### Background

The China-Pakistan Economic Corridor (CPEC) is the flagship corridor of China’s Belt and Road Initiative (BRI), a large infrastructure development and investment initiative that spans over 60 states. CPEC itself consists of a total of $46 billion of investments of projects on energy, transport infrastructure, industrial cooperation, and the development of the deepsea Gwadar port. The goal of CPEC is to connect the Pakistani provinces Punjab, Khyber-Pakhtunkhwa, and the administrative territory of Gilgit Baltistan with the Pakistani city of Karachi and Chinese city of Kashgar located in Xinjiang. The projects are also supposed to create a new trade route that will not only be shorter and faster, but that will also avoid the Malacca Strait chokepoint that much of China’s imported oil currently ships through. Many of these projects carry significant risk though, with pressing concerns including terrorist attacks and instability in areas surrounding the investments. The highways, for instance, run through Gilgit Baltistan, which Pakistan considers to be a part of the contested Kashmir region. There are also environmental issues like landslides that have caused concern. Given the sheer financial and political risk that Pakistan and China have taken in embarking on these CPEC projects, it is crucial to mitigate risk when possible to increase the likelihood of a successful implementation. Consequently, this poster explores how the CPEC projects, specifically the highways, increase regional connectivity and aims to identify the high-risk areas for highways based on terrorism and flood risk.

### Methods

Highway map: The highways were created by geo-referencing an existing map of the CPEC highways from the Pakistani government website and using the edit tool to trace over the routes on the government map. Key Pakistani cities and energy projects were also included in the map to establish how the highways increase connectivity in the state.

Terrorism density map: The XY coordinates of terrorist attacks from 2013, the inception of CPEC, to 2018, were used. The kernel density tool used these points to create a raster that displayed the density of terrorist attacks. A radius of 1km was used as an attack beyond 1km of the highway is unlikely to cause any consequential damage.

Floodplain map: Since the Indus river is known for moderate to severe flooding, a buffer was created to highlight areas of the highways that may be damaged in the event of a flood. A buffer of 150m was created around the Indus river because the floodplain width has historically been greater 200km.

Total risk map: I turned the vector floodplain map into a raster by using the polygon to raster tool. Then I used the raster calculator and weighted the floodplain risk and terrorism risk equally, because they are both equally damaging, to create a raster with the combined risk. This analysis assumes that places with a history of terrorist attacks indicate a higher likelihood of attack in the future.

### Limitations

One significant limitation of this poster’s analysis is the inaccuracy of the CPEC highway routes. Since the highways routes are relatively new, with some still being constructed, I had to draw the routes by geo-referencing an existing map, which resulted in a somewhat high margin of errors for the highways routes. The analysis, still remains useful though, as it does not depend on the exact location of the highways, just the general areas.

Another limitation of this poster is the floodplain analysis did not take into consideration the altitude and slope of the areas in the floodplain. A future study that incorporated a topographic map with this information would better identify the highway areas that are truly at risk of flooding and damage.

### Conclusion

The analysis reveals that there is increased connectivity through the BRI projects by highlighting how the highways connect the key Karachi and Gwadar ports to the major cities in Pakistan and western China. It also reinforces Pakistan’s strategic location between the Persian Gulf and China and confirms that CPEC are likely to be successful in creating a new oil trade route. Specifically, oil from the Persian Gulf can be shipped to the Gwadar port and then transported via highway or pipeline through Pakistan, into western China. Thus, China’s CPEC projects advances China’s strategic interests of regional connectivity and energy security. Additionally, the high-risk areas of the CPEC highways can be identified as the cities Peihawar, Islamabad, Rawalpindi, Quetta, and Karachi. The total risk map indicates that these cities are the highest risk because they are both subject to a disproportional rate of terrorism and are located in a floodplain. As a result, China and Pakistan should work together to increase the security of the highway projects in these cities to better protect the projects against these risks. The governments could implement terrorism prevention strategies and upgrade the highways to prepare for flooding to minimize potential damage.