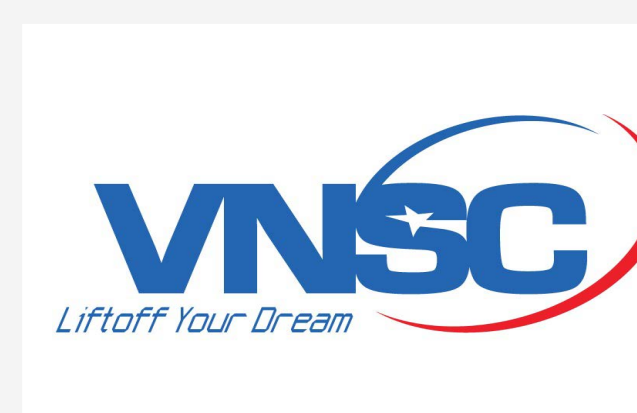


Mapping and modelling vulnerability to dengue in Viet Nam and the Philippines using geospatial and time-series approaches

Nga T. T. PHAM^{1*}, Cong T. NGUYEN¹, Kenji NAKAMURA², and Maria Ruth B. Pineda-Cortel³

¹ Vietnam National Space Center, Vietnam Academy of Science and Technology, Viet Nam; ² Faculty of Economics, Dokkyo University, Japan; ³ Faculty of Pharmacy, University of Santo Tomas, the Philippines; * Corresponding author. Email: pttnga@vnsc.org.vn; Tel.: +84-37917675; Address: Build. A6, 18 Hoang Quoc Viet, Hanoi, Viet Nam

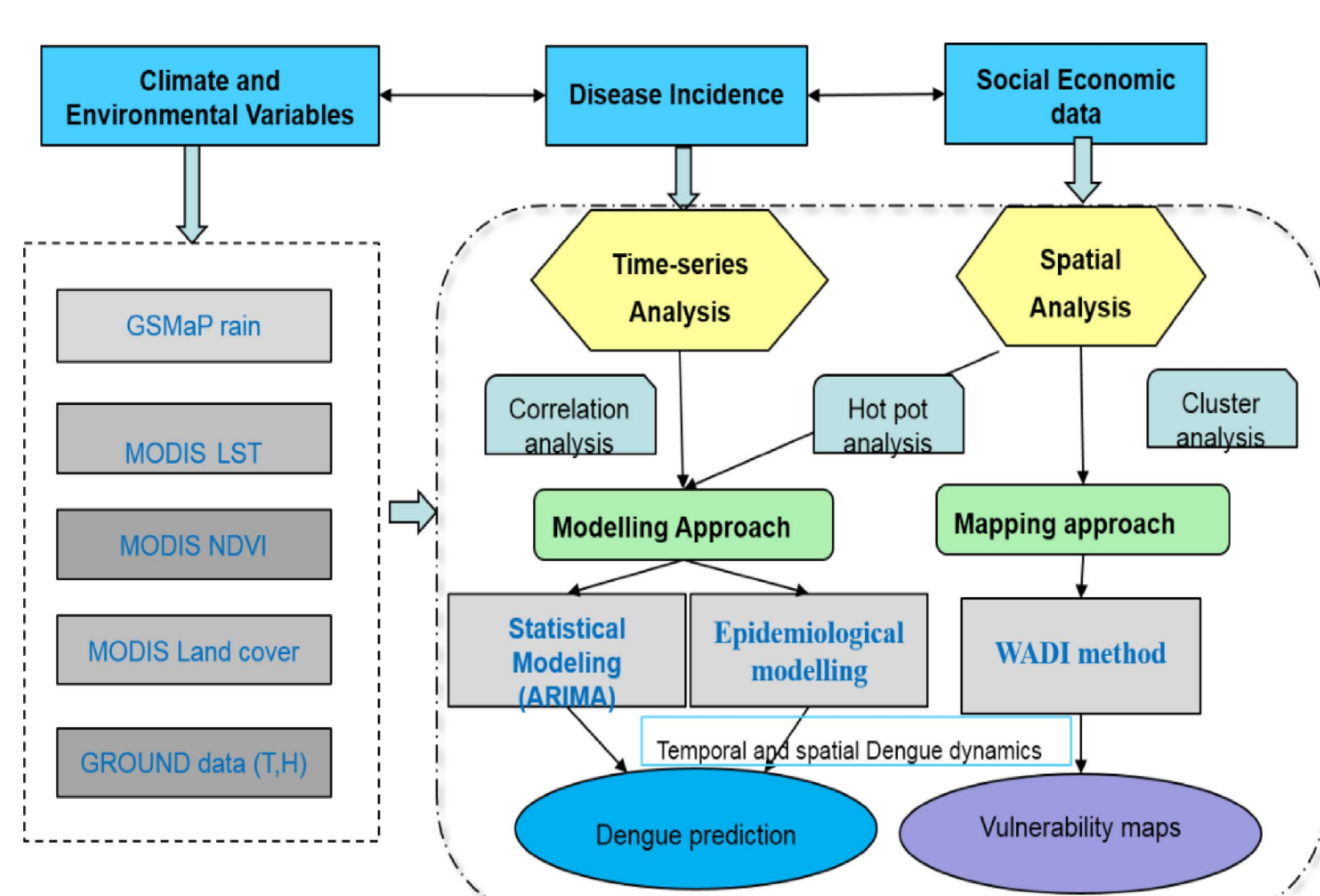


ABOUT THIS PROJECT

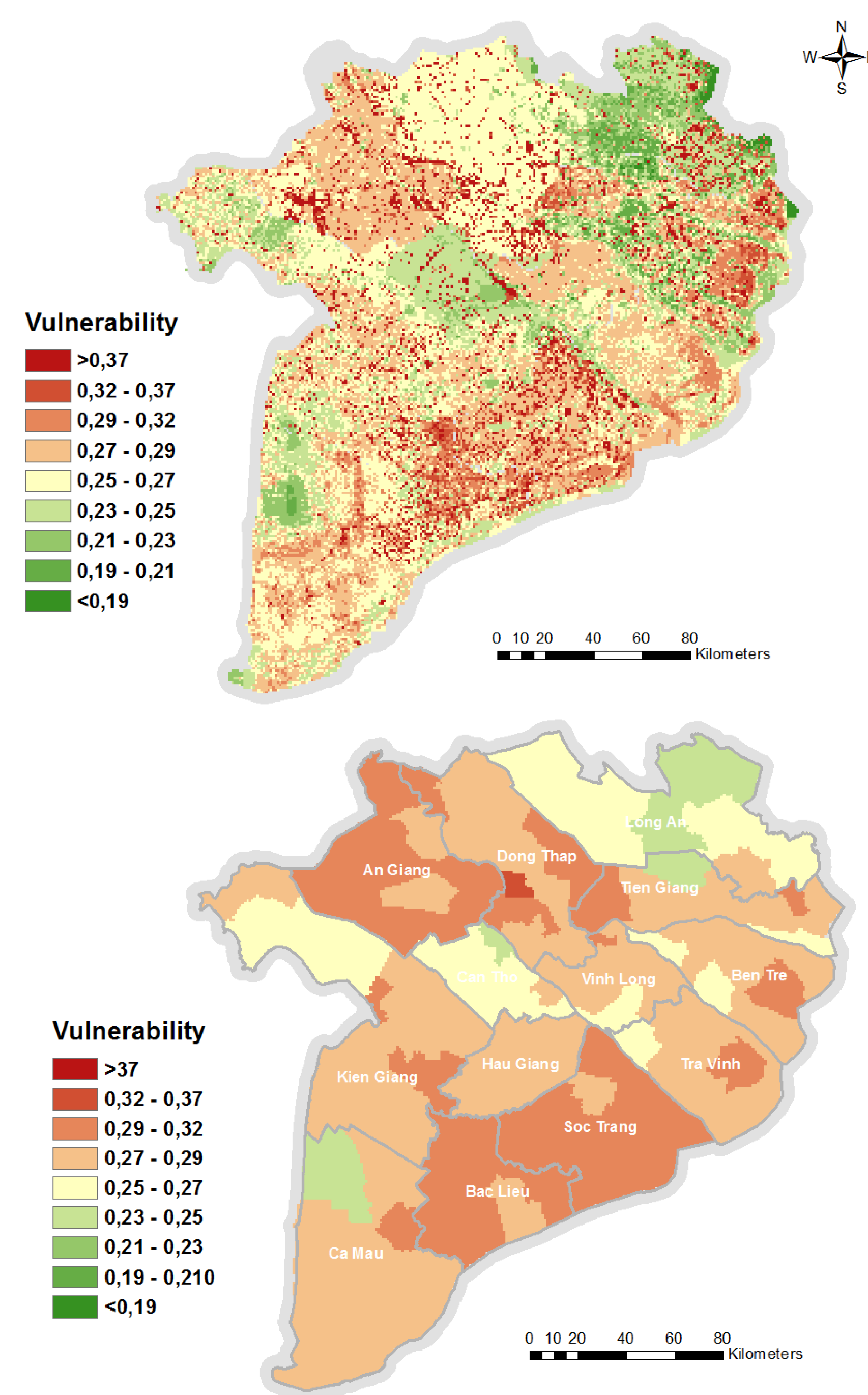
Viet Nam and the Philippines are recognized as extremely vulnerable to climate change due to regular flooding and frequent typhoons and, therefore, has an increased burden to climate change related diseases. Changes in temperature and precipitation are likely to alter the incidence and distribution of vector-borne diseases such as dengue and malaria.

The objective of the project is to improve the knowledge of the above vector-borne diseases and their vulnerability to climate variability for rural populations in both countries by using advanced geospatial technology. The study gathered and analyzed data on disease exposure in the period 2000-2016. We developed a geospatial database on dengue including temperature, precipitation, land cover, and socio-environmental conditions. Data analyses helped in identifying trends in epidemiological patterns, high-risk locations and factors, and mapping vulnerability to dengue. In addition, two mathematical approaches were applied to predict dengue in the most disease exposed regions in the two countries.

The outputs of the project including the database of climate-related diseases with the analyses and maps of vulnerability to dengue are accessible at the webGIS, <http://apn-climateandhealth.com>. Project results are expected to contribute to building science-based knowledge for adaption planning and decision making in health sector via informing risk and vulnerability.



^ Figure 1. Project framework.



^ Figure 2. (top) Yearly average vulnerability to dengue over the Mekong Delta region of Viet Nam shown in grid map; (bottom) data aggregated to administrative boundaries. Source: Pham, N., Nguyen, C., Vu, D., & Nakamura, K. (2018). Mapping of dengue vulnerability in the Mekong Delta region of Viet Nam using a water-associated disease index and remote sensing approach. *APN Science Bulletin*, 8(1). doi:10.30852/sb.2018.480

OUTPUTS

- A geospatial database of climate change related malaria and dengue diseases
- A GIS-based website presenting project results: <http://apn-climateandhealth.com>
- Published results on vulnerability of malaria and dengue diseases to climate change variable projections

Peer-reviewed publications

Pham, N., Nguyen, C., Vu, D., & Nakamura, K. (2018). Mapping of dengue vulnerability in the Mekong Delta region of Viet Nam using a water-associated disease index and remote sensing approach. *APN Science Bulletin*, 8(1). doi:10.30852/sb.2018.480.

Pineda-Cortel, M. R. B., Clemente, B. M., & Nga, P. T. T. (2019). Modeling and predicting dengue fever cases in key regions of the Philippines using remote sensing data. *Asian Pacific Journal of Tropical Medicine*, 12(2), 60.

Pham, N., Nguyen, C., & Pineda-Cortel, M. R. B. (in press). Time-series modelling of dengue incidence in the Mekong Delta Region of Viet Nam using remote sensing data, *Western Pacific Surveillance and Response*, 10(4). doi: 10.5365/wpsar.2018.9.2.012.

OUTCOMES*

- Enhanced application of remote sensing for public health in developing countries
- Improved basic knowledge for developing early technologies that can predict dengue outbreaks and map the vulnerability using climate and non-climate information
- Supported policymakers and public health institutions in formulating strategies for dengue prevention taking into consideration environmental/climatic variables in Viet Nam and the Philippines

* Project outcomes are not possible to achieve without earth observation related research for the public health sector.