

High Risk Shipping Routes in the South China Sea

Background

The South China Sea (SCS) has experienced growing confrontation and conflicts in the recent decades. Multiple parties including mainland China, Taiwan, Vietnam, Philippines, Brunei and Malaysia claimed either sovereignty or sovereign rights in the area. The overlapping claims to water has flared hot and cold tensions over the years between the parties. Parties fight over sovereignty, but also over the abundant natural resources under the sea bed of the South China Sea. Some precious and rich resources include gas, oil, and fishing resources. The natural gas is estimated to range from 190 trillion to 266 trillion cubic feet. Proved oil reserves is at least 7.7 billion barrels.

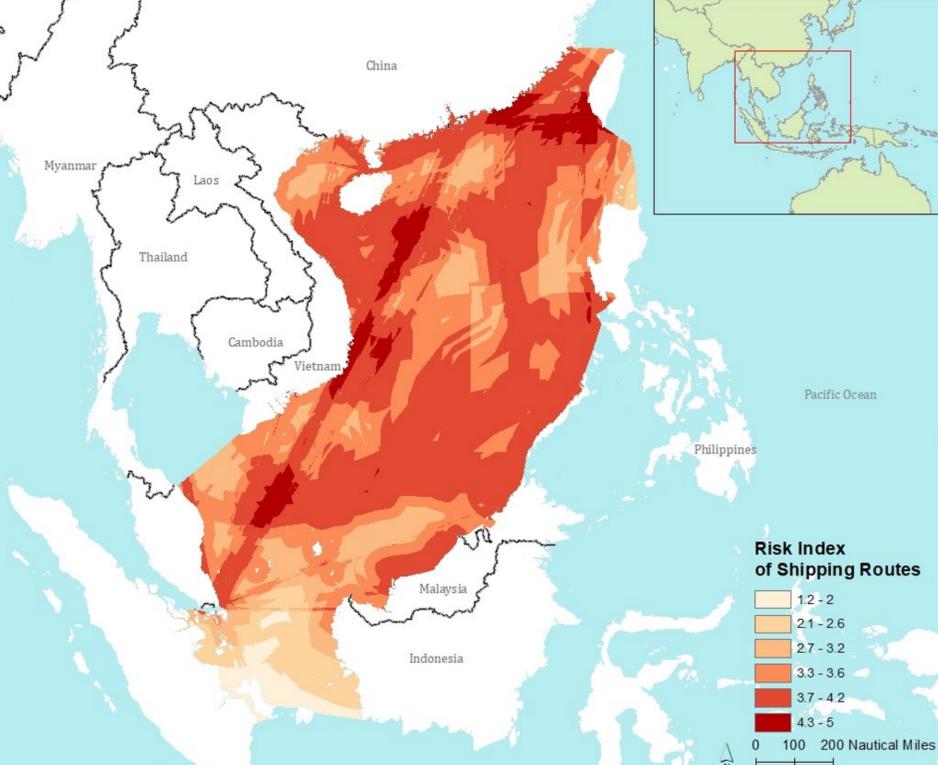
As claimants seek more aggressive approach to reinforce their claims

Results

The result shows that the shipping routes with the highest risk of conflict are located at where the **claimed boundaries** and **EEZ** of each country *cross* with one another, as well as where **oil and gas blocks** of each country *adjoin* each other. In terms of the oil and gas ownership, it turns out that **Vietnam, China and Malaysia** have the largest amount of oil and gas at high risk. Vietnam owns the largest share, of about 655477 sqkm of oil and gas in the SCS, China having about 364641 sqkm and Malaysia owning 344442 sqkm.

Limitations

Because the oil and gas blocks are drawn manually based on a georeferenced map, the locations and areas are only best estimates. This is important to note as it affects the area of oil and gas ownership by each country.



in the region, the South China Sea has seen many stand-offs, if not direct confrontation. Recent conflicts include the 2012 stand-off between China and the Philippines during the occupation of the Scarborough Shoal, the close stand-off between China and U.S. which nearly escalated into a conflict during U.S.'s operation in the South China Sea in 2018, and Chinese and Vietnamese ships that got into a stand-off since July, 2019.

This project aims to understand the vessel routes in the South China Sea that are most likely to experience conflicts, which can be illustrated by their proximity to maritime boundaries, vessel traffic, and availability of oil and gas, which are the two most important resources at stake in the area.

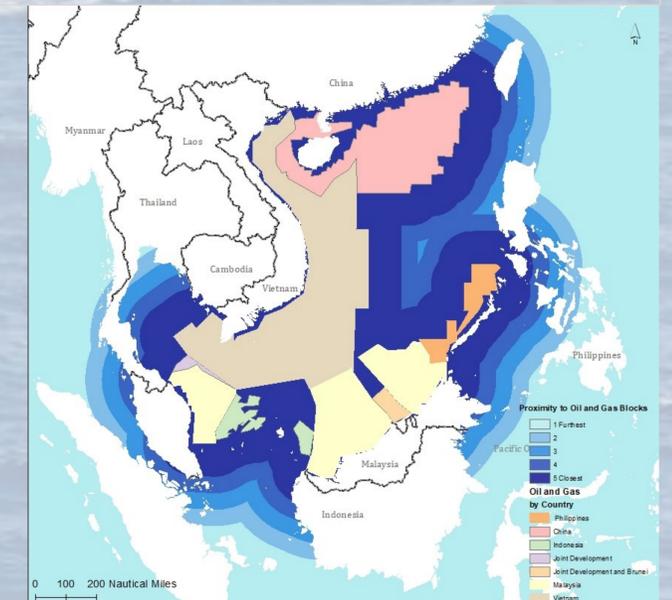
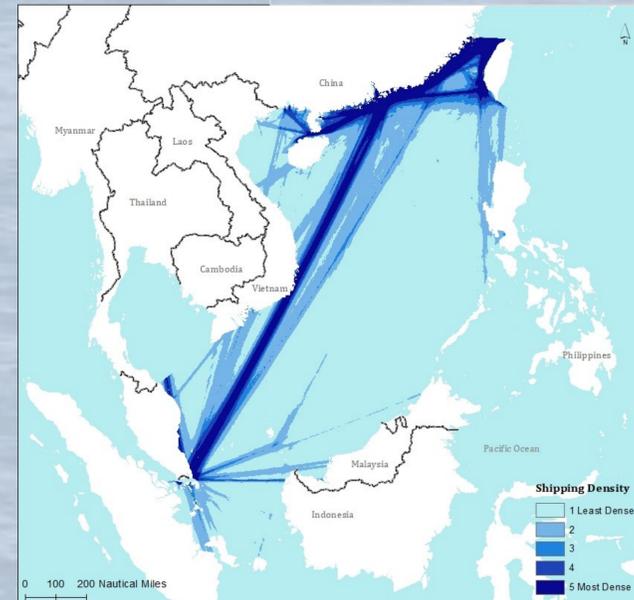
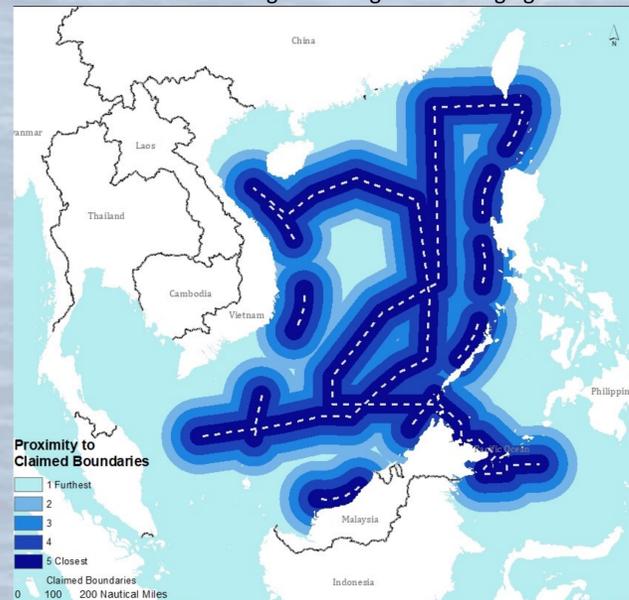
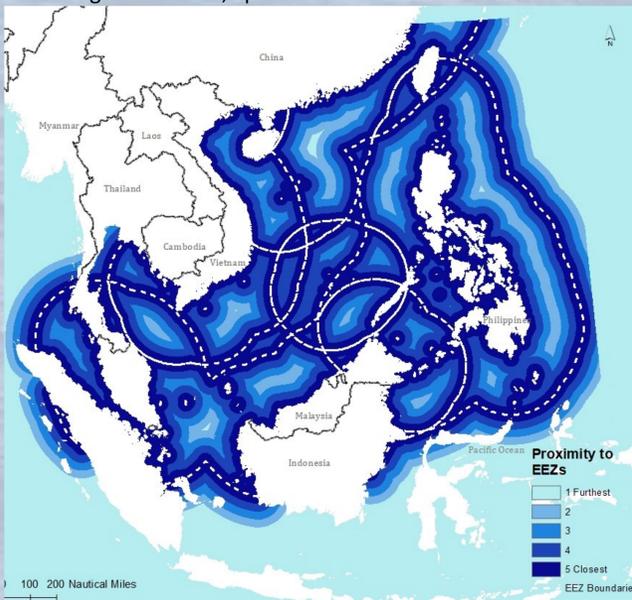
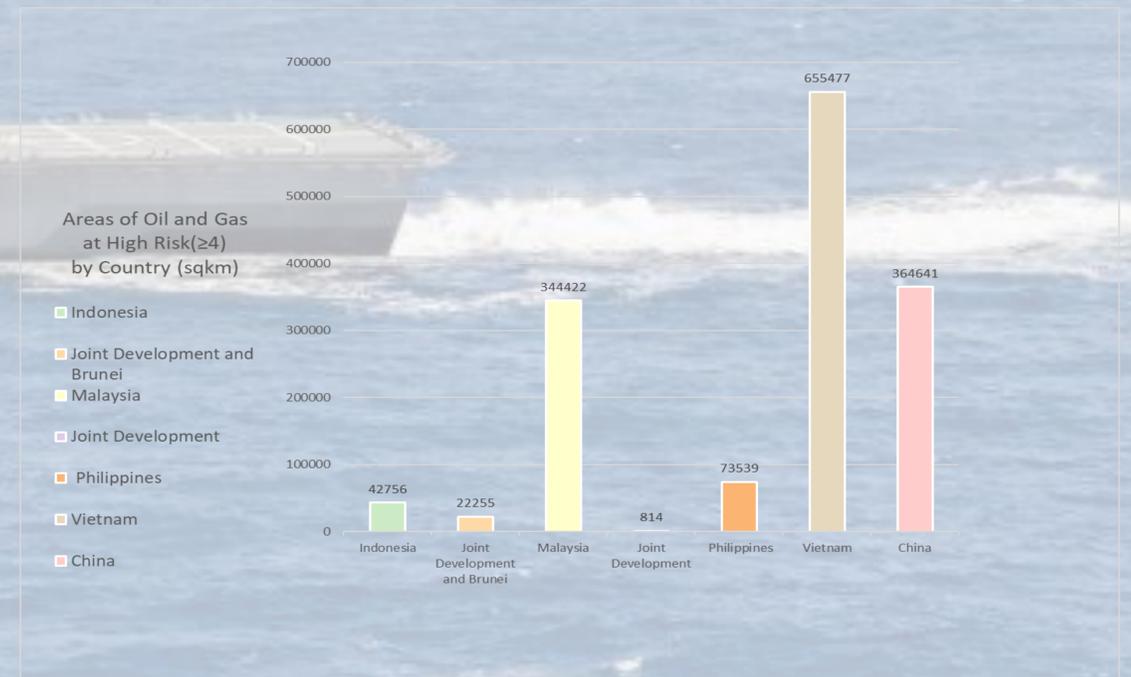
Methods

I first drew out the oil and gas blocks in the SCS based on a georeferenced map. Then I used the Euclidean Distance and Reclassify tool to reclassify distance from oil and gas blocks from 1 to 5, with 5 being the closest, thus most likely to experience conflict. The same method is applied to EEZ and claimed boundaries. The shipping density is also reclassified to a value from 1 to 5, with 5 being the most dense, thus most likely to experience conflict.

Finally, the shipping route risk index is calculated using raster calculator based on weighted index of all four attributes (proximity to EEZ, proximity to claimed boundaries, proximity to oil and gas, and shipping density). I assigned weights based on their relative importance regarding likelihood of conflict as follows:

$$\text{Risk index} = 40\% * \text{proximity to oil and gas} + 20\% * \text{proximity to EEZ} + 20\% * \text{claimed boundaries} + 20\% * \text{shipping density}$$

Because I want to explore the geopolitical power which comes into play regarding oil and gas resources, I grouped oil and gas blocks with risk index higher or equal to 4 as "high risk". Then, I performed a zonal statistics as tabular data so I can see the area of oil and gas with high risk belonging to each country.



Sources

Center for Strategic & International Studies (CSIS), The South China Sea in High Resolution ; Flanders Marine Institute (2018). IHO Sea Areas, version 3. Available online at <http://www.marinerregions.org/> <https://doi.org/10.14284/323> <https://www.marinerregions.org/downloads.php#iho>; Sophia Karbowski, South China Sea Map <https://www.arcgis.com/home/item.html?id=8d4d9653f373401fa108647646ad91e0>

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