Prelimitary Analysis of the Relationship Between Conlifct Measures and Nightlights in Thailand: Pre-Doc Evaluation Task for Wyss Academy at the University of Bern

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Introduction & Background

Research Question: Is there a relationship between conflict measure and nightlights in Thailand? How did this relationship change during the decade 2010-2020?

To answer this research question, two types of data are required: the conflict data and the nightlight data. Conflict data can be obtained from Davies et al. (2025)'s UCDP Georeferenced Event Dataset (GED), which contains disaggregated conflict data on conflict events for specific times and locations. To ensure data completeness, we will not select based on event location precision and conflict type at this stage. However, further arguments and concerns may be necessary in a later analysis.

Nightlights data is widely publicly available [1]. The two main sources of night lights data are the Defense Meteorological Satellite Program Operational Linescan System (DMSP), available until 2013, and the Day-Night Band (DNB) of the VIIRS onboard the Suomi satellite launched by NASA and the National Oceanic and Atmospheric Administration (NOAA) in 2011. The VIIRS data is more advanced, contains fewer errors, and is more suitable for research. To adjust for inconsistencies between the two datasets, Xuecao et al. (2020) integrated DMSP data with VIIRS data, making the night-light raster data consistent from 1992 to 2020. As the research question focuses on the recent decade, which includes a transition period in nightlight data technology and methodology, we use Xuecao et al. (2020) adjusted nightlight data for time-series comparison and analysis. It is also worth noting that Gibson et al. (2020) discuss the potential risks of applying such data to economic analysis based on their underlying data collection methodology.

[1] e.g., World Bank Light Every Night Data, Xuecao et al. (2020)

1 Asian Map

Figure 1 shows conflict measures and night-lights for countries in Asia, where Figure 1a shows the measures for the year 2020 and Figure 1b shows the measures for the year 2010. The maps on the left show only nightlights, while the maps on the right show conflict events (red dots) in each country, overlaid on the nightlights data.

The countries that have suffered the most from conflicts in Asia over the past decade are Afghanistan, India, Pakistan, the Philippines and Myanmar. Thailand
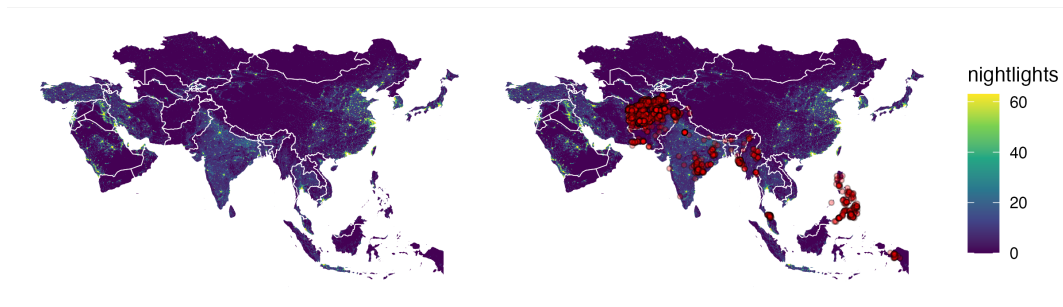
(a) 2020
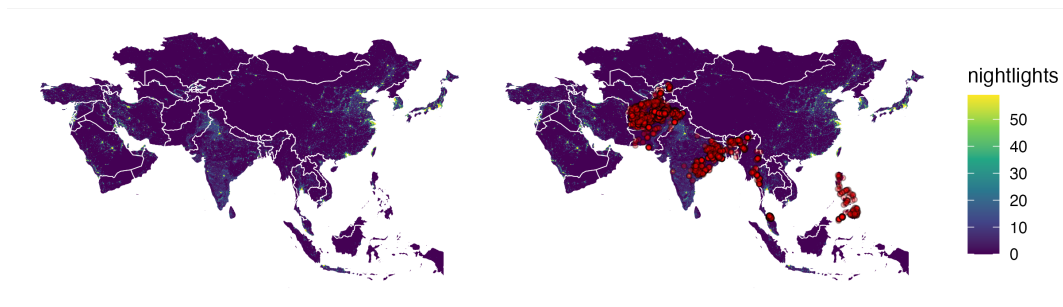
(b) 2010

Figure 1: Conflict Events and Nightlight Intensity in Asia. Year 2020 vs 2010.

is sixth (see the complete figures in the Appendix). By comparing areas of conflict with night-light intensity, a negative correlation between night-light usage and the concentration of conflict events can be identified. This negative correlation has also been consistent over time: for example, in 2010, night-light intensity was lower and conflict intensity was higher than in 2020.

2   Thailand Map

The comparison maps specifically of Thailand for year 2010 and 2020 are illustrated in Figure 2, where Figure 2a shows the nightlights and conflict events happened in Thailand in 2020 and Figure 2b shows similar data in 2010. The red dots on the right of each figure indicate the number of conflicts that have been undergone in that year. The white lines on the map are the province borders, which are obtained from GADM.

The night-time light usage is concentrated around the capital, Bangkok, which is the area with the most active economic activities. The conflicts are concentrated in the southern provinces, due to the ongoing ethnic and religious separatist insurgencies in the three southernmost provinces (Southern border provinces) of Thailand, Pattani, Yala and Narathiwat from 2004 to the present (Payo and Kamarulzaman, 2024). The insurgencies become more violent in early 2000s.

The map indicates similar correlations between conflict events and nightlights as in Figure 1 - conflicts are concentrated in areas with low night-time light usage, and in 2010, there were fewer night-time lights and more conflicts than in 2020.
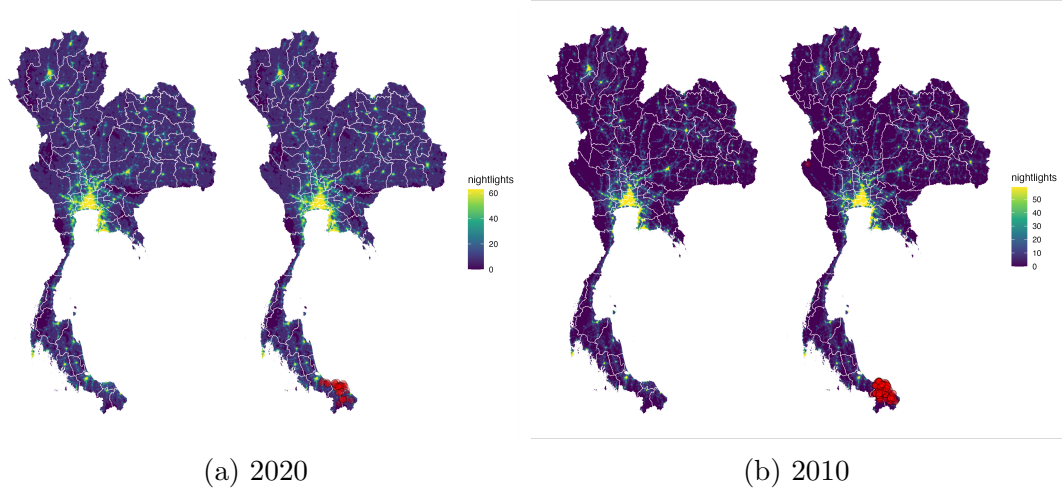

(a) 2020   (b) 2010

Figure 2: Conflict Events and Nightlight Intensity in Thailand. Year 2020 and 2010.

3   Descriptive Statistics

Next, Table 1 represents the descriptive statistics of Thailand province-year panel data on the nightlight and conflict measure. There are 77 first-level provinces in Thailand, and the sample covers the period from 2010 to 2020. The variable *nightlight mean* represents the average nightlight value in the given province in a particular year. *Conflicts number* is the number of identified conflicts ongoing in a certain time and area, and *conflicts events* is the total number of conflicts events occur in the province at a given year (the data unit of UCDP GED). A maximum of two types of conflict can occur in one province in one year, but 73 conflict events can occur in one province in a given year.

Statistic	N	Mean	St. Dev.	Min	Median	Max
nightlight mean	847	11.618	11.620	0.478	7.950	57.377
conflicts number	847	0.092	0.402	0	0	2
conflicts events	847	1.054	6.353	0	0	73
year	11			2010		2020
province	77					

Table 1: Descriptive Statistics for Nightlight and Conflicts in Thailand

4   Discussion

In conclusion, the preliminary analysis suggests promising avenues for future research into the relationship between night lights and conflicts. However, to conduct a causal relationship analysis, other factors affecting both nightlights and conflicts need to be taken into consideration. For instance, Payo and Kamarulzaman (2024) show the conflicts in the Southern Thailand have worsened the economy in such area, and the economy plays also an important role in the nightlight activities (Gibson et al., 2021). Other factors such as ethnicity/cultural, government repression actions (both online and offline), and rural/urban areas can also have an impact. There may also be a time effect, considering that some conflicts last for several years or even decades. Therefore, more robust research methodologies need to be employed for casual reference studies, such as difference-in-difference analysis.

5   Declaration of AI

I use AI tools and internet sources, such as books and YouTube videos, to enhance my understanding of geographical information systems and respective coding implementation in R during this task. All codes and data are available at Github Page.

References

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A   Appendix

rank	country	conflicts
1	Afghanistan	29248
2	India	4725
3	Pakistan	3963
4	Philippines	1714
5	Myanmar (Burma)	1152
6	Thailand	913
7	Bangladesh	135
8	Indonesia	78
9	Tajikistan	36
10	Kyrgyzstan	26

Table A.1: Ranking of aggregated conflicts events from 2010 to 2020 for Asian countries