

Country Name	Project for Capacity Building for Enhancement of the Geothermal Exploration Technologies
Republic of Indonesia	

I. Project Outline

Background	The “Fast-Track Program (Crash Program II)” (2010) aimed to develop about 10,000 MW of new power sources by 2014, out of which 3,977 MW was planned through geothermal power. Indonesia was endowed with about 29,000 MW of geothermal power development potentials, but only about 1,200 MW was developed as of 2010. It was deemed important to expedite geothermal power development. The Center for Geological Resources (CGR) of Geological Agency (GA) is responsible for regional and detailed resource surveys in order to identify prospective geothermal fields. However, CGR faced difficulties in terms of using integrated data formats, collecting highly accurate resource data and conducting quantitative evaluation of geothermal reservoirs.												
Objectives of the Project	Through capacity building of CGR on geothermal resource exploration, the project aimed at supporting CGR for provision of geothermal resource information for both government and companies to develop geothermal power, thereby contributing to accelerating geothermal power development in Indonesia.												
	Overall Goal: To accelerate geothermal power development in Indonesia. Project Purpose: Center for Geological Resources (CGR) of Geological Agency (GA) provides geothermal resource information for both government and companies to develop geothermal power.												
Activities of the project	<ol style="list-style-type: none"> 1. Project site: CGR (Bandung) 2. Main activities: Trainings and seminars on geothermal resource survey, geothermal resource exploration for reservoir evaluation and geothermal resource exploration technology for geothermal wells, development of the database on resources, etc. 3. Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Indonesian Side</td> </tr> <tr> <td>1) Experts from Japan: 20 persons</td> <td>1) Staff allocated: 29 persons</td> </tr> <tr> <td>2) Training in Japan and third country: 12 persons</td> <td>2) Land and facilities: Office space, training room, vehicles, etc.</td> </tr> <tr> <td>3) Equipment: isotope water analyzer, water quality test kits, PC, software for reservoir modeling and remote sensing, ion chromatograph, etc.</td> <td>3) Equipment for exploration and analysis</td> </tr> <tr> <td>4) Operation cost.</td> <td>4) Operation cost.</td> </tr> </table> 			Japanese Side	Indonesian Side	1) Experts from Japan: 20 persons	1) Staff allocated: 29 persons	2) Training in Japan and third country: 12 persons	2) Land and facilities: Office space, training room, vehicles, etc.	3) Equipment: isotope water analyzer, water quality test kits, PC, software for reservoir modeling and remote sensing, ion chromatograph, etc.	3) Equipment for exploration and analysis	4) Operation cost.	4) Operation cost.
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Project Period	October 2010 to September 2013	Project Cost	(ex-ante) 360 million yen, (actual) 298 million yen										
Implementing Agency	Center for Geological Resources (CGR), Geological Agency (GA), Ministry of Energy and Mineral Resources (MEMR)												
Cooperation Agency in Japan	West Japan Engineering Consultants, Inc.												

II. Result of the Evaluation

[Special perspectives considered at the ex-post evaluation]

- Based on the recommendation from the terminal evaluation, the indicators of the Overall Goal were revised under agreement between CGR and the project team in August 2013. However, among the seven revised indicators, the Indicators 3, 6 and 7 were accumulated data of the Indicators 1, 4 and 5, respectively. Therefore, achievement of the Overall Goal was verified with the Indicators 1, 2, 4 and 5.

- Some of the originally set indicators were used as those for verification of other impacts.

- The Indicator 2 of the Project Purpose was the “number of data used for setting working area for geothermal development (WKP).” In the terminal evaluation, this indicator was not used, because it was difficult to count the number of data since various surveys were conducted before WKPs were approved. Instead, the “number of the fields used for setting WKPs” was used as an indicator. This was used also at the ex-post evaluation.

- No target figure was set in the four indicators of the Project Purpose. At the ex-post evaluation, it was judged as “achieved” if there was improvement or increase.

1 Relevance

<Consistency with the Development Policy of Indonesia at the time of ex-ante evaluation and project completion>

The project was consistent with the development policy of the Government of Indonesia, as it set forth the geothermal power development plans by laying out the Geothermal Road Map in 2004 and 2005 with a target to develop 9,500MW geothermal power by Year 2025 and “Fast-Track Program (Crash Program II)” in 2010 to develop geothermal power volume of 3,977 MW by Year 2014. The “Crash Program II” was still effective at the time of the project completion.

<Consistency with the Development Needs of Indonesia at the time of ex-ante evaluation and project completion >

Energy consumption in Indonesia was increasing rapidly with the high economic growth. The country was endowed with about 29,000 MW of geothermal power development potentials, but only 1,189 MW was developed as of 2010. There were great needs for capacity building related to geothermal exploration, and thus the project was relevant with the development needs of Indonesia at the time of the ex-ante evaluation and project completion.

<Consistency with Japan’s ODA Policy at the time of ex-ante evaluation>

In the Country Assistance Program for the Republic of Indonesia (2004), one of the priority areas was set as “assistance to realize sustainable growth driven by private sector.” One of the development issues under this priority is the “Building Economic Infrastructure,” and importance of increasing power generation capacity was emphasized in this regard. Thus, the project was consistent with Japan’s ODA policy at the time of the ex-ante evaluation.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement for the Project Purpose at the time of Project Completion>

The Project Purpose was mostly achieved by the project completion. Through the project activities and procured equipment, CGR improved its capacity of detailed studies on geothermal resource exploration and integrated interpretation. As a result, CGR became able to study more areas (Indicator 1), have more fields for setting WKPs (Indicator 2), and then more working areas were newly approved (Indicator 3). Thus, CGR became capable of providing geothermal resource information and data. However, the number of the accesses to CGR data from private developers did not increase (Indicator 4), because biddings for WKPs were suspended in 2012. The reason for this suspension was that there was a plan to issue new regulations on renewable energy feed-in tariff.

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

It is judged that the project effects have partially continued from the following reasons. First, since the project completion, CGR has continued exploration surveys, though the number of the surveys depends on the budget and collected data on 3Gs (geology, geochemistry and geophysics) and gradient thermal drilling, and this has resulted in the stable number of the fields used for setting WKPs. Private developers' access to the data collected by CGR has increased, because MEMR issued the Geothermal Potential Profile in 2012 which has drawn their attention to geothermal development. Second, on the other hand, few working areas have been newly approved for the last three years, because several prospected areas were taken for preliminary survey but the result did not meet the geoscientific criteria to be proposed WKPs. However, at the time of the ex-post evaluation, there were more than 20 WKPs still waiting for tendering. In other words, if the approved WKPs increases while the tendering process is limited, there will be more WKPs in the waiting in the pipeline. That is why MEMR has limited the approval of new WKPs¹, even though CGR has capability sufficient for setting 3-4 WKPs per year.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal has been partially achieved. Concretely, the achievement level of the approval of WKPs and power generation potentials have been partial. First, WKPs prepared by both CGR and other institutions have not been approved by MEMR as planned (Indicator 1). The reason is that many tenders have been suspended due to the waiting of the issuance of new regulations on feed-in tariff. Second, power generation potentials of approved WKPs have not increased as planned, either (Indicator 2). Main reasons include: limited number of approved WKPs; land acquisition problem, and other non-technical issues such as budget restrictions.

<Other Impacts at the time of Ex-post Evaluation>

Following positive impacts have been confirmed. First, capacity of geothermal power generation has increased to 1,838 MW in 2017 from 1,341 MW in 2013, which is attributed to expansion of existing WKPs and new development of existing WKPs. Second, based on the project experience, CGR has improved new methodologies for example using isotope, three-dimensional magnetotelluric (3D MT) and reservoir analysis for geothermal exploration. There has been no negative impact on the natural environment.

<Evaluation Result>

In light of the above, the project purpose was mostly achieved and the effects have partially continued. The Overall Goal has been partially achieved, though positive impacts have been confirmed. Therefore, the effectiveness/impact of the project is fair.

Achievement of the Project Purpose and Overall Goal

Aim	Indicators	Results												
(Project Purpose) CGR of GA provides geothermal resource information for both government and companies to develop geothermal power	1. The number of studied areas by CGR	Status of achievement: <u>Achieved (Partially continued)</u> . (Project Completion) - The number of the studied areas increased: 14 (2010), 16 (2011), 17 (2012) and 19 (2013). (Ex-post Evaluation) - The number of the studied areas has been on a decreasing trend: 26 (2014), 22 (2015), 18 (2016) and 22 (as of July 2017).												
	2. The number of fields used for setting WKP	Status of achievement: <u>Achieved (Continued)</u> . (Project Completion) - The number of the fields used for setting WKPs increased from 2 in 2010 to 4 in 2013. (Ex-post Evaluation) - The number of fields used for setting WKPs has been mostly stable: 3 (2014), 4 (2015), 3 (2016) and 3 (as of July 2017).												
	3. The number of newly approved working areas	Status of achievement: <u>Achieved (Not continued)</u> . (Project Completion) - The number of newly approved working areas increased from 0 to 5 by the end of 2012. (Ex-post Evaluation) - The number of newly approved working areas has decreased: 11 (2014), 0 (2015), 4 (2016) and 1 (as of July 2017).												
	4. The number of access by private developers to the data collected by CGR	Status of achievement: <u>Partially achieved (Continued)</u> . (Project Completion) - The number of the private developers' access to the data collected by CGR increased but then decreased: 45 (2010), 50 (2011), 36 (2012) and 30 (2013). (Ex-post Evaluation) - The number of the private developers' access to the data collected by CGR has increased: 30 (2014), 65 (2015), 107 (2016) and 135 (as of July 2017).												
(Overall goal) To accelerate geothermal power development in Indonesia.	1. Number of WKPs (prepared by CGR and other institutions) approved by MEMR	Status of achievement: <u>Partially achieved</u> . (Ex-post Evaluation) - The number of WKPs (prepared by CGR and other institutions) approved by MEMR reached the target only in 2014.												
		<table border="1"> <thead> <tr> <th></th> <th>2013</th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> </tr> </thead> <tbody> <tr> <td>Plan</td> <td>7</td> <td>5</td> <td>5</td> <td>5</td> <td>5</td> </tr> </tbody> </table>		2013	2014	2015	2016	2017	Plan	7	5	5	5	5
	2013	2014	2015	2016	2017									
Plan	7	5	5	5	5									

¹ Intervene in MEMR's decision making related to approval of WKP was not included in the project scope.

	Actual	0	11	0	3	0
2. Number of approved WKPs prepared by CGR	Status of achievement: <u>Partially achieved.</u> (Ex-post Evaluation) - The number of approved WKPs prepared by CGR reached the target only in 2014.					
	2013	2014	2015	2016	2017	
Plan	5	4	4	4	4	
Actual	0	7	0	2	1	
4. Power generation potentials of approved WKPs (prepared by CGR and other institutions)	Status of achievement: <u>Partially achieved.</u> (Ex-post Evaluation) - The power generation potentials of approved WKPs (prepared by CGR and other institutions) reached the target in 2014 and 2016.					
	2013	2014	2015	2016	2017	
Plan	300	370	340	370	319	
Actual	0	1,340	60	665	97	
5. Power generation potentials of approved WKPs (prepared by CGR)	Status of achievement: <u>Partially achieved.</u> (Ex-post Evaluation) - The power generation potentials of approved WKPs (prepared by CGR) reached the target in 2014 and 2017 and mostly achieved the target in 2016.					
	2013	2014	2015	2016	2017	
Plan	270	70	0	220	274	
Actual	0	487	0	213	274	

Source: Terminal Evaluation Report, Project Completion Report and data provided by MEMR.

3 Efficiency

The project cost was within the plan, but the project period exceeded the plan (ratio against the plan: 83% and 120%, respectively) due to the delay of provision of the equipment and additional technology transfer based on CGR's requests. Therefore, the project efficiency is fair.

4 Sustainability

<Policy Aspect>

Geothermal power development is prioritized in the "National Energy Policy Roadmap for Energy Mix until 2025," and it is a priority program for MEMR.

<Institutional Aspect>

CGR's functions for geothermal power development have been the same as those during the project period: surveys on geothermal resources, information provision on the availability of geothermal resources, evaluation of the area for preparation of geothermal exploration, management of the national database, etc. There are 43 personnel in the Functional Group of CGR, but it is not sufficient to perform the mentioned functions. Though CGR has proposed MEMR additional personnel assignment, it still suffers from staff shortage, especially young engineers (geochemists, geophysicist and drilling engineers). However, the prospect of additional young staff to CGR in the near future is considered difficult, since the central government has a policy not to increase government employees. Because of this reason, CGR conducts outsourcing of the field work.

<Technical Aspect>

CGR itself considers that its personnel have sufficient knowledge and skills for geothermal power development, as they have conducted data acquisition, processing, and interpreting data without problems. When new staff joins CGR, technical training is given to them by MEMR. The handbook on geothermal resources developed by the project has been utilized by CGR personnel.

<Financial Aspect>

The budget source of CGR is the allocation from the central government. The budget has decreased from 47 billion IDR in 2014 to 26 billion IDR in 2017, because the government has put more priority in infrastructure development. The decrease in budget is expected to happen in 2018 as well. It has not been sufficient to conduct all the mandated functions of CGR, so it has to limit programs and activities with available resources.

<Evaluation Result>

In light of the above, slight problems have been observed in terms of the institutional and financial aspects of the implementing agency. Therefore, the sustainability of the effectiveness through the project is fair.

5 Summary of the Evaluation

The Project Purpose was mostly achieved at the project completion and the effects have partially continued. Concretely, through the project activities CGR improved capacity for providing geothermal information and CGR's geothermal information has been accessed by more private developers. Also, CGR's activities such as WKPs study have been conducted continually. However, geothermal power development has not been promoted as targeted as the Overall Goal due to the limitation of WKP approval and tender by MEMR. Regarding the sustainability, CGR lacks several technical staff, especially young staff, and budget to perform all the mandated functions. As for the efficiency, the project cost was within the plan, while the project period exceeded the plan.

Considering all of the above points, this project is evaluated to be partially satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing agency:

- Even though CGR provides private developers with quality information for geothermal resources, it cannot lead to geothermal power development unless MEMR sets bidding opportunities for geothermal permit license. It is recommended to MEMR to stably approve WKP and conduct tender as well as to provide budget for human resources of CGR.

Lessons learned for JICA:

- CGR improved capacity for conducting studies on WKPs and providing geothermal information. However, since biddings for geothermal exploration permit license have been suspended, very few WKPs have been approved by MEMR. As a result, geothermal power

development has been limited. It is crucial to make clear the project focus and scope at the project formulation stage. If the project aims at developing a certain section or organization's capacity development and then expects impacts for which other organization or government's involvement and commitment are required, the project should provide not only technology transfer and equipment provision, but also work on policy and institutional development for producing and continuing impacts, by encouraging the implementing agency and other governmental agencies to assign necessary budget and personnel. On the other hand, if the project only aims at developing a certain section or organization's capacity development as the Project Purpose and involves only the target section and organization in the project scope, the Overall Goal and its indicator should be related to impacts for which it could be responsible.



Equipment provided by the project (MT/TDEM and MT Equipment)



Equipment provided by the project (Ion Chromatograph)