COASTAL CALAMITY

Assessing Coral Reef Protection in the Philippines

Introduction:
The Philippines lies in the Coral Triangle, a region densely packed with coral reefs. These coral reefs are crucial habitat for fish stocks for the region, for export, and for tourism, so careful reef management is necessary. The dominant strategy for protecting fisheries and nursery habitats is establishing Marine Protected Areas (MPAs), which are zones of enforced regulation designed to minimize harmful impacts. Regulations can include reduced marine traffic and shipping, catch size limits, and licensing for fishery use.

I have generated a vulnerability analysis of MPAs for coral reef fisheries in the Philippines. I examine the correlation between coral reef vulnerability and MPA protection by answering the spatial questions: where do high population density and coral reef damage overlap, and where do MPAs currently exist? Further, what is the vulnerability of each coral reef in the Philippines and where can MPAs be improved or established to help mitigate the risk? In this project, I use available data on MPA location, location and incidence of coral reef health and decline, population density as an instrument for urban development, and risk areas for destructive fishing practices. I then use that data for a vulnerability score to compare with existing MPAs and determine where MPAs are effectively placed, and where the need for new MPA implementation is greatest.

The Data:
The data primarily comes from a past project from the World Resources Institute called Reefs at Risk Revisited, which mapped risk factors around reefs globally. I used destructive fishing practices data and MPA locations from WRI as inputs for the vulnerability analysis, population estimates from WorldPop to generate a risk factor based on proximity to infrastructure, and occurrence of bleaching and coral disease from ReefBase for another proximity-based risk factor. Together, these indicators of vulnerability are added together and mitigated by MPAs if necessary.

Conclusions:
Reefs are particularly vulnerable in smaller channels and passages among densely populated islands. These regions have typically higher concentrations of large coastal cities, coral bleaching, and coral disease. The MPAs that exist currently are generally rated as ineffective by the WRI, and more can be done to both increase effectiveness of existing MPAs and create new MPAs. The summary statistics of current MPAs indicate that only 0.007% of area at risk has been totally protected. These results are unsurprising because the Philippines relies on fishing and export for a large portion of its GDP. Shipping and port infrastructure combined with fishing pressures will continue to pose a threat to coral reefs, even as the oceans’ temperatures continue to climb.

This model serves to identify areas that can be protected in the future, though geospatial analysis is limited by an inability to determine causation, and arbitrary weighting. With further research, this model can be refined to serve as an accurate indicator of vulnerability hot spots and also accountability for existing MPAs.

Total Vulnerability Score in the Philippines

This score reflects values from 1 to 64, on a weighting scheme that involves each risk factor and a fractional modifier to reflect the protection offered by MPAs. The MPAs were weighted according to WRI analysis of their effectiveness as of 2011.

Proximity to High Population Density
Score weighting is 1 - 4 points for 20km - 5km respectively.

Proximity to Coral Disease
Score weighting is 1 - 4 points for 20km - 5km respectively.

Proximity to Coral Bleaching
Score weighting is 1 - 4 points for 20km - 5km respectively.

Frequency of Destructive Fishing
Score weighting is 2 points for medium risk, 4 for high risk.

MPA Location and Effectiveness
Score modification is 0 for Most Effective, 1/4 for Partially Effective, 3/4 for Least Effective.


Relevant Time Period: 2010

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