PILOT ANALYSIS TO ASSESS BUSINESS CONTINUITY OF INDUSTRIAL COMPLEXES IN THAILAND BY CHANGES IN NITROGEN DIOXIDE CONCENTRATION

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1. INSTRCUTION

The 2011 Flood in Thailand triggered an acceleration of business continuity planning in industrial complexes. In these circumstances, the development of an objective indicator to measure the effectiveness of business continuity planning is necessary for future resilient business. There are studies conducted on understanding the heat emissions of industrial complexes [1], but there is limited scientific knowledge to understand the activities of industrial complexes from the perspective of business continuity. Therefore, this study set the research question of whether it is possible to objectively assess the status of activities in industrial complexes from indirect data and conducted a preliminary study of the effective feasibility of this approach was conducted.

2. RESEARCH METHODOLOGY

This study focused on Rojana Industrial Park (RIP) located in Phra Nakhon Si Ayutthaya province. COVID-19 was adopted as a crisis event. It is assumed that the RIP activity is negatively affected by the situation of the pandemic or by government intervention, such as the declaration of a state of emergency decree. The data used to explain the level of activity in RIP employs changes in nitrogen dioxide (NO_2) concentrations using the Google Earth Engine (GEE), which has created an analytical environment in previous studies by the authors [2]. Since meteorological and hydrological conditions such as relative humidity and NO_2 concentrations are correlated, we attempted to extract the impact of COVID-19 infection status and government interventions by conducting a principal component analysis that considers seasonality for observed time series data.

3. RESULTS AND DISCUSSION

The visualization results of the annual average concentration of NO_2 over RIP in 2019 and 2020 are shown in Figure 1. The COVID-19 outbreak in 2020 resulted in clearly lower NO_2 concentrations than in 2019: the average in 2019 was 10.8e-05, 7.1% lower than the 10.0e-05 in 2020. Figure 2 shows the trend component results for NO_2 concentrations since 2017, overlaid with the extracted change points, the occurrence of new cases of COVID-19 and the date of the emergency declaration. NO_2 concentrations was at a minimum in mid-2020, indicating that activity in RIP was lower than in other years. However, the discrepancy between the timing of the issuance of the emergency declaration and the fact that the concentration of the new coronavirus was decreasing even before the outbreak, does not fully explain whether COVID-19 is affecting the continuation of business in the RIP, i.e., maintaining the volume of business activities. To objectively understand the activities of RIP from indirect data, it is necessary to utilize additional data sets, such as analysis of concentrations of different air composition substances and nighttime light, and to identify environmental factors that change with the activities of industrial parks including RIP.

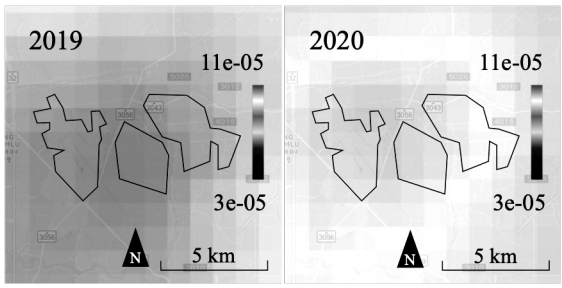

Figure 1. Comparison results of average NO_2 concentrations in 2019 and 2020 over RIP

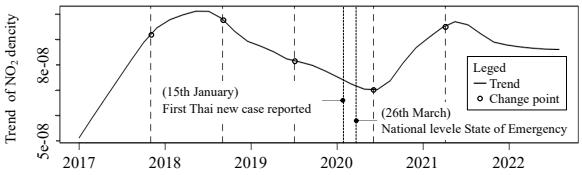

Figure 2. NO_2 trend above RIP: trend component

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