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学年または身分: D3 (3/2020 graduate)

研鑽タイトル Research Title

Development and implementation of solar-powered water treatment system for off-the-grid communities in Western Visayas, Philippines

渡航先 Visited Institution

Host: University of San Agustin

Fieldwork site: Panobolon Island, Nueva Valencia, Guimaras, Region VI, Philippines

渡航期間 Traveling Period

February 12, 2020 to March 16, 2020

研修概要 Research outline

As a research-based outreach program under the leadership of Assoc. Prof. Kumiko Oguma, Ph.D., in collaboration with the University of San Agustin (USA), the technical feasibility was studied by testing the beta prototype of solar-powered UV-LED water treatment system on the site. Specifically, the effectiveness of the system in reducing microbial (coliform) load in deep well water and the social opinion of the target beneficiaries on having a water treatment was probed through a focus-group discussion.

研修先について About the site visited

The fieldwork team is composed of me and Engr. Achilles Espaldon, a researcher faculty of USA – Chemical Engineering Dept., and also an incoming 1st year doctorate student of the AIS Dept., The University of Tokyo and 2 hired research technicians (RTs). We conducted our fieldwork from 2/12 to 3/10 in Panobolon Island, Guimaras. It is an off-the-grid island community with a land area of 3.11 km². This island has level I water supply sources, which include dug wells, artesian wells, shallow and deep wells, and natural sources, such as springs and creeks. One of the residents' main sources of income is fishing and they primarily rely on crude oil-powered electric generators and solar power systems for power supply.

The University of San Agustin houses the Gregor Mendel Research Laboratory, which served as our research team's workplace during weekends for Physico-chemical

measurements of the retain water samples taken during fieldwork.

To wrap up the fieldwork, I paid the Dr. Samuel Gumarin, MD, MPH, the Governor of Guimaras Province, and the Guimaras Environmental and Natural Resources Office (GENRO) team a visit and reported a summary of the fieldwork and our possible next steps, requesting for their financial, infrastructural, and technical support in the future.

研修内容 What you learned

On technical feasibility: the single-unit, 280-nm UV-LED module alone was insufficient to disinfect deep well water. This is possibly due to the wild coliforms being more UV-resistant and that these coliforms would require other wavelengths to cause destruction of the wild coliforms' DNA. Meanwhile, we found that prolonged exposure of water to sunlight having an average intensity of 1200 W/m² reduced its microbial load and no DNA reactivation was observed in the succeeding hours based on water sampling by membrane filter technique.

On social opinion: the main concern of the islanders is where to get sustainable water supply for their needs, specifically during summer. Before we could implement a disinfection system, they need more water sources. They will appreciate if experts on searching aquifers could come and survey the island. Aside from aquifer surveying, a potential water source could be a rainwater harvester. Another concern raised by a community leader was the sanitary discipline that must be imposed in using buckets to harvest water from communal wells. These issues were pitched to the Governor and the GENRO team for their reference in the future.

研修先で特に印象に残ったこと The most impressive thing

Although microbial treatment of water is a different field from my developed expertise during my graduate studies, which is more on the material science of high-efficiency solar energy devices under the leadership of Prof. Yoshitaka Okada, Ph.D., the possible solution which I would like to try out hereafter is very much related to what I was doing back then. While I cannot give specific details about it yet, the new system that I would like to design is based on the concentrator solar cell concept, which I became very familiar with during my Ph.D. pursuit. I am very happy that my past studies will not be in vain as I fully transition into a new research topic and amazed that the nuggets of knowledge I gained during my journey as a young scientist are starting to fall into place.

※研修先でのご自分の写真を数枚添付してください。Please add your photos taken at the destination.



The fieldwork team (left to right): Ryan (RT), Achilles (D1), Bern (D3), and Onyok (RT)



Focus group discussion (FGD) participants from Panobolon Island last March 1, 2020.



Left: Bern inside the black cover doing sampling; Right: Meeting with Gov. Gumarin and GENRO team.

More photos here:

<https://drive.google.com/open?id=1RcEjJbFKM6txG77mykTMHEYfnX9pJmwS>