

## Risk mapping for vector-borne infectious diseases by using multi-drivers

\*Nguyen Kim Anh<sup>1</sup>, Yuei-An Liou<sup>1</sup>

1. National Central University

Rapid changes in climate, environment, natural hazards, and socio-economics have potential impacts on human health. Transmission of vector-borne diseases can consider as one of the resulting impacts. Consequently, Geohealth research requires involvement of various influential drivers from different points of view including epidemiological, ecological, socio-economic, and climate model, while there exist challenges about data limitations and methodologies leading to uncertainties in synthesizing multi-indicators. Here we combine environmental factors, adaptive capacity, and main hazard types to perform infectious disease risk mapping. Vietnam is a suitable candidate for this study since it locates in the sub-tropical climate zone with high humidity and abundant precipitation, while unevenly distributed precipitation leads to frequently annual occurrence of drought and flooding. Results show that high risk tends to spread in the Northwest region, Northern coastal region, Central North Mountains, and Central Highland of Vietnam. Ecologically speaking, these areas are characterized by a high rate of precipitation and high elevation and temperate in the range of 22-36 degrees °C with surface mainly covered by dense forests and crops. Note that these areas are largely exposed to natural hazards. In terms of economics, these regions are of low-income, low-education, and poor housing conditions. While climate, environmental patterns, and natural hazard footprints may have direct effects on vector-borne diseases transmission, their influences may be modified and mitigated by socio-economic (adaptive capacity) factors. This study helps us with better understanding not only the effect of combination from multi-indicators, but also relative interactions of the individual indicator on potential vector-borne diseases' transmission. A risk infectious disease profile map provides flexible tools for local authorities to have an improved plan for health management. In addition, it is vital to prevail knowledge for communities about human and natural system dynamics and interactions and their association with human health related to diseases transmissions

Keywords: Vector-borne diseases, Geohealth, Natural hazards, multi-indicators

## Risk mapping for vector-borne infectious diseases by using multi-drivers

*Anh Kim Nguyen<sup>1,2,3</sup> and Yuei-An Liou<sup>1,3\*</sup>*

<sup>1</sup>Center for Space and Remote Sensing Research, National Central University,  
No. 300, Jhongda Rd., Jhongli District, Taoyuan City 32001, Taiwan, R.O.C.

<sup>2</sup>Institute of Geography, Vietnam Academy of Science and Technology,  
18 Hoang Quoc Viet Rd., Cau Giay District, Hanoi Viet Nam

<sup>3</sup>Taiwan Group on Earth Observations, Hsinchu, Taiwan, R.O.C.

Rapid changes in climate, environment, natural hazards, and socio-economics have potential impacts on human health. Transmission of vector-borne diseases can consider as one of the resulting impacts. Consequently, Geohealth research requires involvement of various influential drivers from different points of view including epidemiological, ecological, socio-economic, and climate model, while there exist challenges about data limitations and methodologies leading to uncertainties in synthesizing multi-indicators. Here we combine environmental factors, adaptive capacity, and main hazard types to perform infectious disease risk mapping. Vietnam is a suitable candidate for this study since it locates in the sub-tropical climate zone with high humidity and abundant precipitation, while unevenly distributed precipitation leads to frequently annual occurrence of drought and flooding. Results show that high risk tends to spread in the Northwest region, Northern coastal region, Central North Mountains, and Central Highland of Vietnam. Ecologically speaking, these areas are characterized by a high rate of precipitation and high elevation and temperate in the range of 22-36 degrees °C with surface mainly covered by dense forests and crops. Note that these areas are largely exposed to natural hazards. In terms of economics, these regions are of low-income, low-education, and poor housing conditions. While climate, environmental patterns, and natural hazard footprints may have direct effects on vector-borne diseases transmission, their influences may be modified and mitigated by socio-economic (adaptive capacity) factors. This study helps us with better understanding not only the effect of combination from multi-indicators, but also relative interactions of the individual indicator on potential vector-borne diseases' transmission. A risk infectious disease profile map provides flexible tools for local authorities to have an improved plan for health management. In addition, it is vital to prevail knowledge for communities about human and natural system dynamics and interactions and their association with human health related to diseases transmissions.

**Index Terms:** Vector-borne diseases; multi-indicators; Geohealth; Natural hazards.