# Kao Corporation

Demonstration project to build a prediction model for the spread of mosquito-borne viruses by using AI technology and improve the forecast system UX for preventing dengue fever in Thailand

Objective of the project

Mosquitoes carry diseases such as malaria and dengue fever, which kill many people. In particular, dengue fever is a serious problem in the ASEAN region, causing significant economic losses. There is no specific medicine for dengue fever, and avoiding mosquito bites is important to prevent dengue fever. Therefore, this project aims to predict and effectively notify people of dengue fever outbreaks, and to promote changes in the awareness and behavior of each individual to protect themselves from mosquitoes.

Cooperation with local companies/governments
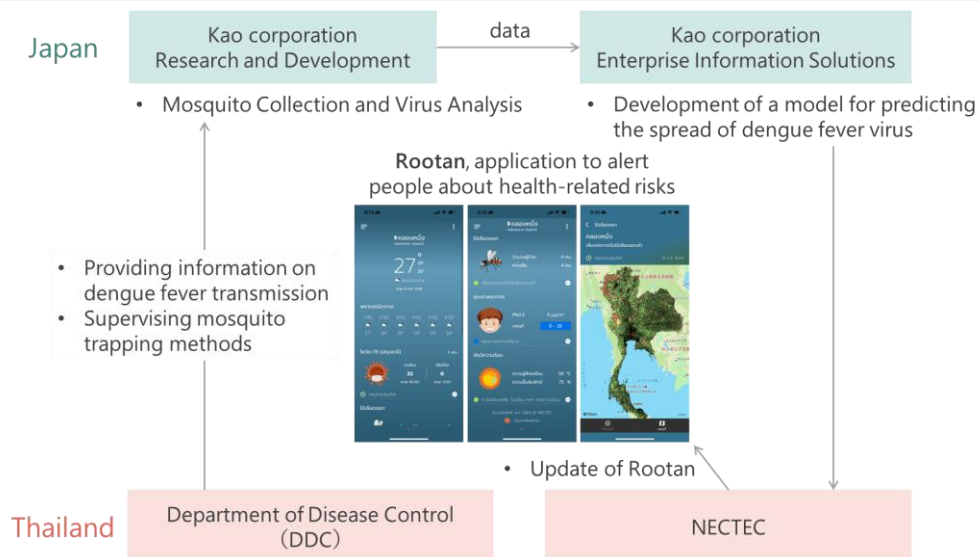
Targeted economic/social issues

The main symptoms of dengue fever are fever and rash that lasts 2–7 days, and some cases can lead to severe dengue hemorrhagic fever with internal and external bleeding. In Thailand, 50,000 to 150,000 people are infected with dengue fever annually, with an estimated economic loss of $61 per household. This amount is more than the average monthly income of a Thai household, and contracting dengue fever is a major physical and economic burden for people living in Thailand.

There is still no vaccine or specific treatment for dengue fever. Therefore, the most effective way to prevent dengue fever is to avoid mosquito bites. In Thailand, the government regularly surveys and exterminates mosquito larvae to prevent the spread of dengue fever, and when dengue fever infection is reported, insecticides are sprayed around the homes of patients to eliminate the mosquitoes. However, the effectiveness of these activities conducted by the government is limited. The reasons for this are (1) the recent outbreak of COVID-19 and (2) the emergence of insecticide-resistant mosquitoes. First, regarding (1) the COVID-19 epidemic, COVID-19 and dengue fever have similar symptoms and are difficult to diagnose and treat in hospitals. In addition, telecommuting increases indoor mosquito bites and raises the risk of infection with dengue fever. (2) Regarding the emergence of insecticide-resistant mosquitoes, the number of mosquitoes that are resistant to insecticidal ingredients such as pyrethroids and do not die even when sprayed with insecticides has been increasing, which has become a social issue in recent years. In 2023, dengue fever spread worldwide due in part to an increase in the number of people traveling to and from overseas. Despite the fact that consumers and governments are aware of the dangers of mosquitoes and the importance of mosquito bite prevention, dengue fever continues to be a major social issue.

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Demonstration period

October 2022 – January 2024

Details of demonstration

During the project period, new predictors were examined in order to more accurately estimate the risk of infection. We focused on "dengue virus prevalence in wild mosquitoes" and "mosquito distribution information obtained from the public." To analyze the dengue virus prevalence in wild mosquitoes, we collaborated with a Thai government agency and collected mosquitoes in the study areas. As a result, it was confirmed that mosquitoes collected near patients' homes after an outbreak of dengue fever had a high positive rate for dengue fever virus. To obtain information on mosquito distribution from the public, we proposed to incorporate a crowdsourcing function into "Rootan," a free application operated by NECTEC. This function is planned to be launched in 2024 and is expected to provide insight into how the mosquito bite information obtained through this method can be used as a predictor to estimate the risk of dengue fever transmission.

In addition, Kao, DDC and NECTEC have established a roadmap for the project and a vision of the society that the project should aim for, which was announced at the ASEAN Dengue Day held in Thailand in June 2023. At the same time, a press conference was held in Japan, where Kao's efforts to combat dengue fever were widely discussed with a great response.

Project outcome / Future plans

This project tested two new predictors for early and accurate estimation of the risk of dengue transmission: "dengue virus prevalence in wild mosquitoes" and "mosquito distribution information obtained from the public." The result revealed a high probability of dengue virus-positive mosquitoes in the vicinity of dengue patients' homes. This suggests that not only information on the occurrence of dengue patients, but also the dengue virus prevalence among mosquitoes may be useful in predicting risk transmission. Through this activity, we were also able to establish collaboration with local health departments and hospitals. We would like to use this collaborative framework to conduct detailed survey on the lives of local residents and dengue outbreaks to appropriately identify the risk of dengue infection and take measures for risk management.

While the development of a dengue risk sharing platform is underway, it is also important to expand the number of users of the application and add new functions to it. In the future, we would like to consider expanding the application to other Southeast Asian countries.

Crowdsourcing function to be included in Rootan (Image)