Natural Disaster Risk to Crop Production in Senegal

INTRODUCTION:

Senegal is one of many African countries affected by increasing food insecurity and decreasing agricultural production. The agricultural industry is essential to Senegal's economy as it employs 60% of the population. Therefore, the Senegalese government has created initiatives to increase the quality of agricultural production, especially in areas most at risk for food and nutrition security.

One of the main threats to Senegal food security is natural disasters. According to the Global Facility for Disaster Reduction and Recovery (GFDRR), Senegal is vulnerable to several natural disasters, with flooding alone causing an $89 million impact on 200,000 people annually. Droughts are another risk that occur cyclically in Senegal, impacting over 3 million people since 198. Land degradation in Senegal is an issue that directly impacts the soil used to cultivate cropland.

RESEARCH QUESTIONS:
- Which departments in Senegal are most prone to natural disasters including flood, drought, and land degradation risk?
- Which departments in Senegal retain the most cropland?
- Which departments have the highest population density per cropland area?
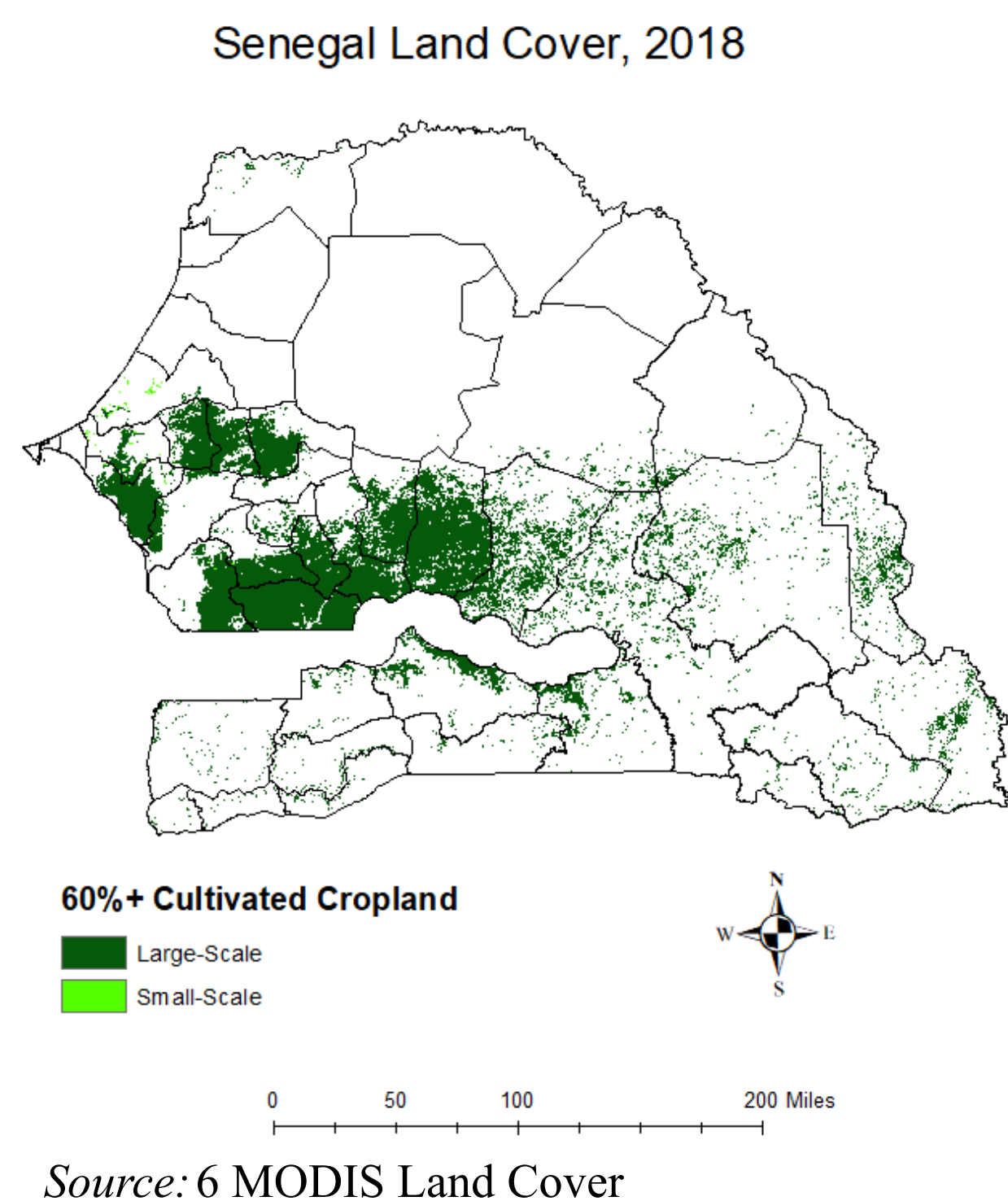
OBJECTIVE:

Since the government has prioritized disaster risk management, the purpose of this project is to identify the areas in Senegal that are most at risk of crop damage due to natural disasters for the Senegalese government to efficiently allocate disaster prevention resources.
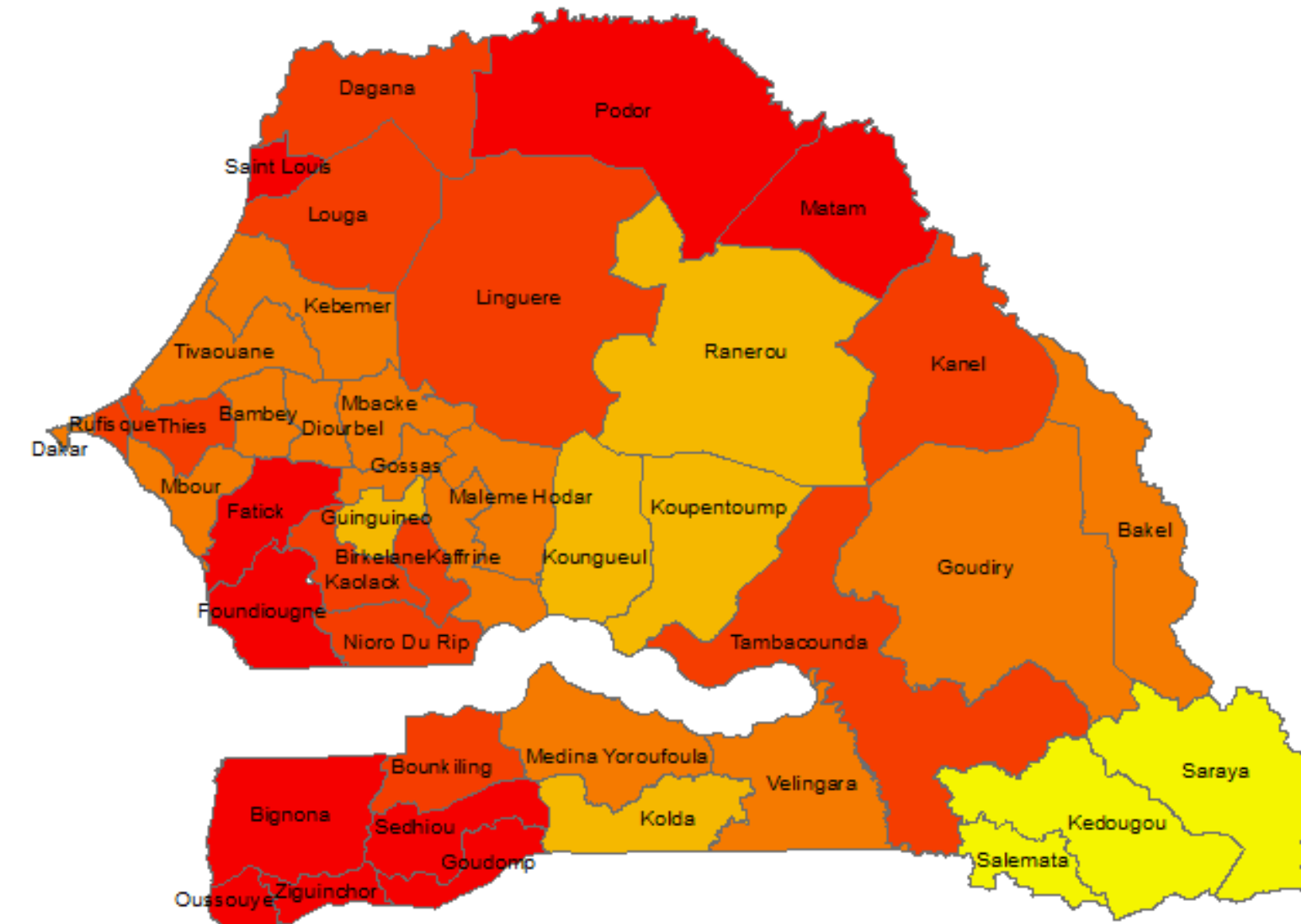
CROPLAND:

This map demonstrates which departments (Administrative Level 2) possess the most cropland. This data was extracted from a land cover data set that was reclassified to only include cropland, and small-scale natural vegetation mosaics. For both categories at least 60% of the area is cultivated cropland.
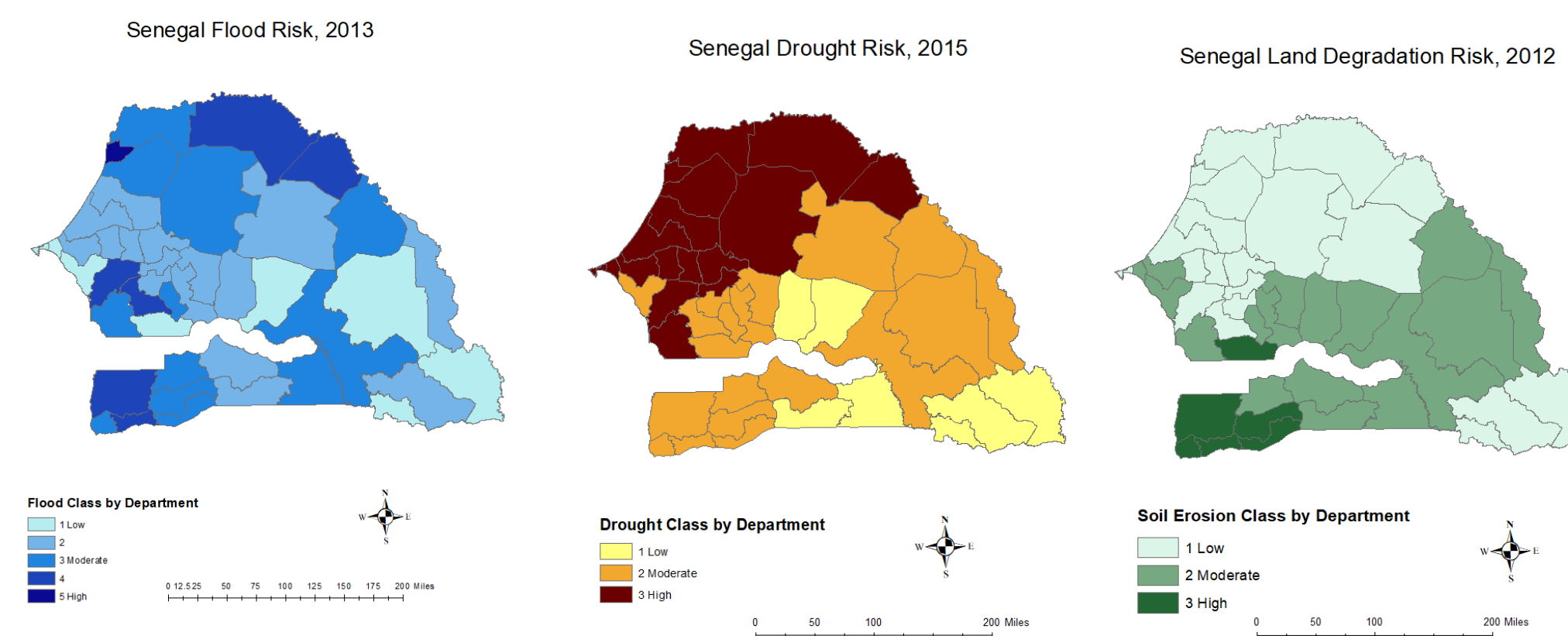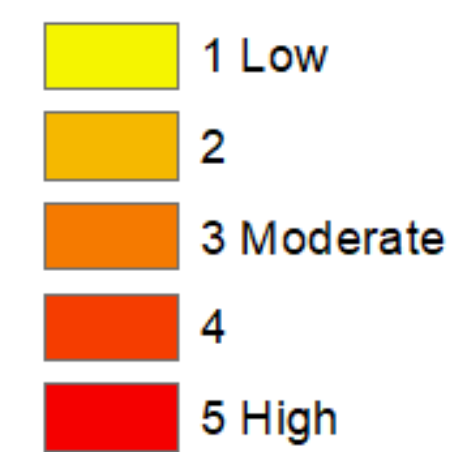
Limitations:

In areas with smaller cropland field sizes, agricultural activity may be underrepresented due to mislabeling as natural

Senegal Land Cover, 2018

60%+ Cultivated Cropland
- Large-Scale
- Small-Scale

Source: 6 MODIS Land Cover

Cartographer: Danielle Ebanks
Date: 5 May, 2020
Map Projection: Africa Lambert Conformal Conic

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Senegal Natural Disaster Risk

Risk Score by Department
- 1 Low
- 2
- 3 Moderate
- 4
- 5 High

Senegal Flood Risk, 2013

Flood Class by Department
- 1 Low
- 2 Moderate
- 3 High

Senegal Drought Risk, 2015

Drought Class by Department
- 1 Low
- 2 Moderate
- 3 High

Senegal Land Degradation Risk, 2012

Soil Erosion Class by Department
- 1 Low
- 2 Moderate
- 3 High

NATURAL DISASTER RISK SCORE:

The natural disaster risk score demonstrates which departments are at the highest risk for flood, drought, and land degradation. The bottom three maps display flood, drought, and land degradation risks independently.

Methodology:

The total risk score was calculated by joining the independent natural disaster classes into a single table. The total risk class was the sum of the flood, drought, and land degradation classes, followed by a reclassification of the totals by high, medium, and low risk. Of the departments, Ziquinchor and Bignona had the highest natural disaster risk scores with a total of 8. Kedougou, Salemata, and Saraya had the lowest score of 3.

Limitations:

While this data describes which departments are most at risk of natural disaster risk, it neither states which departments produces the most crops per the amount of people that live in those departments.
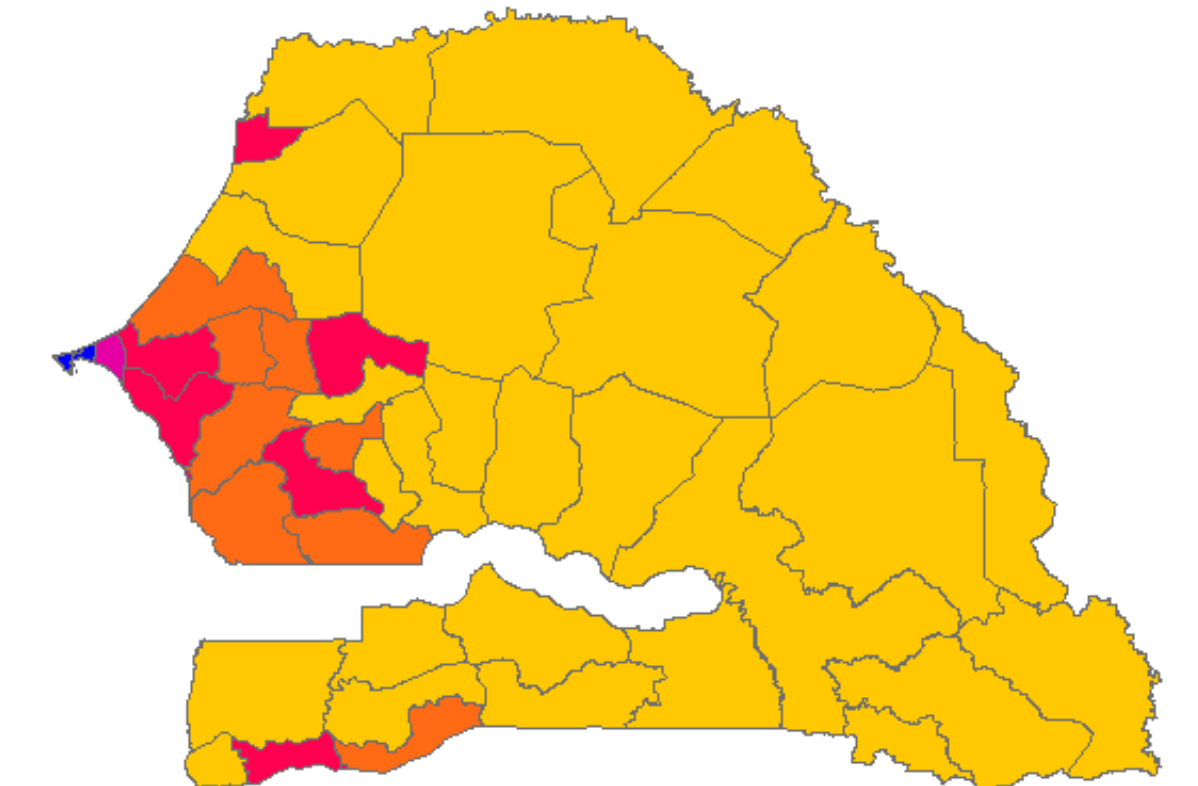
POPULATION PER CROPLAND AREA:

This map shows which departments have the highest concentrations of people per cropland area. The three departments with the highest populations per high cropland production zones are Pikine, Guediawaye, and Dakar.
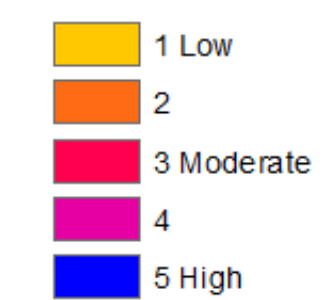
Methodology:
This map was created with population raster data that was joined with the cropland data by department. It was then ranked by population per

Senegal Population per Cropland, 2020

Risk Score by Department
- 1 Low
- 2
- 3 Moderate
- 4
- 5 High

Source: WorldPop University of South Hampton

Department	Population Risk Score	Natural Disaster Risk Score	Cereal Crop Production	Cereal Crop Production
Pikine	5 - High	5 - Moderate	-	250,642,652
Guediawaye	5 - High	5 - Moderate	-	70,573,060
Dakar	5 - High	5 - Moderate	-	245,346,445
Mbour	5 - High	5 - Moderate	29,825,607	141,789,920
Mbacke	5 - High	5 - Moderate	15,782,224	200,612,705
Rufisque	4 - High	6 - Moderate	89	105,047,810
Thies	3 - Moderate	6 - Moderate	10,738,371	141,564,405
Kaolack	3 - Moderate	6 - Moderate	75,596,663	105,433,720
Saint Louis	3 - Moderate	7 - High	88,349,312	62,519,825
Ziguinchor	3 - Moderate	8 - High	32,473,636	53,632,240

CONCLUSION:

The table above compares the Population Risk Score, Natural Disaster Risk Score, and Cereal Crop Production and Needs for each department. While the population and natural disaster scores were calculated for the purpose of this project, the Food Security risk data was extracted from the Food and Agriculture Organization, and the cereal production data was collected from the Senegalese government website.

The table demonstrates that while some departments have high population and natural disaster risk, they do not have significant cereal crop production (e.g. Dakar, Pikine, Guediawaye).

RECOMMENDATION:

Senegal would greatly benefit from allocating natural disaster prevention resources towards Ziguinchor and Saint Louis. These departments have high natural disaster risk with moderate population per cropland levels, and significant cereal production. For the purposes of crop protection, it is not recommended to allocate natural disaster prevention resources to Dakar, Guediaway, and Pikine due to their low cereal production. This is despite their high population per cropland scores.