

# Economic and non-economic regional value-added of large-scale photovoltaic (mega solar) power: A case of Uku Island in Sasebo City, Kyushu

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## 【問題・目的・背景】

Japan government has clarified its strategy of placing renewable energy as the main power source in its mid- to long-term energy transition plan (METI, 2018). Amid various policies of renewable energy expansion, it is, in particular, stressed to as an important material for local economic revitalization and realization of a circulating society at a local level facing the social challenges of a decreasing birthrate and rapidly aging demographics (MOE 2018).

Under these context, in recent, local governments' energy self-governance introducing renewable energy sources is gaining attention in realizing a decentralized energy system and revitalizing the local economy. Municipalities that produce more renewable electricity than the electricity demand for domestic and agricultural water in the region are increasing.

According to statistics on energy self-sufficiency ranking by prefecture in 2018 (Kurasaka Laboratory and Environmental Energy Policy Research Institute, 2019), 4 out of the top 10 prefectures (1st Oita Prefecture, 2nd Kagoshima, 4th Miyazaki Prefecture, and 10th Kumamoto Prefecture) are prefectures within the Kyushu area. Many of these are based on the large-scale photovoltaic (PV) power generation projects.

In regards to regional economic value added, the mega solar projects generate regional economic benefits mainly through tax revenues (tax on fixed installations and businesses, income taxes due to increased employment, etc.). Meanwhile, in terms of non-economic added value, unlike a small-scale community-based energy project for self-sufficiency of electricity, in the case of Mega Solar project, there is a concern of asymmetry in the economic feasibility of business and the creation of non-economic added value of local community (Morotomi, 2019). Thus, the structural and

institutional design of the project considering establishment of an institutional foundation, participation of local residents, sustainable system for profits return are key issues (Suk et al., 2019).

This study focuses on Uku Island in Sasebo City, where the largest mega solar project in Japan is planned. Overlooking the historical progress and discussion on renewable energy projects in Uku Island, it aims to measure regional added value of the large scale PV installation in economic and non-economic aspects, and clarify the issues and challenges for sustainable local energy initiatives.

## 【研究方法】

The study was conducted in conjunction with Nagasaki University (Division of Environmental Sciences) and Berkeley University's summer internship program, *New Landscape for Post-Corona- Saving the cultural landscape of Uku Island*. The purpose of the internship program is to comprehensively understand the history and culture of Uku Island and design its new landscape for post-Corona.

Expanding the findings under the internship, this study is planned in two folds: firstly to identify the policy progress and historical discussions on the renewable energy in Uku Island, using internet accessed documents by the local governments, literatures in academia, newspapers by Medias and other written information were widely reviewed, and to empirically measure residents' perception onto the mega-solar project in their place by implementing questionnaire survey during July in 2020. As a result of the survey, 738 valid samples were collected.

Based on this first step, in the second stage, it further examines the economic and non-economic regional value-added of mega solar power quantitatively and qualitatively. For the economic add value, RVA

(Regional Value Added) of Renewable Energy, developed jointly by Kyoto University, Ristumeikan University and Institut für angewandtes Stoffstrommanagement (IfaS) are employed. In addition, this study develops an analytical framework for non-economic added value, including determinants of regionally driven renewable initiatives based on literature reviews.

This study also adopts interviews targeting with related local government officials, related experts on energy policy and aging decreasing as well as residents in various age range via online or in person.

Due to delay of data collection for the research activities, this paper presents mainly the results and findings learned in the first step.

**【研究・調査・分析結果】**

Ukushima is an island in the northernmost part of the Goto Islands, about 50 km west of the mainland of Kyushu, and belongs to Sasebo City. The total area is 24.93 million square meters. Its population is 2,179 in 2015 (1,183 household in 2017), and livestock industry is thriving.

It is said the birthplace of the Goto family. In the Island, there are many historical and cultural monuments related to “Heike Mori” all over the area. Currently it is suffering severe depopulation with high share of aging population.



Figure 1 Geographical location of Uku Island

In April 2013, Photovolta Development Partners GmbH (PVDP) launched a mega solar project on Uku Island.

In addition to PVDP, in June 2014, four companies including Kyocera, Kyudenko Corporation, ORIX Corporation, and Mizuho Bank signed the project and reached a basic agreement.

However, on January 24, 2018, PVDP agreed to transfer its rights to 「Ukishima Island Future Energy Holdings Limited Liability Company」, resulting in PVDP and ORIX Corporation were excluded, but SPCG (headquarter in Thailand), Tokyo Century Corporation, Furukawa Electric Industry, Tsuboi Industry, and 18Bank were newly joining. The total investment amount is around 200 billion yen.

According to the information on Kyocera’s website, the total power generation capacity of the project and the annual power generation are estimated to be 480MW and 51.5 million MWh, respectively, which is equivalent to an annual amount for covering approximately 173,000 households. The annual CO<sub>2</sub> reduction of the project is expected to be about 27,4750tons.

The scale of the project requires a total of 16.5 million PV panels, which covers an area of 6.3 million square meters, accounting for 40% of the total island area. In fact, the annual power consumption required for the entire island is only 0.7% of the project’s estimated annual power generation. It poses a significant scenery impairment, risk of landscape damage such as flooding and infringement of the cultural heritage, as a result, is likely to have an adverse non-economic impact.

Factors evaluated as non-economic impacts include the establishment of a system for the use of natural resources in the region (enactment of related regulations, establishment of NGOs, NPOs, or etc.), realization of energy self-sufficiency, participation and investment of local residents’ voluntary energy projects, community revitalization, environmental and cultural conservation, etc., which were found in local governments that are recognized advanced cases of energy autonomy.

In Uku, no institutional norms for the use of

natural resources on the island was found. The mid-to-long-term institutional provision in which business profits are returned to the island is also insufficient. Particularly in terms of local residents' participatory energy business and community revitalization, although 60% of the residents are interested in large-scale projects on the island, the institutional mechanism for capturing local residents in these projects is very weak and in actuality local residents are excluded from renewable energy projects, which is contrasted with precedents of citizens' activities in other advanced cases adopting citizen investment.

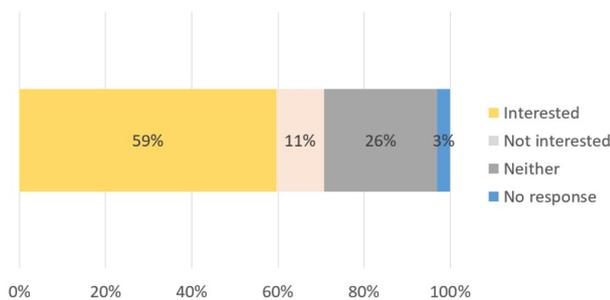


Figure 2 Interested or not in Uku Island's renewable energy business (n=737)

#### 【考察・今後の展開】

In order to achieve the government's long-term renewable energy expansion target and greenhouse gas reduction target, introduction and expansion of renewable energy is inevitable. At a local level, renewable energy utilization that makes use of energy sources available in the region is an important axis for the local economy and community revitalization, while population reduction and aging are increasing.

Focusing on the Uku Island, this study seeks to raise the question of the balance between renewable energy development paradigm and conservation of nature and culture around Uku Island.

Renewable energy is an eco-friendly business. However, if a large-scale project does not express its original value in the community, it should not be overlooked that it is only an existing development-oriented project we have experienced in a high-growth era in the past.

Therefore, along with the economic added value of the renewable energy project, the local governments and companies in planning and implementing the renewable projects should take non-monetary added value into account significantly in the mid- and long-term view.

It would be a critical policy implications for the local governments and citizens who under considering large-scale renewable energy projects.

As a follow-up study, it is necessary to estimate environmental costs by industrial waste of large number of photovoltaic panels as well as non-monetary costs of cultural value loss due to the project and externalize these neglected cost into the profitability of the project.

#### 【引用・参考文献】

- Kurasaka Laboratory and Environmental Energy Policy Research Institute、2019、「永続地帯2019年版報告書」、千葉大学
- METI (Ministry of Energy, Trade and Industry)、2018、「第5次エネルギー基本計画」  
(<https://www.meti.go.jp/press/2018/07/20180703001/20180703001-1.pdf>)
- MOE (Ministry of Environment)、2018、「第5次環境基本計画」  
([http://www.env.go.jp/policy/kihon\\_keikaku/](http://www.env.go.jp/policy/kihon_keikaku/))
- Morotomi Toru, 2019, 「入門 地域付加価値創造分析—再生可能エネルギーが促す地域経済循環」, 日本評論社
- RAUPACH-SUMIYA Jörg, 2014, 「Measuring Regional Economic Value-Added of Renewable Energy: The Case of Germany」, 社会システム研究, 第29号, p.1-31  
(<http://www.ritsumeit.ac.jp/acd/re/ssrc/result/memoirs/kiyou29/29-01.pdf>)
- Sunhee Suk, Nobuo Shirai, Socheol Lee, 2019, 「Locally-led renewable energy implementation for energy system transition in Korea: a case study of Jeju Special Administrative Province」, Discussion Paper, Research Project on Renewable Energy Economics, Graduate School of Economics, Kyoto University  
([https://www.econ.kyoto-u.ac.jp/renewable\\_energy/stage2/pbfile/m000166/REEKU\\_DP003.pdf](https://www.econ.kyoto-u.ac.jp/renewable_energy/stage2/pbfile/m000166/REEKU_DP003.pdf))