in February 2016.

8.4.8. Capacity building by Global Environment Centre Foundation supported by MoEJ

Besides IGES, GEC has also supported the implementation of JCM in Indonesia. The support from GEC is in the form of dissemination activities particularly for the feasibility studies and project implementation. It provided support for establishing annual workshop for JCM's feasibility study and project implementation report.

8.4.9. Capacity building through City-to-City cooperation

City-to-City cooperation under JCM scheme offers platform for cities in Indonesia to adopt a sustainable city development by collaborating with Japanese cities. It can realize continuous diffusion of advanced low carbon technologies as well as transfer of knowledge and know-how to foreign cities from Japanese municipalities with provision of long-term support. Currently there are four City-to-City cooperation under JCM scheme in Indonesia, such as, Semarang and Toyama, Surabaya and Kitakyushu, Bandung and Kawasaki, and Batam and Yokohama.

City-to-City cooperation provides continuous support from Japanese cities with its environmental experience to support Indonesian cities to establish master plan for low-carbon development. On the other hand, the Indonesian cities will provide local knowledge and data to assess project potential. This cooperation increases the capacity of the local government particularly related to establishing a sustainable city. The capacity building is conducted in the form of seminars, overseas training for local government staff, etc.

8.4.10. Capacity building in JCM Project Implementation

JCM project implementation is expected not only reducing GHG emissions but also provide co-benefit for developing countries. In this regard, every JCM project implemented must disclose their activity related to building the human capacity of developing country's counterpart.

Based on the survey conducted by the Indonesia JCM Secretariat on assessing JCM's benefit, it is found that 46% of participants view that capacity building is one of the significant benefit of JCM. The capacity building varied between projects. A series of activities such as, classroom training, study tour to Japan, etc are incorporated in the JCM project implementation. Figure 26 show the percentage of the responses related to JCM's capacity buildings

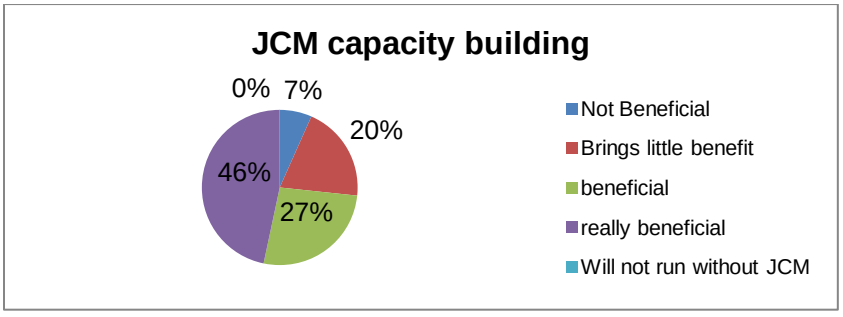

Figure 8. 9 Perception on JCM's capacity building

Capacity building activities conducted by JCM project participant are varied. The activities include in-class training, overseas training, seminar, workshop, etc. In general capacity building given in smaller scale, such as in-class training for the related staff which will directly involve in the operation and maintenance of the technology. However, some company conducted more intensive model of capacity building. For example PT. Yamaha Motor Manufacturing Indonesia together with Toyota Tsusho, which implement the project together with Hokuriku Techno Co. Ltd. and PT Matahari Wasiso Tama for replacement of conventional burner with regenerative burner. In this project, local furnace

manufacturer PT. Matahari Wasiso Tama replaces and modifies the furnaces supervised by the branch of Japanese furnace manufacturer Hokuriku Techno. PT. Matahari Wasiso Tama acquires sophisticated furnace design and manufacturing know how of regenerative burner furnaces and their tuning/maintenance techniques from its Japanese counterpart.

In regard to what aspect that the capacity of the project participants increase, 89% of the participants responded that there is improvement in the technology knowledge. While 11% of participants mentioned that their knowledge in green funding is increase due to JCM implementation. Figure 27 show the percentage of the response related to aspect of capacity building.

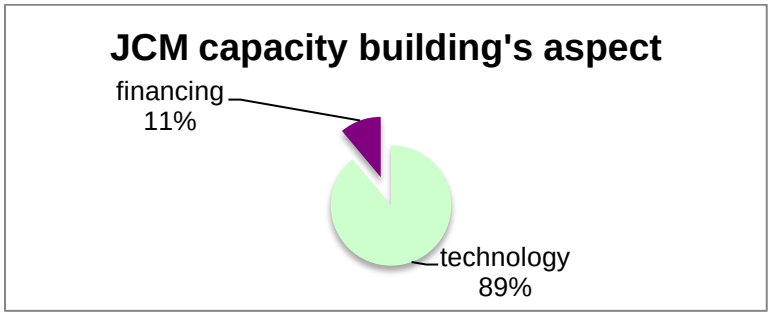

Figure 8. 10. Capacity building aspect in JCM

Based on this response, it is found that project participant considers that capacity building as one of the JCM's benefit particularly in:

1. New knowledge in low-carbon technology, including climate change information
2. Further understanding in green funding and financing low-carbon project

Japan has excellent low carbon technologies and products that can contribute to the reduction of greenhouse gas emission in overseas countries for the purpose of solving the climate change issue. For developing or less developed countries to utilize these technologies require some mechanism to reduce the cost. Implementing the mechanism will allow the transfers of these technologies from developed to developing countries.

Transferring Japan's low carbon technologies and products through JCM will enable capacity building program through training in Japan and expert dispatching to countries that have established JCM. The program aims to facilitate the smooth implementation of JCM, and provides capacity building for systems, such as measurement, reporting and verification (MRV) and for introduction of low carbon technologies and products

Indonesia JCM Secretariat regularly conducted capacity building activity to disseminate the information regarding market-based instruments in general and JCM in particular e.g. JCM's MRV. The capacity building activity targeted government organization, private sector, educational institution, and NGOs.

8.4.11. Contribution to Sustainable Development Criteria

Beyond financial and capacity building, JCM has also stressed the importance of co-benefit in its implementation. The co-benefit of JCM has also been recorded in the survey conducted by the JCM Secretariat. The co-benefit of JCM stated by several project participants including the increased workforce capacity due to the implementation of JCM project, and the increase of the health due to the utilization of more efficient technology.

PT Adib reported there is 30% increase in number of workforce due to the increase of productivity as a result of the utilization of the high efficient refrigerator in their frozen food plant compare to the previous chiller. In the case of PT Semen Indonesia, the installation of heat recovery power generation system is estimated to increase the number of workforce, as PT Semen Indonesia requires establishing a whole new division to manage and operate the waste heat power generation. Beyond workforce, PT Semen Indonesia also reported that the installation of waste heat power generation has able to reduce the dust from the clinkerization process, thus increase the health condition of the worker in the facility.

8.5. Specific JCM Project Assessment

Some of the projects selected to be assessed in detail. The projects have been assessed on the basis of its strength, weakness, opportunity and threat factors.

8.5.1. High Efficient Refrigerator

There are two projects relating to the introduction of high efficient refrigerator. These are the installation of Mayekawa's High Efficiency Refrigerator to PT Adib's Frozen Food Processing Plant and PT Adib's Food Industry Cold Storage.

The first project installs a cooling system (a high efficient refrigerator for individual quick freezer) at an existing frozen food processing plant to chill the food products to below -35 degree Celsius. The other project installs a cooling system (high-efficient refrigerator) in a newly established food industry cold storage for the purpose of chilling the food products below -25 degree Celsius.

The system for both projects is a secondary loop cooling system using natural refrigerant (NH_3 and CO_2). CO_2 is used as the secondary refrigerant in the system.

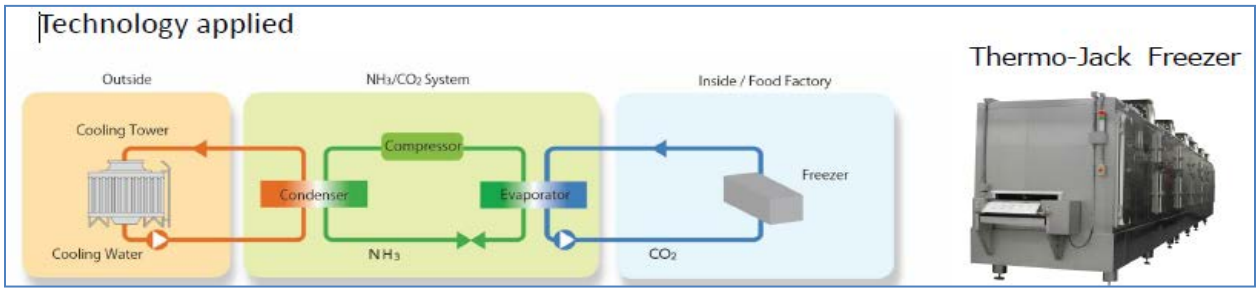

Figure 8. 11. Cooling System for the Cold Storage

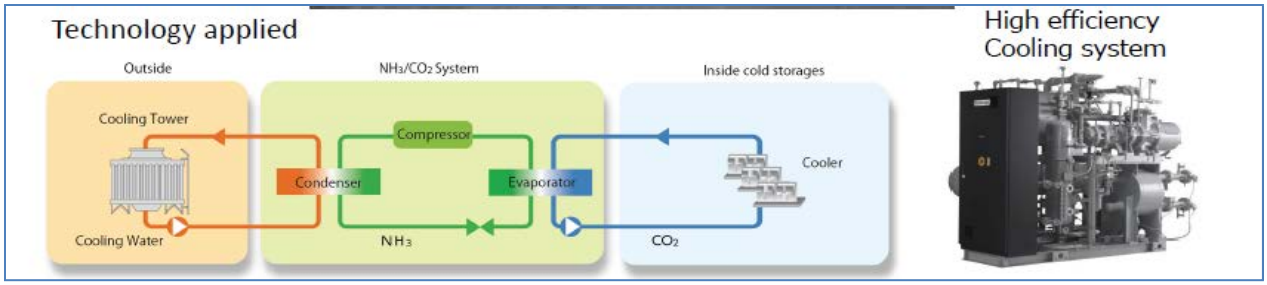

Figure 8. 12. Cooling System for the Cold Storage

The refrigerator applied in the project cooling system is a two-stage compressor refrigerator where the compressor is controlled by an inverter. The refrigerator install for individual quick freezer is the Mayekawa NewTon F-300 (HFS-45L-PR4I-01) with 70kW cooling capacity. For the cold storage, the refrigerator installed is the Mayekawa NewTon R-6000 (HCS-90L-PR4I-01) with 189kW cooling capacity (Table 8.1).

Table 8. 1 Refrigeration Technical Comparison

	Newton R-6000	Newton F-300
Cooling Temperature	-25℃	-35℃
Cooling Capacity	189 Kw	70 Kw
Power Consumption	86 Kw	43 Kw
COP (Coefficient of Performance)	2.2	1.6
Refrigerant	NH3 + CO2	NH3 + CO2
Remarks	Inverter Drive	

The Coefficient of Performance (COP) under full load condition of the Newton R-6000 is calculated by dividing cooling capacity (189 kW) of the refrigerator by its electricity consumption (86kW) based on the manufacturer's catalogue. COP of reference refrigerator is set as 1.71, which is the maximum value among the collected data for commercially available refrigerators in Indonesia to ensure a net emission reduction.

The COP under full load condition of the the NewTon F-300 is calculated by dividing cooling capacity (70 kW*) of the refrigerator by its electricity consumption (43kW*) based on the manufacturer's catalogue. The COP of reference refrigerator is set as 1.32, which is the maximum value among the collected data for commercially available refrigerators in Indonesia to ensure a net emission reduction.

8.5.1.1. Technological Aspects

The high efficiency cooling systems installed at PT Adib are innovative cooling technologies due to the utilization of halogen-free natural refrigerant for the freeze-drying process. These natural refrigerants are environmentally friendly (in terms of ozone depletion and global warming) and also reduce the operating costs in a wide range of areas, from cold storage or ice rinks to ground freezing for construction work.

Although other companies in the world also use natural refrigerant, but Mayekawa MFG (MYCOM) use all five natural refrigerants (CO_2, NH_3, hydrocarbons, water and air) and thus become one of the most advanced companies in manufacturing industrial refrigeration compressors. Its market shares in Japan amounting to 70% and 30% from the world's industrial refrigeration market. In addition, the Mayekawa's NewTon technology semi-hermetic screw compressor is equipped with an Interior Permanent Magnet (IPM) Synchronous Motor driven by an inverter. The IPM is a high-efficiency motor, proven to be 5-10% more efficient than an induction motor.

Ammonia (NH_3) is a well-known, highly efficient refrigerant with a theoretical efficiency slightly higher than that of R134a or propane. Due to the toxicity and flammability of ammonia, its installation has to reduce charge levels, especially when situated in populated areas. One way of accommodating the safety issues is to use ammonia as a refrigerant in combination with CO_2 for medium or high temperatures or in cascade applications for low temperature.

For the Mayekawa NewTon system, the chance of ammonia leak is minimized due to the low ammonia charge and the semi-hermetic screw compressor, compared with the direct ammonia cooling system of the same size. Also, by containing the ammonia equipment within the machine room, the facility manager is reassured that damage would be minimal in case of ammonia-related accident. Hence, this system does not give any harmful damage to the foods and environment even in case where the refrigerant is leaked from the syste**m.**

The Newton system is compact in design thus it greatly reduced the on-site installation work, avoiding potential problems. The NewTon package comes as a skid-mounted unit that requires no on-site assembly, an advantage in workmanship and quality over a conventional built-up system.

Plant construction for installing the cooling system took 6 months to complete and new stainless piping is necessary to be installed. Engineers involved in the installations are all local engineers (PT Adib and Mayekawa)

After installation, every NewTon package will be monitored from Mayekawa's head office in Japan through a cloud based monitoring system. Data will be collected from the equipment for analysis and maintenance. This predictive and preventive maintenance system monitors the NewTon's operating conditions, and thus can anticipate failures. Mayekawa is also monitoring the system's performance to see how it can fine-tune the package in the future.

In case of a failure, Mayekawa will not service the compressor on site, but change the entire NewTon unit. With a modular system of several units, this can be done with minimal downtime, as the load can be distributed. In addition, a non-hardware type of supports including maintenance services after installation of the facilities are to be provided by PT. Mayekawa Indonesia, therefore the cooling systems installed are expected to continuously operate under optimal conditions.

Consumer can monitor operations remotely from an office or observation room, via a computer or touch panel. Centralized control and scheduled operations are also supported.

For the food processing plant freezer model, its efficient operations support increased productivity. Decreasing the difference between the air temperature inside the freezer and the evaporating temperature of the coil reduces frost formation on the latter. This prevents deterioration in the functionality of the refrigeration system and thus maintains high operational efficiency. The expected operational lifetime of the refrigerators is 12 years.

Based on the interview with PT Adib, there are several drawbacks in the technology, such as (i) difficult to get spare part i.e. liquid pump; (ii) CO_2 spraying cooling tower pipe often leak; (iii) no certification for temperature sensor calibration; (iii) no alarm for temperature sensor; and (iv) expensive price of the technology.

8.5.1.1. Economic and Social Aspects

For the Frozen Food Processing Plant, the annual electricity consumption of the Mayekawa refrigerator is 135 MWh, while that of the reference refrigerator is 167 MWh resulting in 19% energy saving and reduce the CO_2 emission by 25 tCO_2e (The reference emissions are 136 tCO_2e and the project emissions are 110 tCO_2e). On the other hand, the annual electricity consumption of the Food Industry Cold Storage for Mayekawa refrigerator is 603 MWh, while that of the reference refrigerator is 776 MWh resulting in 22% energy saving (Saving of 570,000 kwh/year) and reduce the CO_2 emission by 140 tCO_2e (The reference emissions are 631 tCO_2e and the project emissions are 491 tCO_2e).

Ammonia is an inexpensive and abundantly available refrigerant. Ammonia installations, however, tend to be relatively expensive due to the requirement for steel tubing, semi hermetic compressors, and the installation of a number of safety devices, such as gas detectors.

Initial cost for installing the Mayekawa cooling technology is high. It is approximately three times more expensive than the conventional technologies, around USD 900,000 per machine excluding the cost of installation. In Indonesia, the cost seems to be too high for the fishery communities and SMEs to consider using it. Financial support scheme for the communities or SMEs by Indonesian side needs to be considered.

Mayekawa provide product warranty stating that if any defect in material or workmanship is found or if any malfunction is encountered with a MAYEKAWA refrigeration compressor during the 18-month warranty period, MAYEKAWA will repair or replace the defective parts free of charge based on their in-house warranty rule.

As a package system, piping and equipment for CO_2 is smaller, resulting in lower cost for material and construction. In addition, factory packaged systems reduce areas for regular maintenance, e.g. oil flushing. In addition, the longer product life gives a very long interval between overhauls. On top of these, the ammonia detector is only required in the machine room. All these benefits have resulted a dramatic decline in maintenance cost. A NewTon installation running for six years requires only an oil change. In comparison, with Freon installations, leaks and compressor failures are common and have to be taken care of by the end user.

Through JCM scheme, the Ministry of the Environment, Japan provided financial supports up to 50% of initial investment for the projects. The NewTon technology, compared to Freon systems, can create up to 40% of efficiency gain. If the market has been dominated by ammonia refrigeration for many years, the only way NewTon can penetrate the market is by calculating total cost of ownership based on a 20 years horizon. Under this case, the NewTon technology offers users a three-to-five-year payback period.

Energy savings with the Mayekawa refrigerators translates to approximately IDR 80 million in energy cost saved per month. The machines are 3 times more expensive than the old technology, costing approximately USD 900,000 per machine without the cost of installation. It will take around 5 years to make up the higher machine cost without the 50% subsidy and approximately 3 years with the subsidy.

PT Adib is the leader in the frozen food industry and is a role model for other similar companies. They have conducted study visits to gain knowledge about the technology. In addition, PT Adib has installed one additional equipment in their Bekasi facility, which makes the total equipment installed becomes two. The equipment bought outside JCM was obtained utilizing the company's equity and bank loan.

8.5.2. High Efficient Chiller

Chillers are refrigeration systems that produce chilled water for cooling air in commercial, residential and industrial processes or food preservation. Such chiller applications are usually operated under a variety of ownership structures including:

- Chillers operated by private entities, such as industrial facilities, hotels and banks;
- Chillers operated by public entities at the State level, such as ministerial buildings and airports;
- Chillers operated by public entities at the municipal level, such as municipal buildings and hospitals

Chiller systems use either reciprocating or rotary or, particularly for large capacities, centrifugal compressors. Centrifugal chillers manufactured before 1993-1995 typically use a CFC refrigerant, which is listed among the substances controlled under the Montreal Protocol on substances that deplete the ozone layer. Developed countries retrofitted almost all of the chillers of this age while in developing countries it would most likely only those that are installed in international chains.

Replacing CFC-based centrifugal chillers with new efficient chillers, whether centrifugal or of another type, can significantly reduce electricity consumption and peak electricity demand. As a result, it will reduce the greenhouse gas emissions as well as phase-out the CFC refrigerant. Thus, chiller replacement projects achieve a dual environmental impact by: (1) protecting the ozone layer; and (2) offsetting global warming and related climate change.

Introduction of high efficient chiller is one of several projects implemented under the JCM in Indonesia. In the case of industrial facilities, the replacement focused in textile industries. These industries generate significant revenues as it supplies not only a huge domestic demand for textile products but also one of the biggest export businesses in the country. In addition, textile industry is labour intensive which is also important for the economy.

Textile industry, however, is known for its high-energy use, in which energy is the main source of company's expenditure. To maintain its competitiveness, Indonesian textile companies need to implement good energy management system to reduce energy consumption and increase energy efficiency, which eventually leads to the reduction of energy cost. In order to help the industries replace the old machinery with modern, energy efficient and environmentally friendly machines and equipment, the Indonesian government through Ministry of Industry launched the machinery and equipment revitalization program for textile industry, textile and footwear product. The program provides incentives and financing mechanisms to replace old machinery in not only qualified textile plants but also leather-working and footwear industries.

Chillers replacement is included in the industrial revitalization program. Textile factories needs considerable electricity and chillers consume significant amount of energy compared with the other machines in the factory. Most of the textile factories are still using old chillers. Introduction of high efficient centrifugal chiller will allow energy saving in the factory especially for Air Condition (AC) and process cooling. JCM Subsidy will reduce the investment cost for the high-efficient chiller since these chillers are expensive.

Two textile industries participated in the JCM introduction of high-efficient centrifugal chiller, PT Primatexco Indonesia and PT Nikawa Textile Industry. Both textile companies are operating the project chillers as well as collecting the electricity consumption data for MRV.

In the case of PT Primatexco, JCM has funded two projects of chiller replacement at the Batang factory in Central Java. The Phase-1 energy saving for AC and process cooling project through introduction of high efficient centrifugal chiller" (Project ID001) replaced two existing chillers with one 500 USRt high efficient centrifugal chillers. The two existing chillers has a plate capacity of 230 USRt (centrifugal chiller) and 400 USRt (absorption chiller using steam from fossil fuels) but are being operated with the actual capacity of 200 USRt and 250 USRt respectively.

Figure 8. 13 Ebara high-efficient chiller

Phase-2 JCM project at Batang factory (Project ID005), installed the 500 USRt HE centrifugal chiller to replace three existing absorption chillers (400 USRt, 400 USRt, and 250 USRt).

At the PT NikawaTextile Industry, the Karawang factory has two units of absorption chillers and an old chiller, to be replaced. The JCM high efficient centrifugal chiller is installed to cover the capacity of the replaced chiller, which will result in energy saving for the AC and cooling process of the factory.

The existing 500 USRt chiller is replaced by a high-efficiency centrifugal chiller, which consists of a two-stage high efficiency compressor, economizer and sub-cooler system. By applying a purge unit with Activated Carbon, nearly 100% of HFC-245fa refrigerant with 0 ODP is recovered for excellence in GHG reduction.

The Japanese chiller manufacturer is Ebara Refrigeration Equipment & Systems Co. Ltd (ERS) and its subsidiary, PT. Ebara Indonesia (PTEI), will conduct the maintenance for the chillers. Ebara collaborates with Nippon Koei Co., Ltd as the focal point for these JCM projects.

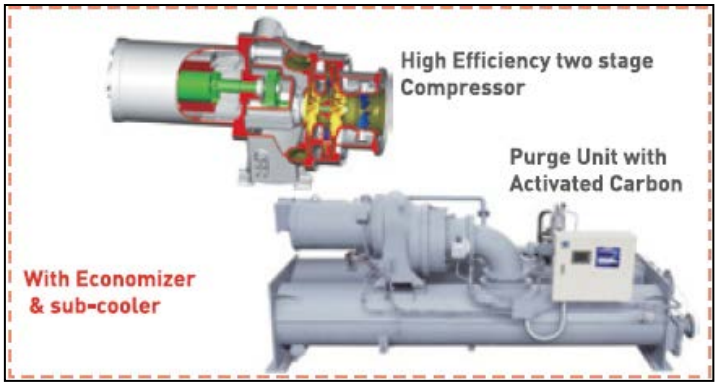

Figure 8. 14. High efficiency chiller.

In regard to the deployment of high efficient chiler in commercial building, JCM has implemented a project initiated under the JCM City-to-city Collaboration which is the Energy Saving for Air-Conditioning at Surabaya Shopping Mall, East Java with High Efficiency Centrifugal Chiller. The project is replacing existing 5 central cooling systems with high efficient centrifugal chiller as well as replacing existing 8 cooling towers with more efficient Japanese models. The existing chillers were replaced with one high-efficiency centrifugal chiller of 569 USRt and four high-efficiency centrifugal chiller of 966 USRt by the project.

8.5.2.1. Technological Aspects

The first registered JCM project is implemented by Nippon Koei Co. Ltd. and Ebara Refrigeration Equipment & Systems Co. Ltd. to install a high-efficiency centrifugal chiller. As the existing chillers make up the majority of the factory´s energy needs, this measure leads to energy savings from air-conditioning and process cooling[1].

The Project chiller was easy to operate. The method for operation is simpler than the previous systems. Required time for starting is much shorter (2 minutes.) than the previous one (15 minutes). Performance data of the chiller was completely collected through the microcomputer control panel.

The project chiller is running without any trouble until August 2015, and trouble shooting of the project chiller is easier than the other chillers in the factory. Change of oil was done after 1 year of operation. Technician from PT Ebara Indonesia conducted the periodical direct checking.

The project started in March 2014 and has a lifetime of 7 years, which is identical to CDM crediting periods. Over this period the activity is expected to reduce 799 tCO_2e only. This is far below even the micro-scale category in the CDM.

Ebara Refrigeration Equipment & Systems Co. (ERS), the manufacturer of the high efficient chiller has a subsidiary in Indonesia, PT. Ebara Indonesia (PTEI). PT. Ebara Indonesia is the

[1] The cooling requirements of the project are 1.75 MW (500 US refrigeration ton, USRt). Before the project, two existing chillers whose plate capacity is 0.8 MW (230 USRt) (centrifugal chiller) and 1.4 MW (400 USRt) (absorption chiller using steam from fossil fuels) are operated with the actual capacity of 0.7 MW (200 USRt) and 0.87 MW (250 USRt) respectively in the factory. These chillers were replaced with one high-efficiency centrifugal chiller of 1.75 MW (500 USRt) by the project.

first domestic manufacturer of water pumps in Indonesia. Established in 1980 in Jakarta in the form of joint venture between PT. Donomulio Industry (Indonesia) and Ebara Corporation (Japan). The PTEI has a service center for client satisfaction. The ERS provided the customer with the manual for operating the chiller including error codes and countermeasures. The project chiller has proven operates well. However, if any trouble occurs, the customer can check the manual and ERS and PTEI will resolve the problem.

Actually, the ERS equipped the chiller with a remote monitoring system to enable continuous monitoring of the chiller (24 hours) through internet. This remote monitoring system automatically detects the potential error every hour and reports any abnormal condition of chiller to ERS immediately so that local engineers can solve the issue.

ERS and PTEI agreed to conduct at least one direct periodical check per year by PTEI and remote periodical checks every month by ERS. This periodical check procedure both by direct and remote method is more frequent, effective and better than "more than four (4) times" of periodical checks stipulated in the approved JCM methodology (ID_AM002). Report of the periodical checks will be provided to the customers.

The project is verified by the third party Lloyd's Register Quality Assurance Limited. It applies the JCM methodology AM002 Ver1.0 "Energy Saving by Introduction of High Efficiency Centrifugal Chiller"[2] that was developed for this project by Nippon Koei. According to the methodology, the calculation of baseline emissions applies GHG emissions from reference chillers and calculates with power consumption of project chiller, ratio of COPs of reference/project chillers and grid emission factor. Project emissions are GHG emissions resulted from utilizing project chiller, calculated with power consumption of project chiller and grid emission factor. The monitoring plan covers the power consumption of the project chillers. Total amount of GHG reduction as a result of installing high efficient centrifugal chiller in the textile industries reached to 813 tCO_2 by end of 2016 (Table 11). It is expected that an additional 1,632 tCO_2 will be reduced until the end of the JCM project (2020).

Table 8. 2 Estimated amount of GHG reduction for textile sector project in JCM

Industry		**Amount of GHG Reduction (tCO2)**		
		Until 2016	Additional to 2020	Total
Primatexco	1st Project	254	417	671
	2nd Project	204	537	741
Nikawa Textile		355	678	1033
Total		813	1632	2445

SOURCE: *Ebara. 2017. JCM Project Experience in Indonesia*

[2] https://www.jcm.go.jp/id-jp/methodologies/7

8.5.2.2. Economic and Social Aspects

The high efficient chiller is proven to reduce 10% of electricity cost compare to conventional chillers. In the economic perspective, the project chiller becomes affordable since PT Nikawa Textile Industry received subsidy around 47% through JCM. The equipment cost is IDR 2 billion each, and PT Nikawa Textile has acquired 3 set of the equipment. PT Nikawa Textile Industry has paid import duty of around IDR 63 million to import the chiller. ERS conducted technical transfer by inviting few engineers from Indonesia to Japan to be trained on chiller technology in Japan. ERS also arranged training for both textile companies' local engineers in Indonesia.

PT Nikawa Textile Industry has agreed not to release refrigerant used for the Project and existing chillers to the atmosphere. A refrigerant is extracted or treated in the proper manner following the instruction of PT Ebara Indonesia when the Project chiller is maintained.

The refrigerant will be handled safely in accordance with the Indonesian Law on Environmental Protection and Management (Law no 32/2009) after the chillers is scrapped or disposed. PT Nikawa Textile Industry will outsource the destruction of the disposed refrigerant in a well-equipped plant such as at the Prasadha Pamanah Limbah Industri (PPLi).

High Efficiency chiller is expensive. But energy saving model can expect to save GHG emission. In Indonesia, air conditioning system is one of the biggest markets for chillers. Textile Industry is one of the biggest export businesses in Indonesia. On the other hand, many textile factories are still currently using old chillers technology.

In Indonesia, initial cost is one of the most important points for selecting the chiller. Energy saving and stable operation is also one of many considerations for long time operation.

8.5.3. Waste Heat Recovery Power Generation (WHRPG)

8.5.3.1. Technological Aspects

Waste heat is generated from a variety of industrial systems distributed throughout a manufacturing plant. The largest sources of waste heat for most industries are exhaust and flue gases and heated air from heating systems such as high-temperature gases from burners in process heating; lower temperature gases from heat treating furnaces, dryers, and heaters; and heat from heat exchangers, cooling liquids, and gases. Technologies are now available to recover the waste heat and use for combustion air preheating, boiler feed water preheating, load preheating, power generation, steam generation, space heating, water preheating, and transfer to liquid or gaseous process stream.

In the case of Waste heat to power (WHP) the heat discarded by an existing process is captured and used to generate electricity. Cement industry is an energy intensive industry with energy typically accounting for 30–40% of the production costs. As such, energy efficiency improvement in the cement industry is important.

The key process in cement production is the burning of the ground materials in a rotary kiln to produce the clinker. Most of the energy, over 85%, is consumed in the clinkerization process, in the kiln. Kiln exhausts heat from the clinker cooler and the kiln preheater system,

which typically being release into the atmosphere. The waste heat from the preheater exhausts and clinker coolers can be recovered and used to provide low temperature heating needs in the plant, or used to generate power to offset a portion of power purchased from the grid, or captive power generated by fuel consumption at the site. Usually cement plants do not have significant low-temperature heating requirements, so most waste heat recovery projects have been for power generation. Typically, waste heat recovery can provide up to 30 per cent of a cement plant's overall electricity needs and offers the following advantages:

- Reduces purchased power consumption (or reduces reliance on captive power plants), which in turn reduces operating costs
- Mitigates the impact of future electric price increases
- Enhances plant power reliability
- Improves plant competitive position in the market
- Lowers plant specific energy consumption, reducing greenhouse gas emissions (based on credit for reduced central station power generation or reduced fossil-fired captive power generation at the cement plant)

The technology for utilizing waste heat to generate electricity at a cement plant was first introduced in Indonesia as part of the collaboration project between the Ministry of Industry and the Government of Japan. The project was implemented under CDM scheme where PT Semen Indonesia jointly collaborates with New Energy and Industrial Technology Development Organization (NEDO), Japan, to install a WHRPG system at PT Semen Padang factory in West Sumatera**.** In this system, thermal energy generated through the cement pyroprocess is recovered to generate steam. A steam turbine generator then converts the high-temperature steam into electricity, which is then used in the cement production, thereby contributing to energy conservation and reducing CO_2 emission.

JFE Engineering Corporation of Japan completed the installation of the WHRPG system at Semen Padang in 2011 and the WHRPG system started operation in 2013 with a capacity of 8.5 MW. The total investment of the project was US$ 26 million, and around US$ 15 million was sourced from NEDO, Japan.

Through JCM, PT Semen Indonesia with JFE Engineering Corporation installed another WHRPG system at the Semen Gresik factory, Tuban, East Java. The WHRPG with a capacity of 30.4 MW utilizes the exhaust gas produced from the 4 kilns inside the Tuban I - IV factories to generate steam for the power generator. Figure 32 shows the typical system flow of the WHRPG system in a cement plant.

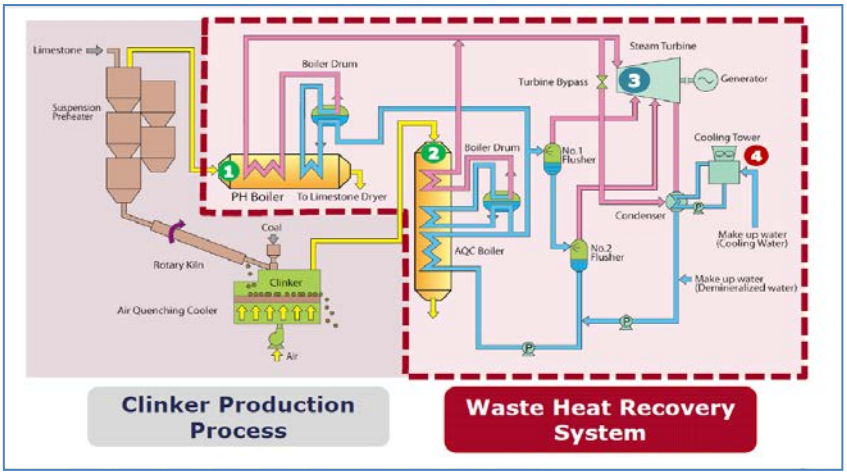

Figure 8. 15. System Flow for WHRPG in Cement Plant

8.5.3.2. Economic and Social Aspects

The WHRPG system at Tuban will reduce up to 25% of the electricity consumption saving up to 85% of its electricity bill. The total electricity requirement of Tuban cement plant with total installed capacity of 14 million tons of cement is around 100-140 MW per year. The total annual expected CO_2 emission reduction is 122,000 tCO_2. The WHRPG will fully operate on March 2018.

Increasing energy price requires industries to implement measures to reduce their energy consumption. Waste heat recovery in industries, such as in cement industry, is one of the most effective way to not only reduce energy consumption by increasing energy efficiency but also has the potential to save fuel cost (cost of operation). This means that the cost of production will be reduced and so their products will have a higher comparative advantage in the market place. Moreover, in most cases simple payback period on the investment for WHR implementation would be close to one year. Current practice of WHR is very limited, which provides wealth of opportunities for diffusion of WHR technology. The waste heat from the grate cooler or the exhaust gas can be sufficiently used to either supply low heating requirements or generate electricity. JFE Engineering operates in Indonesia and have installed a few systems in cement industries. It is estimated that there is an immediate demand for 112MW of WHR in cement industry in Indonesia.

In 2011, the PT Semen Indonesia jointly with New Energy and Industrial Technology Development Organization (NEDO) inaugurated the completion of installing WHR system in their factory in Padang, West Sumatera. The WHR system has been additionally installed to utilize the steam generated from the recovery of waste heat in the cement production process for electricity generation. The electricity generated was then subsequently used to operate the cement production processes, thereby decreasing electricity purchased from PT PLN, the national power utility, as well as reducing GHG emissions. This project aimed to promote the dissemination of the system throughout Indonesia. Comparison in the saving of electricity (power) consumption for the Padang cement factory (Indarung) is shown in Figure 33.

The success of the PT Semen Padang WHRPG project has made PT Semen Indonesia broaden the use of the system to another cement factory in Tuban, West Java. The capacity of the WHRPG will be 28,5MW with total investment of around US$ 60 million (approximately IDR 638 Billion). The JCM scheme provides around US$ 11 million and the emission reduction is estimated to be around 130,000 tCO_2/ annually. The WHR technology of JFE Engineering Corporation of Japan will be introduced in Tuban cement plant, and JFE Engineering Corporation will provide staff training on the operation and maintenance of the WHR system.

The engineering expertise will also be transferred to the host party through this project activity. This will result in the transfer of technology and know-how associated with the installation and operation of the WHR system.

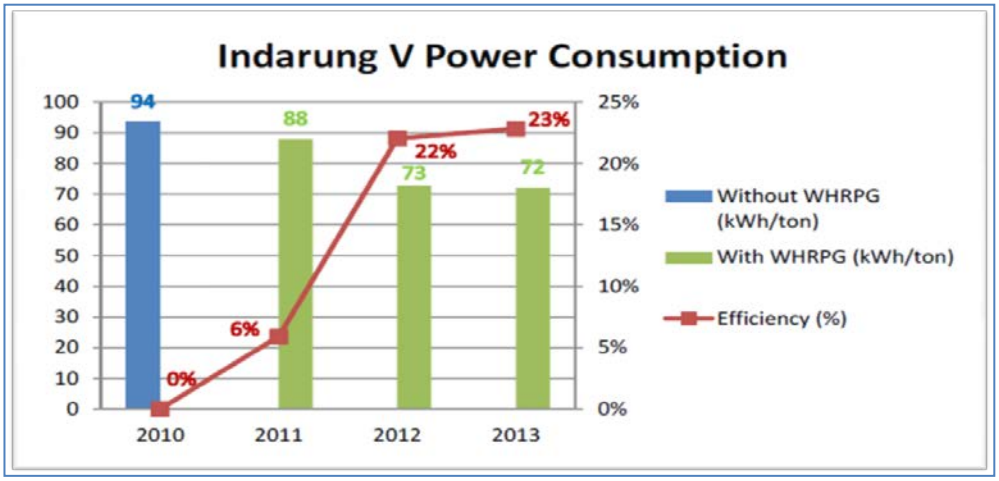

Figure 8. 16 Power Consumption Comparison

Source: Energy Efficiency Implementation in Large State - Owned Company [28].

Currently there are 12 cement companies in operation in Indonesia (see Table xx). Prior to the installation of the WHRPG in Padang factory, these companies do not have any experience on WHR project in their cement plants. Considering the benefit of installing WHRPG system, the remaining 10 cement companies would alone be a good market for the WHRPG system in Indonesia. Assuming each cement factory will install a 12 MW WHRPG system in their factories, there will be an immediate opportunity for 120 MW replacements from the electricity grid.

Table 8. 3 Cement Companies in Indonesia

No.	Company	Factory line	Units	No.	Company	Factory line	Units	Note
1.	PT Semen Padang*	Indarung	4	1.	PT Semen Padang/ Semen Gresik Group	Indarung	4	OK
2	PT Semen Andalas	Andalas	1	2	PT Semen Andalas	Lok Nga	1	OK
3	PT Semen Baturaja	Baturaja	1	3	PT Semen Baturaja	Baturaja	1	OK
						Palembang	1	OK
						Panjang	1	OK
4	PT Semen Bosowa Maros	Maros	1	4	PT Semen Bosowa Maros	Maros	1	OK
5	PT Holcim Indonesia	Narogong	2	5	PT Holcim Indonesia/	Narogong	6	OK
6	PT Holcim Indonesia	Cilacap	1			Cilacap	7	OK
7	PT Semen Gresik	Tuban	3	6	PT Semen Gresik / Semen Gresik Group	Tuban	3	OK
8	PT Semen Tonasa	Pangkep	3	7	PT Semen Tonasa/ Semen Gresik Group	Pangkep	3	OK
9	PT Semen Kupang	Kupang	1	8	PT Semen Kupang	Kupang	1	OK
10	PT Indocement	Palimanan	2	9	PT Indocement Tunggal Prakarsa	Palimanan	2	OK
11	PT Indocement	Citeureup	1			Citeureup	1	OK
12	PT Indocement	Tarjun	3			Tarjun	3	OK
	Total	12	24		9	14	**24**	--
(2) The project is the "First -of-its-kind" in Indonesia and it can be demonstrated by the evidences of the Newspapers and the interview with the Chairman of the Indonesia Cement Association.								

Source: Waste Heat Recovery Power Plant in PT. Semen Padang, Indonesia.

In addition to cement industries, JCM is considering a proposal on the implementation of Waste Heat Recovery for Electricity Generation in Flat Glass Production Plant [30]. The project proposed to install the waste heat recovery and electricity generation system with generation capacity of 1300 kW at PT. Asahimas Flat Glass Tbk. in Sidoarjo, East Jawa. In addition to JCM, GIZ funded the installation of a German WHR system at a textile plant of PT Coats Rejo Indonesia in Bogor, West Jawa. Considering the saving of energy cost and CO_2 emission, the potential market for this technology will be significant. Financial strength and purchasing power of these industries will be a major factor for deployment of these WHR systems.

8.5.4. Once Through Boiler

8.5.4.1. Technological Aspects

Boilers have the function to change water to steam needed for production process, Boilers are considered as the heart of an industry and as such large size companies will procure high performance boilers. Most of the big boilers installed in the countries are American, European and Japanese brand (Cochran).

These large size boilers are usually for utilities. The medium and smaller size boilers are usually used by industries for the purpose of factory process as well as private power generation. In the case of smaller size boiler, most SME's installed lower cost boiler from China. These industries prefer quick return on investment rather than long-term investment payback period. SME's industries mostly consider initial cost for purchasing a technology not the life time cycle cost.

Once-through boilers are a special type of water tube boiler where water input at the bottom directly pas through an evaporative heating surface to produce steam. In power

generation, once-through boilers are generally associated with high-pressure operation and the feed water enters at high sub-critical (>180 bar) or supercritical pressure whilst superheated steam leaves at a pressure some 20-30 bars lower. Sliding pressure operation is adopted to accommodate requirements of part-load running. The typical Babcock two-pass once-through utility boiler and Babcock once-through tower boiler are those commonly install at coal power plant.

In the case of smaller size once through boiler, the Japanese Miura brand has already considerable market share in Indonesia. Miura boilers are small in size and modular. The compact size will provide space saving for the factory and thus reduce construction cost for boiler facilities. The multiple-installation (MI) system improved the operating efficiency of the boiler because not all of the boilers need to be operated simultaneously. Only those amounts needed. The Miura's unique low-NOx technology also creates environment-friendly systems. An example of Miura technology installation is in a brewer company in China (1.7t/h X 22 unit) showed an operating efficiency of 93% and savings in fuel cost around 11% and CO_2 emission reduction of 14%.

Beside Miura, the IHI (Ishikawajima-Harima Heavy Industries Co., Ltd) also produced the compact once through boilers (K series) with market existing in Indonesia. Other Japanese producers of once through boilers have also market in the country. The Chinese once through boilers would be competitors for the Japanese brand. However, the factor of presence and strength of competition will be outweighed if customers have financial strength and purchasing power. In addition, the cultural suitability of product use will become an important factor for Japanese market expanding in the future.

In Indonesia, JCM has introduced once-through boiler system in a film factory of PT MC Pet Film Indonesia and in a Golf Ball Factory of PT Sumi Rubber Indonesia. The once-through boiler (gas type) replaced the water tube boiler (oil type) of PT MC Pet Film while at PT Summi Rubber Indonesia it replaced the conventional gas fired tube boiler.

The once-through boiler introduced through JCM is equipped with PI (Proportional Integral) controller. This controller better manages the combustion and feed water supply, which contribute to increased boiler efficiency and stable steam supply. For instance, it can achieve maximum boiler efficiency of 98% (95-97% under practical condition), whereas the efficiency of conventional fire tube boiler and water tube boiler is around 88%. In addition, the boiler includes built-in inverters that can reduce electricity consumptions. Overall, the once through boiler enables energy savings for the factory.

Figure 8. 17 Once through boiler.

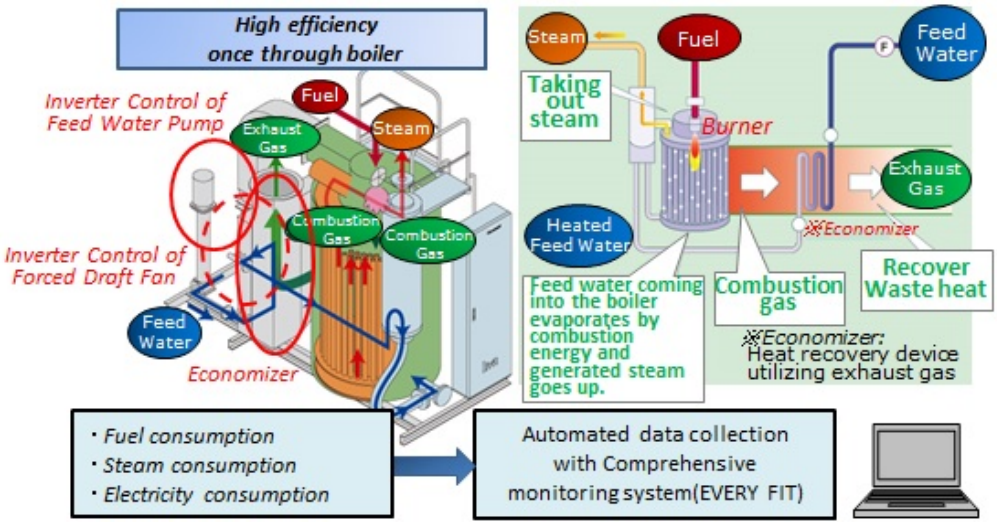

Figure 8. 18 Detail system of once through boiler.

PT Sumi Rubber took around 4 months after project approval, to complete the installation and start-up the HE boiler. The Japanese companies have been able to deliver the boiler in a short time and both Indonesian and Japanese companies need only a short time to start up the new boiler.

Installation of the project boiler includes changing of the piping system since it was not the same type as the previous boiler. The installation area is not as small as for the old type boiler. Both companies took only 3 days in tuning the boiler control to fulfill the factory demand.

PT Mitsubishi Pet Film took longer to install the new boiler after project approval due to Building Permit for New Boiler issue. Getting this building permission required longer period than expected which eventually delayed the overall schedule to some extent. However, once the permit has been issued, it took only around 3 weeks to install the boiler.

8.5.4.2. Economic and Social Aspects

The once-through boiler has several advantages compare to the conventional boiler. The once-through boiler efficiency is up to 95% while the conventional boiler has efficiency of around 85%. This efficiency leads to cost reduction of around US$ 13,532 annually. In

addition, the technology is utilizing low electricity consumption and has been able to reduce of around 30% of electricity cost or around US$ 3,935 annually. In regard to the operation and maintenance, the technology is considerably easy to operate and monitor. Beyond cost savings, the utilization of the technology has allowed technology transfer to the employee of the project participant and increased their capacity in the monitoring process and the energy efficiency.

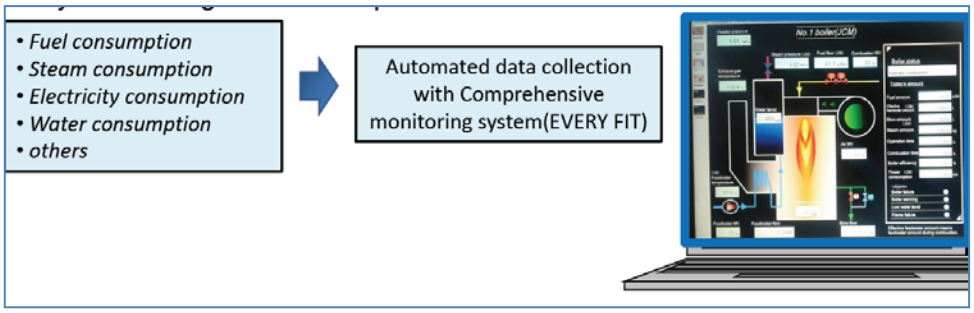

Figure 8. 19. Once through boiler combustion control.

8.5.4.3. Future Opportunities

From the market survey, every year, at least 200 industrial boilers estimated were sold and more than half of them use coal as the fuel.

- There are plenty of technology replication opportunities in Indonesia every year.
- The once-through boilers (especially gas type) emit much less GHGs per steam supply compared to coal boilers.
- PI control of the once-through boiler can maintain stable combustion, which contributes to the prevention of air pollution.

Figure 8. 20. Higher efficiency of once through boiler.

CHAPTER 9
Conclusion and Recommendations

9.1. Conclusion

Indonesia has committed to reduce around 834 $MtCO_2e$ unilaterally and 1,081 $MtCO_2e$ with international support by 2030. This commitment requires substantial amount of resources such as financial, technology, and human capacity. In regard to financing climate change mitigation action, Indonesia is one of countries with the highest international climate finance flow in the world. However, with the high amount of climate finance, Indonesia is currently still facing some issues of financial insufficiency. A research found that Indonesia would require around US$ 7.5 billion to US$ 9 billion annually to finance climate change mitigation effort. This amount is far from the government capacity thus the involvement of private sector is crucial. Banks, which have a very crucial role in the economy, are unable to support the country to achieve its climate target. The lack of comprehension of financial industry to the novel technology and green financing has been identified as one of the hindrance of financing climate mitigation in Indonesia.

Since its implementation in 2013, JCM has transformed to be one of important key player in the low-carbon funding in Indonesia. With the total value of project around US$ 150 million, JCM has become the leader of the bilateral carbon market initiative both in Indonesia and the world. In Indonesia, the implementation of JCM has been able to capture the participation of private sector in the low-carbon development and subsequently participate in the effort to achieving the national target.

JCM implementation is also supports several government effort in reducing GHG emissions. The Ministry of Industry Regulation number 12/M-IND/PER/I/2012 on "Roadmap for CO_2 Emission Reduction in Cement Industry" stipulated that cement industry is obliged to reduce 3% of its aggregate CO_2 emissions within the period of 2016-2020 by utilizing 2009 BAU. The regulation also specifically mentioned that in order to achieve this target several measures could be taken such as, installation of advance technology in the cement facilities. The regulation also stated that one of the policy strategies related to this regulation including provision of fiscal incentive for the cement company, which installed heat recovery in their facility. However, to date, it is still unclear if the government has dedicated a specific fiscal incentive related to the installation of heat recovery in the cement industry or it will be treated as general industry sector importing advance machinery for industrial development for the purpose of investments referring to the Ministry of Finance Regulation 188/PMK.010/2015.

The Ministry of Industry Regulation number 12/M-IND/PER/I/2012 on "Roadmap for CO_2 Emission Reduction in Cement Industry" also stated that one of its policy strategies is to accelerate the capacity of the industry to implement MRV. The core of JCM is the implementation of robust MRV system. By implementing JCM project, several project participants admit that they have improved their knowledge in the MRV and its importance in the emission reduction project.

To increase the performance of textile industry, Ministry of Industry has also provided incentive for the adoption of advance technology particularly for textile industry, textile and footwear product. Minister of Industry Regulation 123/M-IND/PER/11/2010 stipulated that the textile and footwear industry is one of the priority export products for Indonesia, and thus it is important to implement restructuration and revitalization of its machinery and equipment to ensure its international competitiveness and product reliability. In this regulation, Ministry of Industry stated that it provides 10% rebate for company which replace their machinery/ equipment with more advance technology. While for machinery/ equipment with high local content, Ministry of Industry would increase the rebate to 15% of the machinery/ equipment cost.

Textile industry currently consists one of the biggest portion of JCM portfolio. To date there are 4 projects in the textile industry related to the replacement of chiller and installation of air jet loom. The investment for installing the equipment is costly and without JCM subsidy, the participants mentioned that they would not be able to continue to pursuit the project.

JCM implementation also supports the National Energy Policy on energy mix. The Government Regulation 79 year 2014 on National Energy Policy stipulated that it aims, inter alia, to achieve the proportion of renewable energy in the energy mix of 23% by 2025. JCM has provided funding for the private sector as well as local government to contribute to this objective. Currently there are 5 JCM renewable energy project mainly in solar power generation are in pipeline, with total emissions reduction of more than 45,000 tCO_2 annually.

JCM current portfolio is dominated by the energy efficiency project. This is unsurprising as currently the energy efficiency sector received minimum attention from the government. Even with the market potential of up to US$ 3 trillion, energy efficiency market is yet untapped. The focus of foreign aid and national budget in the energy sector is still on the development of renewable energy mainly geothermal. Energy efficiency funding which were established by several institution has been underperform due to the lack of ability of the financial institution in appraising low-carbon projects. JCM has taken the role of low-carbon funding provision and mobilizing private sector contribution to transform to low-carbon society.

In detail, there are several findings obtained from the study conducted, which are as follow:

9.1.1. Financial Benefits

JCM subsidy increases the financial viability of the project

The subsidy from JCM has able to reduce the project's payback period thus enables the company to continue with the investment decision. In addition, JCM subsidy also increases the viability of the project through reducing the amount of investment required to implement the project. This is particularly important as majority of the project participants utilize their own equity in combination with JCM subsidy, instead of utilizing bank loan. In regard to other carbon market mechanism, JCM offers fix amount of subsidy at the initial stage of the project, while other carbon market scheme offers revenue stream, which usually fluctuated based on its market value once the project is running. Several schemes also offer fix advance payment for the carbon credit, which normally will result a lower price of carbon credit compare to the normal procedure.

Cost saving due to efficiency improvement

Once the project is running, the impact of installing of low-carbon technology can be directly felt. As has been reported by the project participants that the implementation of JCM project has enable their facility to reduce costs such as electricity and fuel cost. This is mainly due to the efficiency improvement from the advanced low-carbon technology.

Increase competitiveness and profitability

JCM improve the efficiency of the project thus saves operational cost. This is eventually positively impact the company competitiveness and improves their profit due to the utilization of more efficient technology. In addition, several project participants have also reported that there is increased in the workforce as the new technology allows the company to increase their production.

Increase access to capital

Implementing low-carbon project under JCM can be used as a way to increase access to capital. This is particularly relevant for public listed companies such as PT Semen Indonesia, Tbk and PT. Fajar Surya Wisesa. This is due to the fact that investors views that a business plans incorporating a good CSR approach is often seen as a proxy of good management.

Leverage investments in low-carbon technology (national level)

JCM has positioned itself as one of the alternative funding to promote climate change mitigation for private sector and non-state actor. Within 4 years of implementation, it has been able to leverage more than US$150 million of low-carbon investments. This is an important achievement as JCM as it has mentioned before that in order to achieve climate change target, Indonesia is require to allocate around up to US$ 9 billion funding, which can only be achieved with the private sector participation. Thus the JCM business model has successfully contribute to this effort, particularly in the energy efficiency and renewable energy sector.

The implementation of JCM in Indonesia is currently the most progressive among other JCM partner countries. JCM has managed to well position itself to be one of the alternative funding for low-carbon investments. However, there are several barriers that hindered the implementation of JCM.

9.1.2. Technology Benefits

Accelerate the diffusion of advance low carbon technology

JCM has acted as a catalyst in the low-carbon technology diffusion in Indonesia. The technology implemented in JCM is superior compared to those sold on the market. Without JCM subsidy, it is unlikely that these technologies would be implemented in Indonesia at this current time.

Advance low carbon technology demonstration

Besides diffusing low-carbon technology in Indonesia, JCM project also acted as a showcase for that certain type of technology. It is very common that company is hesitant to spend money on untested technology. Thus, by knowing that the technology has been utilized and runs well, it will provide assurance to other company to adopt the technology.

9.1.3. Social Benefits

Increase the capacity of the Indonesian counterpart

The implementation of JCM has been admitted to increase the knowledge of the Indonesian counterpart particularly in the climate change mitigation effort as well as the update on the new technology and the MRV concept and requirement.

Improve the health condition in the facility area

The adoption of the advanced low-carbon technology, for some company has brought co-benefit in the form of reduction of substance, which can lower the health condition of the worker. For example, the installation of waste heat recovery power generation in PT Semen Indonesia is expected to reduce the dust resulted from the process and thus will reduce the health risk of the worker.

Increase workforce

Several companies, which has implemented JCM scheme reported that the installation of the new technology has increase their production capacity thus increase the demand of workforce.

Besides all the benefits, the implementation of JCM scheme also facing several barriers. Based on the survey conducted by the Indonesia JCM Secretariat, the prominent barrier in the implementation of JCM including as follow:

9.1.4. JCM Implementation Challenges

Financial

Several projects, even with the subsidy from JCM, still encountered financial problem. Based on the survey response, 37.5% of the respondents faced financial problem during the implementation of JCM project. When further observed, it was found that part of the financial problem is related with the regulatory issues. For example in renewable energy project, the uncertainty of feed-in-tariff rate creates problem in conducting financial feasibility of the project. This is particularly in Indonesia where feed-in-tariff rate has become the biggest issue for IPP. In addition, JCM as a scheme has also limited in funding. Thus it is impossible to solely rely on JCM. The role of the banking industry has to be revived in order to support the climate change mitigation effort.

Regulatory

There are several policies, which consider to disincentive energy conservation effort e.g. the implementation of parallel cost of electricity by PLN. The Ministry of Energy and Mineral Resources Regulation number 1 year 2017 requires company, registered PLN's customer, which owns and utilizes its electricity generation facility parallel with the PLN's electricity supply, to pay certain amount of cost. The fee charged by PLN consists of interconnection cost, capacity charge and energy charge. This bulk of costs have burdened the company intent to develop its own electricity generation facility, which in several cases are more efficient and cleaner generation than the PLN's.

Currently there are several projects in JCM, which encountered this issue. It is reported that the parallel cost of electricity by PLN has reduce the viability of the project by almost doubling the number of years of payback period. In the renewable energy sector, the uncertainty of the feed-in-tariff rate has jeopardized the financial viability of several projects. In addition, particularly for the non-state participants such as local government, the procurement issue has been prominent challenge in implementing JCM project.

In regard to the implementation of public private partnership, this is related to JCM City-to-City cooperation, its implementation still hindered by the procurement issue. The mismatch between city's procurement policy and JCM's funding mechanism has become the barrier for the implementation of City-to-City cooperation.

Communication with the Japanese partner.

25% respondents reported that they have difficulties in interacting with their Japanese partner. In the case of PT Semen Indonesia, they mentioned that they have problem in communicating their interest to the Japanese counterpart. They also have suggested that the leader of the venture should be the biggest contributor of the project, in this case is PT Semen Indonesia, Tbk, or in general the Indonesian counterpart. However it is unclear on what is the main cause of this problem and what is the impact on the project.

9.1.5. Recommendation

It is also recognize that one of JCM's main objectives is to scaling up JCM financing model into bigger scale and magnitude. Thus, based on the current JCM implementation, there is several recommendations for future implementation of JCM:

Further explore the potential of JCM collaboration with other institution to provide low-carbon funding. The cooperation can be done with the Ministry such as Ministry of Industry, or multilateral development bank (ADB JFJCM), or to tap GCF financing through PT Sarana Multi Infrastruktur (Persero).

Improving coordination amongst related institution. Institutionally, JCM is under the host of CMEA, whereby it has function to coordinate several ministries such as Ministry of Finance, Ministry of Environment and Forestry, etc., which is considerably relevant with the JCM operation. However, currently JCM's portfolio is mainly in the energy sector, both energy efficiency and renewable energy, which is under the authority of MEMR. Even though JCM Joint Committee has included MEMR as one the representatives, it is view that it will be more effective to include Coordinating Ministry for Maritime (CMM), which currently hold the coordination function for energy issues (MEMR report to the CMM). It aims to enhance the institutional arrangement and coordination function for improving JCM implementation, between CMEA and CMM, and to increase the level of acceptance from the related ministries.

Inclusion of private sector representative in the JCM's decision making. Scaling up JCM project requires intensive information dissemination regarding the scheme. The role of the industry association/ private sector representative is crucial in this matter as industry association can disseminate the information regarding JCM and its benefit. It is also very common to include industry association/ private sector representative such as Indonesia Chambers of Commerce or

other relevant organization to be involved in government program's executive board e.g. ICCTF, Global Environment Facility and Earth Fund. Therefore, the inclusion of private sector representative may be able to support JCM penetration in private sector.

Advocacy for incentive provision for low-carbon technology utilization and/or pollution limit including fiscal policy. In order for JCM to attract further participation, JCM scheme has to demonstrate that it will bring benefit for the company who implement the project. Currently the subsidy given by JCM will only have value as much the investment cost reduction. However, if government impose policy taking an account of externalities, the values of JCM subsidy will not only cover parts of investment costs but it will also provide incentive for reducing the GHG emissions. The policy can be in the form of environmental tax, emissions performance standard, etc. The implementation of environmental tax or similar policy will create urgency for private sector to implement emissions reduction activity (creating demand). This is also related with the internal barrier of energy efficiency project, where company do not see energy efficiency or emissions reduction activity as important as other investments which directly relates to their core business. The implementation of this policy incentive will also useful for future JCM implementation, when the Japanese government decided to remove the subsidy program.

Increase the involvement of host country participant in implementing JCM project. Based on the JCM implementation in Indonesia, it is found that there is lack of sense of project ownership from the Indonesian project participant. For many participants, the implementation of JCM is considered as trade activity (buy and sell) of discounted equipment. This is mostly due to the lack of involvement of the Indonesian counterpart. Based on the observation, the succeed JCM project is the project which able to capture the participation from both Japanese and Indonesian participant.