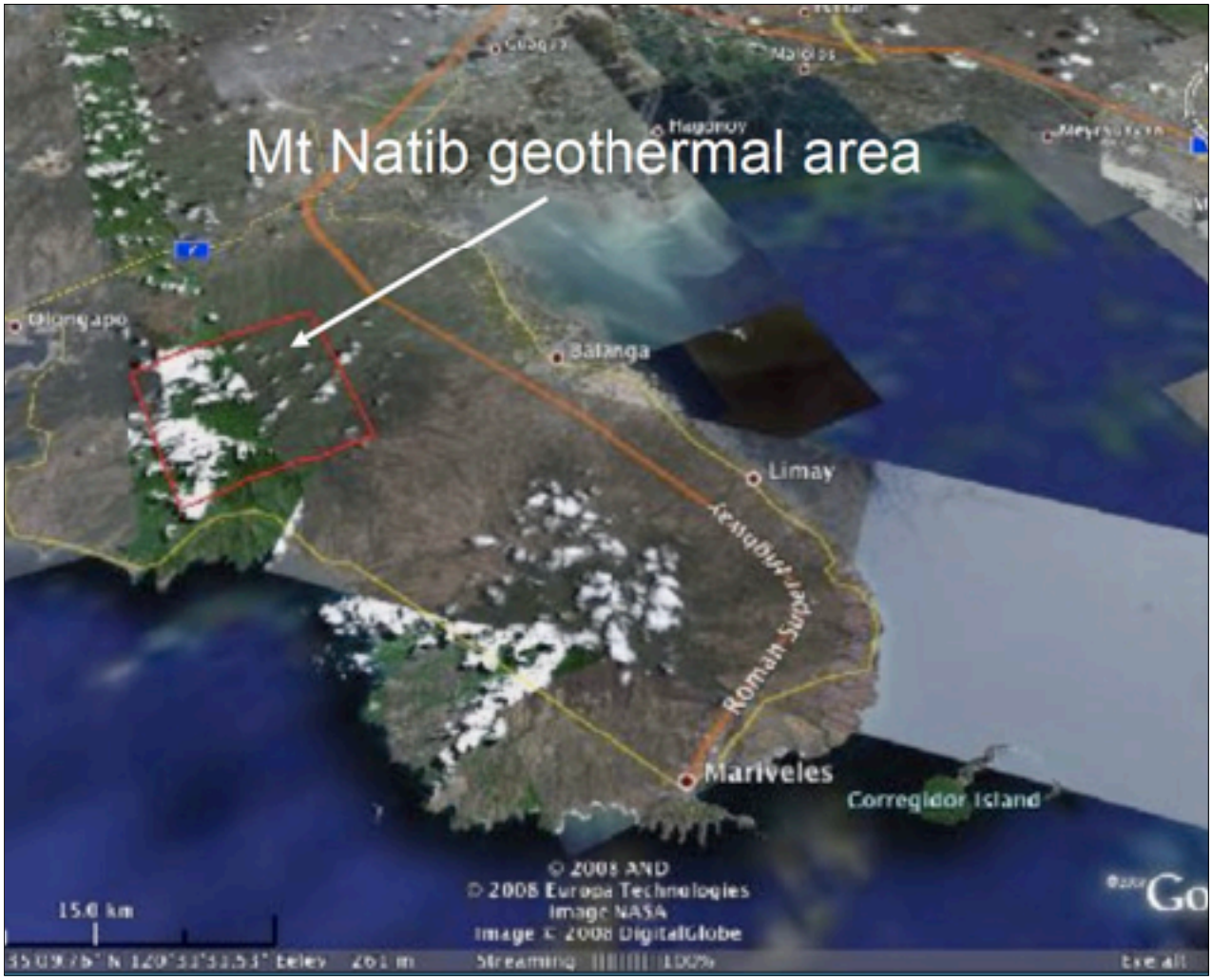

Mt. Natib Geothermal Energy Project

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EXECUTIVE SUMMARY

Introduction

The Philippines has very good potential for geothermal energy because it lies along the volcanic region of the Pacific Rim. It has untapped natural geothermal systems that are estimated to be capable of producing an additional 1,495 megawatts of power. Geothermal energy provides 15% of the electricity needs of the Philippines in 2017 based on data from the Philippine Department of Energy ("DOE").

The Mt. Natib Geothermal Project is situated in the province of Bataan which occupies the whole Bataan peninsula, southwest of Luzon islands. It is approximately 50 kilometers east of Manila across the Manila Bay. It is bounded by the provinces of Zambales and Pampanga to the North, the West Philippine Sea to the west and the Manila Bay to the east. It can be reached via North Luzon expressway for about 2-hour drive or by taking a ferry service across Manila Bay for about an hour.

Exploration History

The Natib area has surface manifestations, such as hot springs and rock alterations that have previously attracted exploration for geothermal resources. To confirm the existence of the resource, geoscientific surveys were conducted by the Philippine National Oil Company - Energy Development Corporation ("PNOC-EDC") in 1987. Geophysical investigations have been performed by PNOC-EDC including Schlumberger Resistivity Traversing and Vertical Electrical Sounding surveys in an area of about 850 km^2. The surveys have delineated a 32 km^2 area within the Natib caldera where the geothermal energy resource is most likely concentrated.

Based on the results of the surface geoscientific investigation, drilling were done within the Natib collapsed caldera in 1989. PNOC-EDC drilled two (2) wells to confirm the subsurface presence of high-pressure geothermal steam with potential to produce power through sustainable steam flow from the wells. The wells encountered very hot rocks at depths relatively close to subsurface:

- Well Na-1D was drilled to a depth of 2751.5 mVD (2859.0 mMD) with highest measured temperature of 282°C at the bottom of the well. Due to low permeability of the structures encountered, the well did not discharge.
- Well Na-2D reached to a total depth of 2916.12 mVD (3353.7 mMD) with a maximum measured temperature of 259°C at 2916.28 mVD (10 days shut). Three discharge attempts were made in this well and proved to be unsuccessful.

Geothermal Renewable Energy Service Contract ("GRESC") No. 2010-02-016

The DOE awarded Clean Rock Renewable Energy Resources Corporation ("Clean Rock"), Geothermal Renewable Energy Service Contract ("GRESC") No. 2010-02-016, on 19 February 2010 over an area covering 11,915 hectares in the Natib area. Clean Rock has a Certificate of Non Coverage granted by the Department

of Environment and Natural Resources - Environmental Management Bureau dated 20 April 2010 to cover exploration including appraisal drilling. Clean Rock also has a Compliance Certificate issued by the National Commission on Indigenous Peoples ("NCIP") dated 20 January 2010 having satisfactorily complied with the free and prior informed consent process under NCIP Administrative Order No. 1 Series of 2006.

Figure 1. Signing of Natib Geothermal Renewable Energy Service Contract in 2010.

Initial geoscientific evaluation done by Clean Rock based on existing information indicated the presence of exploitable hydrothermal systems in Natib. Beardsmore and Cooper (2009), which Clean Rock engaged to do the revaluation, recommended the conduct of additional electromagnetic surveys such as controlled source magnetotelluric ("CSMT") and magnetotelluric ("MT") measurements in order to define the geothermal resource at deeper levels.

CSMT Survey

In 2011 Clean Rock carried out a controlled source magnetotelluric ("CSMT") survey in order to characterize the subsurface resistivity structure of Natib geothermal area. A total of eighty-one (81) stations were occupied and tested using the CSMT equipment provided by the DOE.

The result of the CSMT survey revealed the presence of geothermal resource from well Na-1D towards the Mt. Natib and Natib crater structure (Figure 2). The survey also revealed that well Na-2D was drilled on the outflow zone. Based on the elevation contour of the base of the conductive layer, the resource area (defined by the -800m contour) is about 7-10 km² as defined by the hacked structure. The inner part of the hacked structure marks the minimum estimate while the maximum boundary is delineated by the outer portion of the hacked structure.

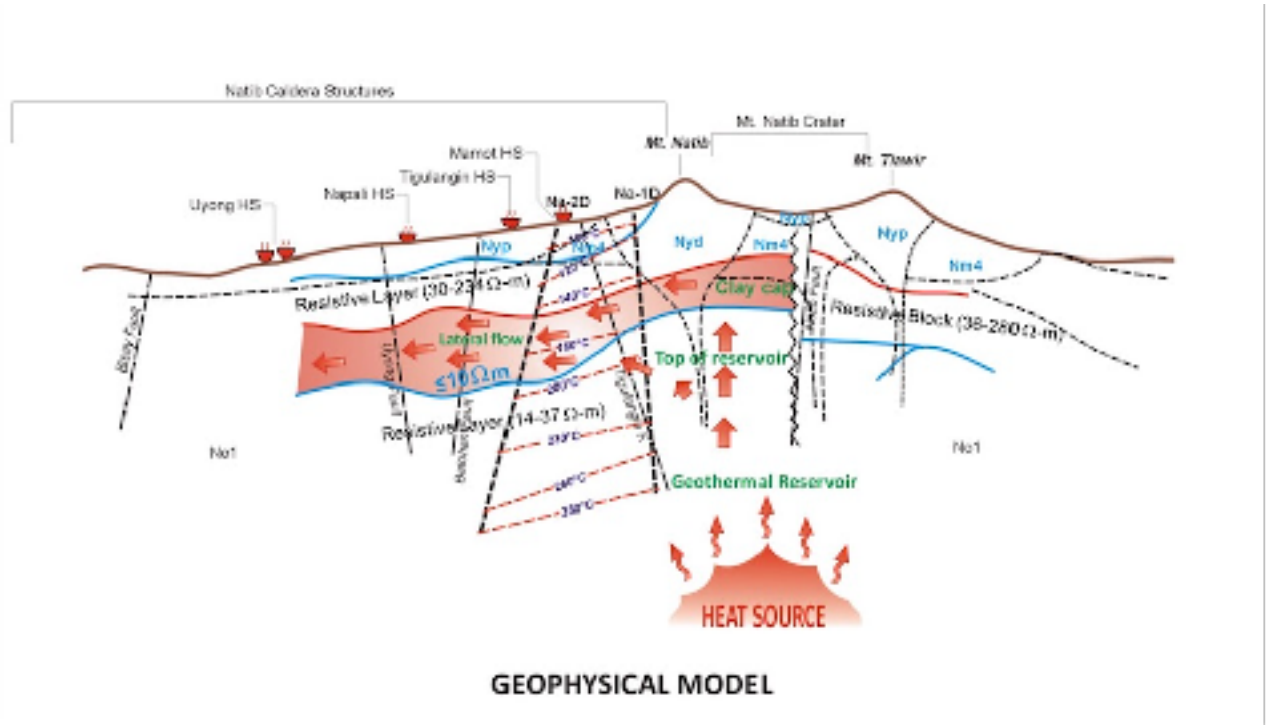

Figure 2. Postulated Geophysical Model Based on CSMT.

Using the Philippines geothermal resource average power density of 5 MWe per square kilometer and based on the resource area of 7-10 km², the power potential of Natib is between 35 – 50 MWe. To further enhance the results of the CSMT survey, a magneto-telluric (MT) survey was recommended to be conducted in the area.

Geochemistry Review

As part of its work commitment under the GRESC, Clean Rock in conjunction with the DOE also conducted a geochemistry re-survey/re-sampling in May 2013. The survey was carried out to determine changes in the chemistry of the hot and warm springs from the previous works conducted in the area and culminated in a report entitled "*Geochemistry Review of the Mt. Natib Geothermal Prospect, Bataan, Philippines*" (December, 2013).

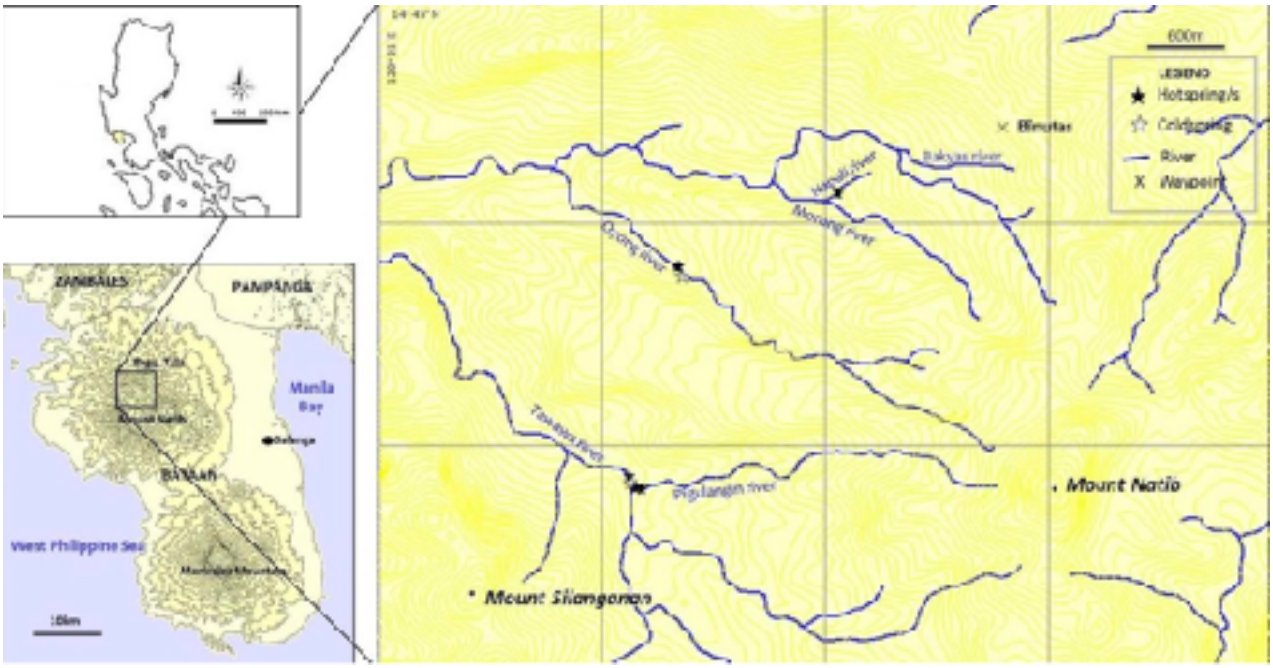

Figure 3. Geochemical Sampling Locations.

Thermal manifestations in the area consist of hot and warm springs. One (1) hot spring, eight (8) warm springs, and two (2) cold springs were sampled from five (5) sampling sites. Sampling locations are located within the Mt. Natib caldera.(Figure 3).

The reservoir temperature was estimated using the Na/K geothermometer. Spring samples indicated a reservoir temperature ranging from 204°C to 265°C while well samples estimate ranges from 231°C to 271°C. **Estimated reservoir temperatures from both spring and well samples indicated a high temperature reservoir. Likewise, as confirmed by well bottomhole temperature (270°C to 282°C), the Natib geothermal field hosts a high temperature geothermal system.**

MT Survey

DESCO, Inc. conducted a magnetotelluric ("MT") survey on behalf of Clean Rock to earn a twenty-percent (20%) interest in the Natib Project. DESCO engaged 3JTech, a Taiwanese geophysical company, to provide

the MT equipment, data processing and interpretation. Initial MT measurement and data gathering was conducted from December 2017 to March 2018 over the entire 11,915 hectares of the service contract area. A total of forty two (42) stations were occupied. The field data were sent to Taipei for processing, initial interpretation, and modeling. 3JTech presented the initial data result interpretations on September 2018. Preliminary results of the MT survey interpretation validated the geophysical model defined by CSMT measurements.

Upon further study of the preliminary interpretation, Clean Rock and DESCO agreed to survey additional infill stations concentrating on the southeast part of the Natib area to further delineate the extent of the geothermal field. Survey of the additional MT stations were done from October to December 2018. The total number of additional MT sites installed was sixteen (16) stations for 55 days of survey activities (Figure 4).

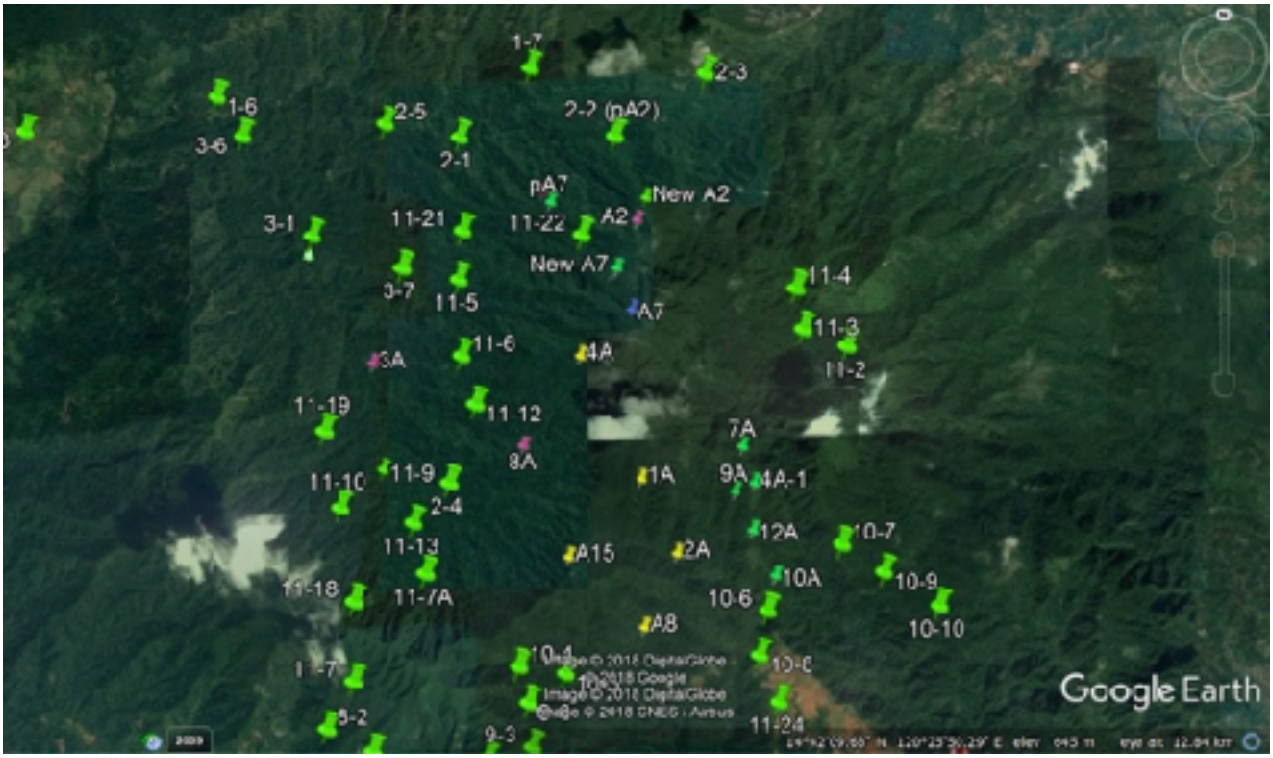

Figure 4. MT Survey Stations

Based on the results of the MT survey submitted to the DOE in 2019, the typical resistivity signature for the presence of a hydrothermal system in Natib was successfully delineated in the isoresistivity map at 2,000 meters depth. The possible geothermal resource has an area of 11.0 km^2.

The upflow region is located to the SE of Natib collapsed structure beneath Mt. Natib and possibly extending beneath Mt. Tawir and Mt. Apisan. Well Na-!D was drilled within, if not near, this upflow zone. The outflow direction is towards the NW where the surface thermal manifestation existed. The presence of a thick conductive clay cap to the SE of Mt. Tawir cannot be discounted as the outflow signature.

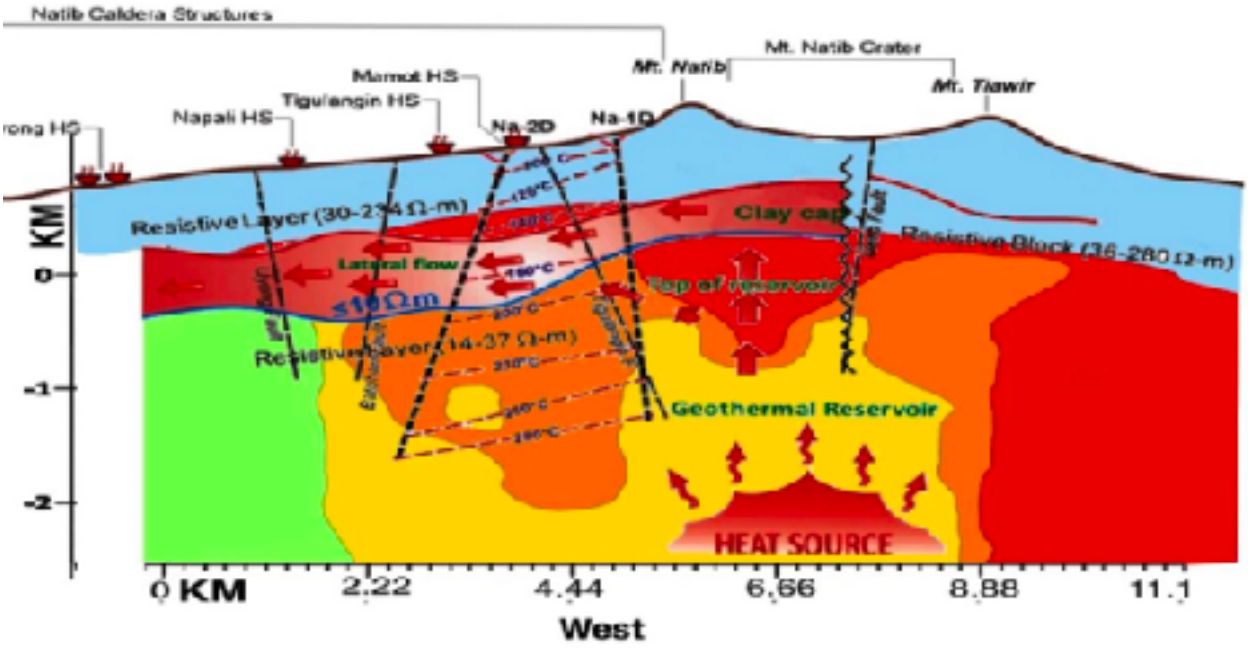

Figure 5. MT Hydro-Geophysical Model.

Using the Monte Carlo simulation, the energy reserves for Natib are P90 + 33 MWe, P50 + 77 MWe and P10 + 201 MWe.

Exploration Well Drilling Commitment

With the encouraging results of the various geochemical and geophysical studies undertaken, Clean Rock applied for an extension of the GRESC. The DOE granted the extension on 09 October 2019. Clean Rock as part of its commitment for the extension, will drill two exploration wells. Prior to the drilling of the commitment wells, it will conduct consultation with the communities and undergo the permitting process for special land use and tree cutting permits.

Based on surface mapping, Natib has known fault systems that could have produced natural fracture systems in the subsurface. The challenge is to encounter such subsurface fracture systems while drilling the wells in order to tap a conventional geothermal system. If after drilling the new wells, Clean Rock is still unable to intercept a natural permeable geothermal fluid reservoir with free-flowing hot fluids, then it could use the alternative hot-dry-rock technology. Using the same wells drilled in looking for a natural fluid reservoir, it will try to create artificial subsurface rock fractures, through the process called hydrofracturing. Hydrofracturing involves injecting water through a well that can flow through the rocks, acquire heat from the rocks and then flow into a second well as steam. The key to the success of hot-dry-rock technology is painstaking geological analysis,

which ensures that the wells are positioned to hit the right rocks. As the depth of the hot rocks in Natib are relatively shallower compared to many other continental hot-dry-rocks, there would certainly be savings in drilling and well maintenance costs.

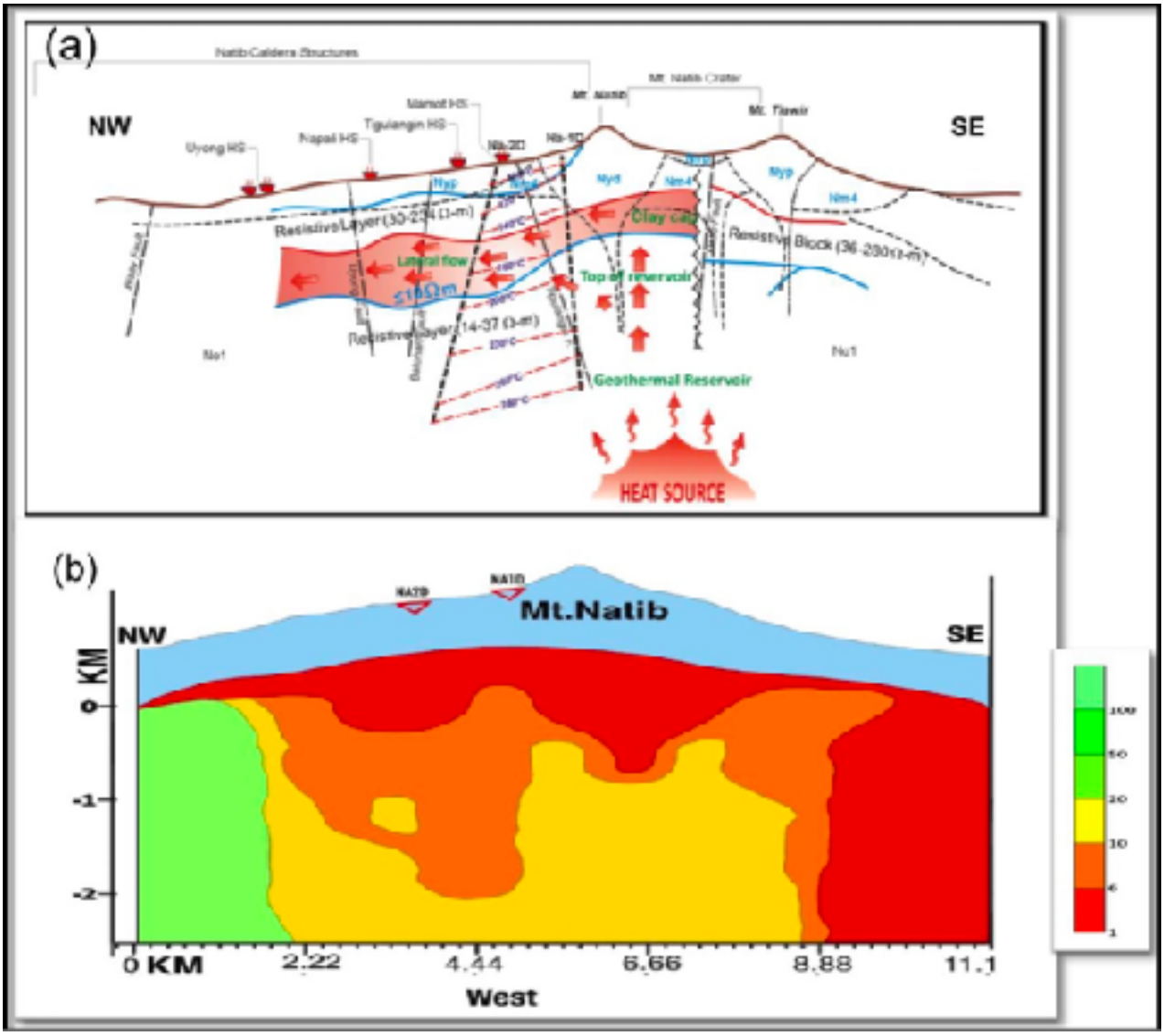

Figure 6. CSMT vs. MT Resistivity Models.

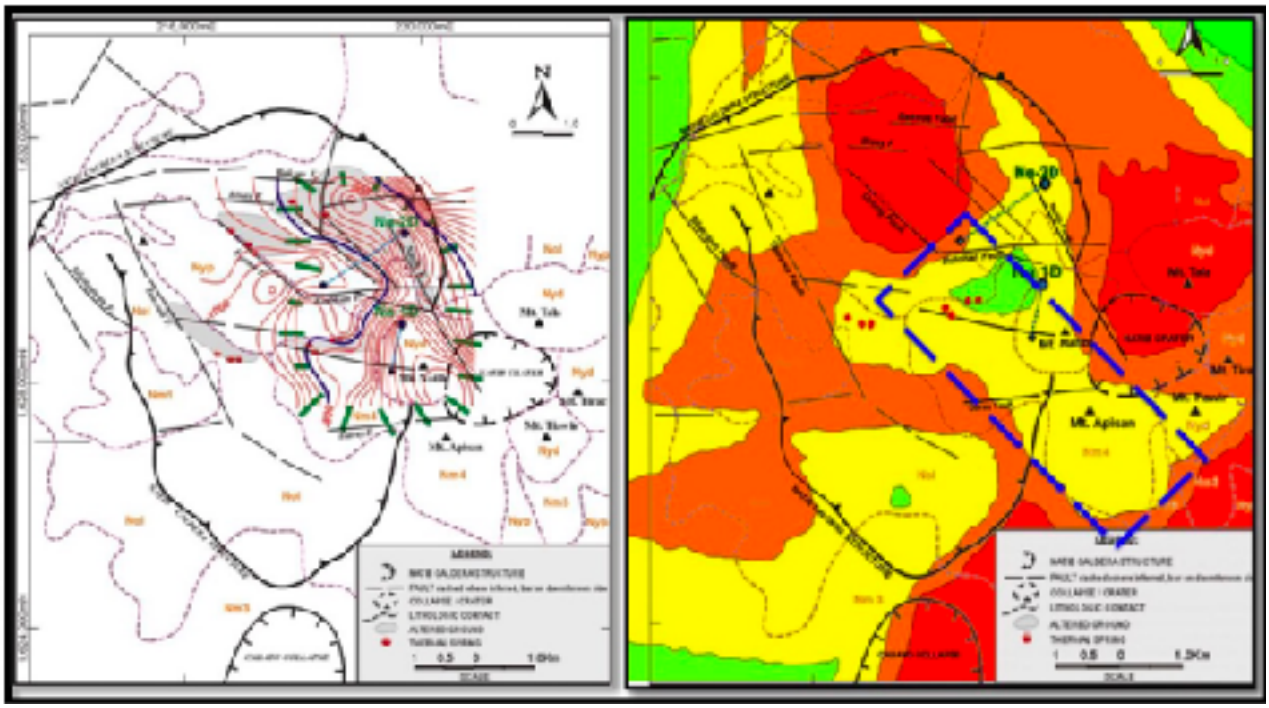

Figure 7. Elevation Contour of the Base of the Conductive Cap (CSMT) vs. Isoresitivity Map at 2,000m depth (MT).

Power Generation Potential

MT survey estimates of the electric power generation capacity of the heat energy within this geothermal prospect is roughly 40 MWe. Assuming that the average power capacity of one production well is 8MWe, then five (5) production wells are needed be drilled in order to produce 40MWe of electricity. For conventional geothermal systems, additional wells for injecting spent water back into the ground need to be drilled also for sustainability of the resource exploitation. Usually, one re-injection well is needed for every two or three production wells.

The Natib Project offers several critical advantages. The Philippines has a relatively big population and a fast growing economy with an increasing demand for baseload electricity. Metro Manila and the Subic Bay Freeport, which are relatively close to the Natib area, are the big potential markets for the electricity that may be produced from the geothermal field. It is also important to note that the Natib geothermal field is close to existing transmission infrastructures, which will make the project more attractive to investors. The national power grid is less than nine (9) kilometers away from the geothermal field and there are roads going to or close to the area.

To summarize, the Natib geothermal project, a baseload power supply, deserves further geothermal exploration drilling and development works in order to fully assess its energy potential primarily as a conventional geothermal resource system. The area has advantages in terms of availability of data, geological occurrence,

proximity to electricity markets, qualification for financial incentives, and closeness to transmission infrastructures that would considerably reduce costs and make the project economically feasible. Also, the project has advantages in terms of environment-friendliness and potential inexhaustibility of fuel supply that are significant considerations in the viability of the project.

Figure 8. The author with school children of Morong, Bataan during the community consultative assembly in June 2009.