No. 3 | 4TH Dec. 2017

BAGUS Project News

Project Mid-term Review

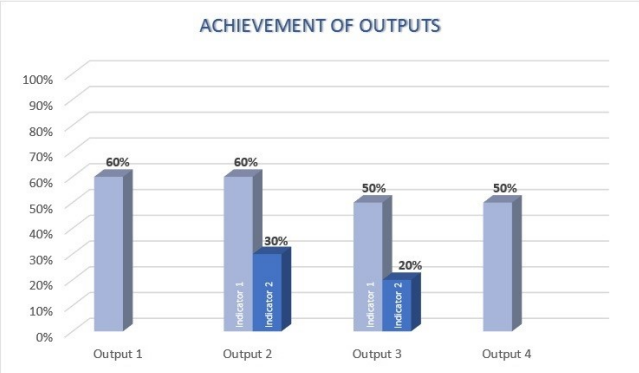
From 9th to 19th October 2017 a Project Mid-term Review Study Mission visited the project.

The purposes of the mission are:

- to review the performance, achievement and implementation of the process of the Project
- to conduct comprehensive evaluation of the activities and achievement of the Project in accordance with the five evaluation criteria, namely relevance, effectiveness, efficiency, impact, and sustainability
- to draw up recommendations for further improvements of the Project during its remaining period and afterward
- to prepare a Joint Evaluation Report and Minutes of Meeting which reflect the direction of the Project

The result of the mid-term review is summarized as follows:

(High)	**RELEVANCE** The Project is consistent with the relevant policies of Indonesia and Japan, and with the needs of the target group.	**SUSTAINABILITY** In terms of policy, financial, organizational and technical aspects, sustainability is high.
(Relatively High)	**EFFECTIVENESS** Most of the research has been conducted smoothly to achieve the Project purpose, the target figure of the indicators of the Project Purpose was set.	**EFFICIENCY** The input from the Indonesian and Japanese sides is appropriate. Installation of some equipment delayed, but most of the activities have been implemented as planned. It is expected that each Output will be achieved by the end of the Project.
(Too Early to Assess)	**IMPACT** As of the Mid-Term Review there are no data. Therefore, the data should be collected and analysis. The technique developed under the Project may be effective for research other than geothermal development. Competitiveness of geothermal power may affect the impact of the Project.	



Output 1

Technologies for detecting steam spots suitable to geothermal power generation are developed in combination with remote sensing, mathematical geology, geochemistry, and mineralogy.

Output 2

Remote sensing-based technologies for environmental monitoring are established to check the effect of geothermal power plant operation.

2.1 Botanical and surface water quality conditions extracted from remote sensing-based technologies are clarified for the comparison with the existing environmental monitoring data.

2.2 D-InSAR based topographic change is quantified for the comparison with the existing data.

Output 3

The optimal operation control system of geothermal power generation is established for long-term use of geothermal resource.

3.1 The computer tool in the system for calculating temperature and pressure in geothermal reservoir is established for the comparison with the existing data.

3.2 The electrical output and lifetime of power generation are predicted by using the computer tool in the system.

Output 4

The capacity of ITB researchers and students for the geothermal science and technology is enhanced.

The recommendations based on the mid-term review to further improve the Project implementation are:

Modification of the Verification Indicators of the Overall Goal, Project Purpose and Outputs	Establishment of new collaborations with other relevant institutions.
Enhancing the information sharing and socialization of the Project results to the stakeholders.	Start discussing the future to expand the researches, continuous development of human resources, and laboratory facilities after the completion of the Project in April 2020.

On 19th October 2017 the 4th Joint Coordinating Committee Meeting was conducted and the Project's mid-term review report was signed by **Prof. Sri Widiyantoro, M.Sc., Ph.D.**, Dean of the Faculty of Mining and Petroleum Engineering, Bandung Institute of Technology (ITB) and **Mr. Hiroyuki Kobayashi**, Senior Deputy Director General/Group Director for Energy and Mining of Industrial Development and Public Policy Department of Japan International Cooperation Agency (JICA).

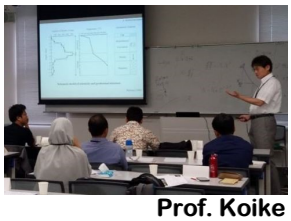
Intensive Training Course on Geothermal Science and Technology

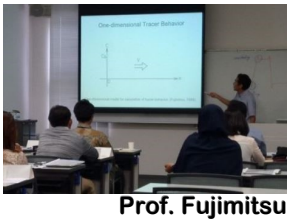
Under the framework of BAGUS Project, Kyoto University held the second two-week intensive course on geothermal science and technology at its Katsura Campus.

A total of thirteen tightly selected participants from ITB, Center for Mineral, Coal & Geothermal Resources of Energy & Mineral Resources Ministry of Indonesia, and Star Energy, Ltd. participated in the course held from 3rd to 17th September 2017. They experienced not only classroom lectures, but also field work and advanced laboratory experiments. A visit to Japan's largest geothermal power generation plant in Hachobaru was also included in their program. All participants successfully completed the courses delivered and returned home happily with added knowledge and experiences.

On Friday, 20th October 2017 at ITB's campus, the Project Leaders, Prof. Sudarto Notosiswoyo from ITB and Prof. Katsuaki Koike from Kyoto University, handed-over the certificate to the participants and awarded Mr. Muhammad Firdaus Al Hakim from ITB the Best Score Participant.

An article regarding this training course has been published in JICA Indonesia's Facebook Fanpage on 26th October 2017


Prof. Koike


Prof. Fujimitsu


Prof. Tosha


Prof. Ishida


Prof. Mikada

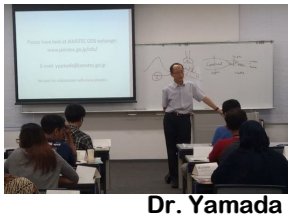

Dr. Tenma


Dr. Kashiwaya


Prof. Yoneda

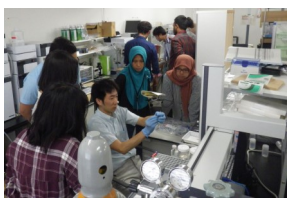

Dr. Goto


Prof. Sakurai


Dr. Yamada

No.	Day	9:30-11:30	13:30-15:30	15:45-17:45
1	3 (Sun)	Arrival at Kyoto and Orientation		
2	4 (Mon)	Prof. Koike *Remote Sensing*	Prof. Fujimitsu *Volcanology*	Prof. Tosha *Social Science*
3	5 (Tue)	Prof. Ishida *Geomechanics*	Prof. Mikada *Seismic Geophysics*	Dr. Tenma *Reservoir Engineering*
4	6 (Wed)	Prof. Koike *Geo-thermics & mathematics*	Dr. Kashiwaya *Geochemistry*	Prof. Yoneda *Mineralogy*
5	7 (Thu)	Dr. Goto *Electromagnetic Geophysics*	Prof. Sakurai *Global Leadership*	*Collaboration Seminar with Koike Lab.*
6	8 (Fri)	Dr. Yamada *Geothermal Drilling*	Mistusbishi Materials & Mitsubishi Materials Tecno *Geothermal Practice*	
7	9 (Sat)	Self study		
8	10 (Sun)	Trip to a Geothermal Site [Orientation of field training]		
9	11 (Mon)	Field training at a geothermal site (Hatchobaru, Kyushu)		
10	12 (Thu)	Return Trip to Kyoto (including geothermal site visits in Beppu City)		
11	13 (Wed)	Laboratory experiments		
12	14 (Thu)	Laboratory experiments	Data Analysis	
13	15 (Fri)	Self study	Presentation of Learning Result	
14	16 (Sat)	Feedbacks on overall training		
15	17 (Sun)	Return to Indonesia		


Geothermal Practice



BEST SCORE

Muhammad Firdaus Al-Hakim | Department of Geothermal, ITB

First of all, I would like to thanks to JICA for this training, to ITB for giving me opportunity to attend this training, and also to Kyoto University for the facility and accommodation during the training. It was a big honor for me to attend these unforgettable and wonderful two weeks geothermal training experience in Kyoto University. I was highly inspired by all lectures and I've gained many experience and knowledge. I am so glad I attended. Hope I can come back to Kyoto again. Thank you.

Jonathan Sharon Widiatmo | Dept. of Geothermal, ITB

The training courses cover many aspects of geothermal exploration, but, in the other hand, adequately compact. Consequently, I learnt a wide and comprehensive technology in Geothermal engineering from extraordinary Sensei which help me integrate my knowledge as Geothermal student. Also, Kyoto is a very enjoyable place to stay. Two weeks stay in Kyoto is a precious experience.

Ahmad Ali Syafi'i | Dept. of Mining Engineering, ITB

The extraordinary experience I got in 2 weeks at JICA's Geothermal short course in Kyoto University. I directly studied about Geothermal science with the Kyoto University's professor. In many kind of new knowledge, basically I have been learned such as how use XRD, XRF and ASD instrument in Laboratory. Visiting the Geothermal site, Hatchobaru, using Shinkansen, the fastest train in the universe, that experiences is very priceless. I want to say thanks you so much Koike Sensei and team give me chance to learn much more and making new experience in Geothermal scope, especially for Kubo -san and Riostantieka-san guide us during in Japan. I hope someday, I can back again to Kyoto University, not as a trainee, but as Doctoral student. I always long for Kyoto.

ドうもありがとうございます

Cipto Purnandi | Academic Assistant of Earth Resources Exploration Research Group, Faculty of Mining & Petroleum Engineering ITB

I got many experiences and knowledge from the "2-Weeks Geothermal Intensive Training" at Kyoto University. All the lecturers are cooperative and will answer our questions related to their topic, not to mention the field and laboratory studies. It was fun, and I hope I can come back to Kyoto University again. Thank you!

Dwiyogarani Malik | PT Star Energy Geothermal

It was a good opportunity for Star Energy Joint in BAGUS project and a two weeks course to enhance and sharing knowledge. The most meaningful of overall BAGUS project is to update the latest technology and opportunity to find the best method that may apply in industry in defining new geothermal prospect or develop current geothermal potential. Gratitude to all Sensei and Team in BAGUS project for hospitality and intention to accompany us and introduce Japan culture.

Mustiatin | Groundwater Engineering ITB

Joining this short course training held in Kyoto for last two weeks was a big opportunity for me. I had amazing experiences during the course. First, of course I got a massive knowledge improvement in geothermal exploration and exploitation. Very good lectures with the awesome lecturers gave me many occasion to learn not only in academic purposes but also in leadership, specifically in global leadership. Second, living in Kyoto for two weeks has gave me many chances to learn and to know more about Japan's cultures including historical and social life. I hope this program would last in several years ahead, so many students will have the same experiences as me.

Tangguh Satria Pamungkas | Mining Engineering, ITB

Maybe, there are a lot of words that can represent my feeling after i joined this BAGUS project. Excited, delighted, motivated, grateful, and many more. JICA training gave me some brands new experience and insight about my future study plan and research, and Japan, yeah...absolutely I want to go there again someday, beautiful scenery, friendly people, and very supportive research environment. Thank you very much for all Sensei, hope we can meet again in my Doctoral program.

Widya Suleman | Center for Mineral, Coal, & Geothermal Resources – Geological Agency

"I am glad that I can join this program, this is a good opportunity to people who has desire to learn about geothermal (advanced)".

Bagus Guspudin | Geology Engineering ITB

YES! I made it, I was very lucky to go to Japan. Two weeks intensive course at Kyoto University was so fantastic. Walking, take the bus and subway for two weeks were the best experience in my life. The course schedule was fun and very useful to increase my knowledge about geothermal. The lecturers were very communicative and attractive to explain, question and answer. The field trip and laboratory analysis were very excellent, I could learn geothermal system in Japan and rock physics analysis. Meanwhile, I was surprised when lecturers and students from Kyoto University always accompany and explain about japan food and culture every time especially in the field trip, they were kind heart people. Thank you very much to Prof. Koike who has guided us from the beginning until the end of training. It was great moment and I will never forget this moment in my life. I hope, JICA and Kyoto University will continue this program every year.

Linda Permata | Dept. of Mining Engineering, ITB

It is a package of recommended program for students! The welcoming lecturers plus wonderful Kyoto city also add priceless memories with a good team. I hope this program will last for my juniors. With a thankful heart, BAGUS 2017 is finally wrapped leaving a best knowledge we will carry in our lifetime.

Boby Benni Wahana | Groundwater Engineering ITB

"Thank you very much for JICA intensive short course for Geothermal & Kyoto university, because this program I can learn a lot of thing about geothermal, especially for method in exploration for geothermal. For the other perspective I have a valuable experience, because I can go to Japan and learn spirit of Japan people. I hope from the program I can use the knowledge in my research and make me the better person".

Lestari Apriani | Department of Geothermal, ITB

I would like to take this opportunity to thank you to JICA team, for being able to join this program. The training was very good especially the field trips and lab experiments. All the lectures explained every topic in detail with good examples. I have got more knowledge and experiences, and I hope I can start applying everything I have learned from this training.

Indra Agoes Nugroho | Dept. of Geothermal, ITB

Join 15 days short course geothermal training program in Kyoto from JICA, is really a great experience to me. Every day I've learned something new, about geothermal and Japan. I really appreciated that I get this opportunity. Thanks to Koike-sensei, Goto-sensei, Kashiwaya-sensei, Kubo-san, Riozz-san Tada-san, Yamada-san, Albert, and all the member of Koike-sensei Lab for treating us in Kyoto very welcome and nice. I hope we can see each other again in other opportunity.

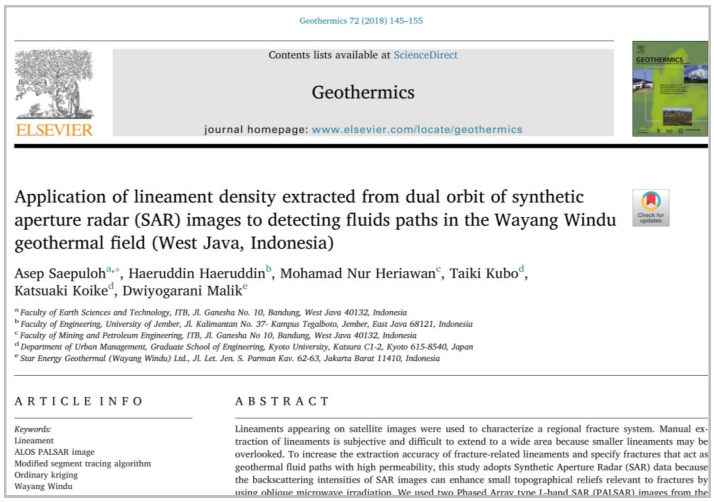
OPINION BOARD

Field Survey & Research Activities

Besides participating in the Project's Mid-term Review mission, Assistant Prof. Koki Kashiwaya took the occasion of his visit to Bandung to conduct some field surveys and research activities from 20th October to 1st November 2017. Dr. Kashiwaya and a team from Kyoto University went to several sites to collect and analyze gas and hot water samples. Dr. Kashiwaya also taught ITB and Kyoto University students the sampling methods and operation as well as maintenance procedures. Ten gas samples were collected at Burung crater in Wayang Windu, the analysis using gas chromatography (GC) was conducted on 21st and 22nd October 2017.

The team continued their activities and went to Patuha from 23rd to 25th October 2017 and collected gas samples from ten production wells and two geothermal areas (Cibuni and Ciwidey craters). The team met Mr. Budi Sutrisno, Steam Field Manager of PT Geo Dipa Energi and explained about BAGUS Project. According to Dr. Kashiwaya, the staff of the company was all friendly and kind that he believed the cooperation in the research activities will run smoothly. The team was able to collect samples at all the ten production wells and according to the company, many other survey wells in Patuha will be made available for the sampling. On 26th October 2017 the team visited Sekarwangi and Cileungsing hot springs of Tangkuban Perahu to collect samples, and they analyzed collected samples using GC and color comparison analysis from 28th October to 1st November 2017.

New Publication on Geothermics



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ELSEVIER

Application of lineament density extracted from dual orbit of synthetic aperture radar (SAR) images to detecting fluids paths in the Wayang Windu geothermal field (West Java, Indonesia)

Asep Saepuloh[a,*], Haeruddin Haeruddin[b], Mohamad Nur Heriawan[c], Taiki Kubo[d], Katsuaki Koike[d], Dwiyogarani Malik[e]

[a] Faculty of Earth Sciences and Technology, ITB, Jl. Ganesha No. 10, Bandung, West Java 40132, Indonesia
[b] Faculty of Engineering, University of Jember, Jl. Kalimantan No. 37- Kampus Tegalboto, Jember, East Java 68121, Indonesia
[c] Faculty of Mining and Petroleum Engineering, ITB, Jl. Ganesha No 10, Bandung, West Java 40132, Indonesia
[d] Department of Urban Management, Graduate School of Engineering, Kyoto University, Katsura C1-2, Kyoto 615-8540, Japan
[e] Star Energy Geothermal (Wayang Windu) Ltd., Jl. Let. Jen. S. Parman Kav. 62-63, Jakarta Barat 11410, Indonesia

ARTICLE INFO

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ALOS PALSAR image
Modified segment tracing algorithm
Ordinary kriging
Wayang Windu

ABSTRACT

Lineaments appearing on satellite images were used to characterize a regional fracture system. Manual extraction of lineaments is subjective and difficult to extend to a wide area because smaller lineaments may be overlooked. To increase the extraction accuracy of fracture-related lineaments and specify fractures that act as geothermal fluid paths with high permeability, this study adopts Synthetic Aperture Radar (SAR) data because the backscattering intensities of SAR images can enhance small topographical reliefs relevant to fractures by using oblique microwave irradiation. We used two Phased Array type L-band SAR (PALSAR) images from the

BAGUS Project members submitted a new research paper entitled "**Application of lineament density extracted from dual orbit of syntethic aperture radar (SAR) images to detecting fluid paths in the Wayang Windu geothermal field (West Java, Indonesia)**" and was accepted by ***Geothermics***, an international journal devoted to the research and development of geothermal energy.

The authors, Prof. Katsuaki Koike, Assistant Prof. Dr. Eng. Asep Saepuloh, Associate Prof. Mohamad Nur Heriawan, Mr. Taiki Kubo along with Mrs. Dwiyogarani Malik of Star Energy Geothermal (Wayang Windu) Ltd., and Mr. Haeruddin of Jember University studied the methods to increase the extraction accuracy of fracture-related lineaments and specify fractures that act as geothermal fluid paths with high permeability using two Phased Array type L-band SAR (PALSAR) images from the Advanced Land Observing Satellite with opposing irradiation directions to reduce the effect of topographic distortion caused by the oblique irradiation. Lineaments are extracted using the modified Segment Tracing Algorithm filtered by the Laplacian of Gaussian for linear features enhancement and noise removal at the Wayang Windu geothermal field, West Java, Indonesia.

Full content is available at the following link: http://www.sciencedirect.com/science/article/pii/S0375650517301979

Other Activities

Following the arrival of laboratory equipment 2nd batch in August 2017, namely Ion Chromatography System, Stable Isotope Ratio Mass Spectrometry System, Inductively Coupled Plasma Mass Spectrometry System, Water Isotope Analysis System, and Gas Chromatograph-Electron Capture Detector System, the installation has been organized and is still ongoing until now. It is expected to be completed in December 2017. In this regard, Assistant Prof. Koki Kashiwaya, Dr. Yohei Tada and Mr. Yudi Rahayudin will have a ten-days visit to ITB from 10th December 2017 to install the Stable Isotope Ratio Mass Spectrometry System.

From 28th November to 7th December 2017 a team of ITB project team members headed by Indonesian Project Leader, Prof. Sudarto Notosiswoyo, will visit Japan to discuss the research plans in 2018.

A Joint ITB/JICA/JST SATREPS Project for Technology Development of Steam-spot Detection and Sustainable Resource Use for Large Enhancement of Geothermal Power Generation in Indonesia
Beneficial and Advanced Geothermal Use System

Contact:
BAGUS Project Office
Faculty of Mining & Petroleum Engineering
Bandung Institute of Technology (ITB)
Jl. Ganesha 10, Bandung, Indonesia

Website:
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