Disaster Response and Economic Instability - Haiti

Introduction - From the Beginning

Ultimate causes of Haiti's misery are human, rooted in greed and power. Both the international community and Haiti's rulers have continuously assured the destruction of Haiti's colonial wealth and the creation and continuance of her misery.

1. **The international community's role**
    1. French colonial contribution
    2. The international boycott of the new nation of 1804
    3. The French debt of 182
    4. The United States Occupation 1915-1934
2. **The role of Haiti's rulers**
    1. Slave-like labor systems in the early republic
    2. The elite's protection of its wealth
    3. Haitian corruption
    4. Human rights violations as a tool of oppression

Introduction - Natural Disasters

2010 Earthquake

- 7.0 earthquake, epicenter located 25 km south of the capital city, Port-au-Prince
- Took the lives of 200,000 and cost almost $11 billion in reparations (close to 100% of the nation's gross domestic product)
- Resulted in displacement and economic devastation of thousands

Hurricane Matthew - 2016

- Category four hurricane, landfall over southwest Haiti
- Resulted in catastrophic damage to the Grande Anse and Sud regions.
- Cost almost two billion dollars in damage, took the lives of 500 people, and displaced many thousands across the nation.

2021 Earthquake

- August 2021, a magnitude 7.2 earthquake struck the Tiburon Peninsula
- COVID-19 makes it challenging to get resources and aid
- 2,248 people were confirmed killed, at least 137,500 buildings damaged or destroyed

Why Should We Care?

1). American Citizens
- According to the 2019 U.S. Census, there were 1,084,055 Haitian Americans living in the USA
- 78% of this population still identified as having family in Haiti.

2). A Humanitarian Crisis
- The Risk of Cholera Could Mean Many More Deaths
- Long Term Food Shortages Are a Real Danger
- Poor Infrastructure, more than 80% of buildings unlivable
- A hesitant and weak governmental force that is absent
- Improper safety regulation, healthcare, and poor education

3). Future Risk
- Conditions in Haiti could continue to worsen until the point of national collapse. What would happen to Haiti? Would the UN step in? Would a nation acquire its burdens? What nation?

What can we learn? How can we help the Haitian people for the future?

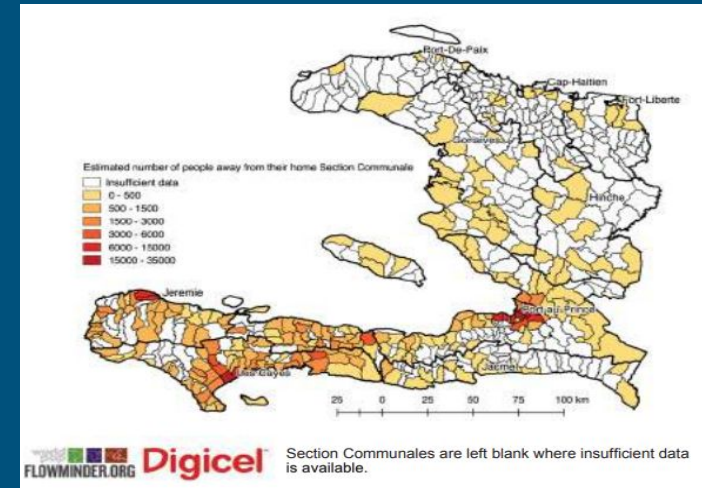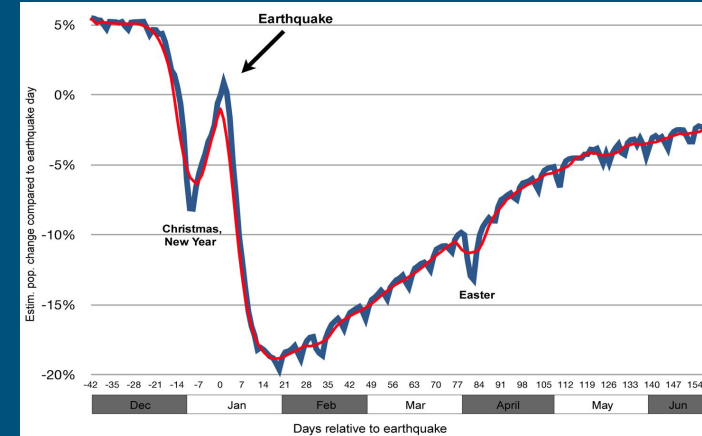# Method 1 - Phone Usage/Clustering

1). Background
- Using mobile operator data, Flowminder (the research group), in collaboration with Digicel Haiti (major mobile network), tracked population density/mobility after 2021 earthquake
- Data scientists were able to track citizens and make logical decisions in order to direct response efforts

2). Implementation
- Geographic positions of SIM cards were determined by the location of the mobile phone tower through which each SIM card connects when calling
- Scientists followed daily SIM position 42 days before quake and 158 days after
- To exclude unactivated SIM cards, they included only the 1.9 million SIM cards that made at least one call both pre-earthquake and during the last month of study
- In Port-au-Prince, there were 3.2 people per given SIM card. The ratio was used to extrapolate from the number of moving SIM cards to the number of moving persons.

3). Results
- Nearly half of the relocated people (45,000 persons) were widely spread across 62 communal sections and 26 communes out of 43, in estimated numbers ranging from 100 to 2,000 persons per communal section
- Estimated net outflow of people corresponded to 20% of the Port-au-Prince pre-earthquake population (~630,000 people, 197,484 Digicel SIM cards)

Estimated number of people away from their home Section Communale
- Insufficient data
- 0 - 500
- 500 - 1500
- 1500 - 3000
- 3000 - 6000
- 6000 - 15000
- 15000 - 35000

Section Communales are left blank where insufficient data is available.

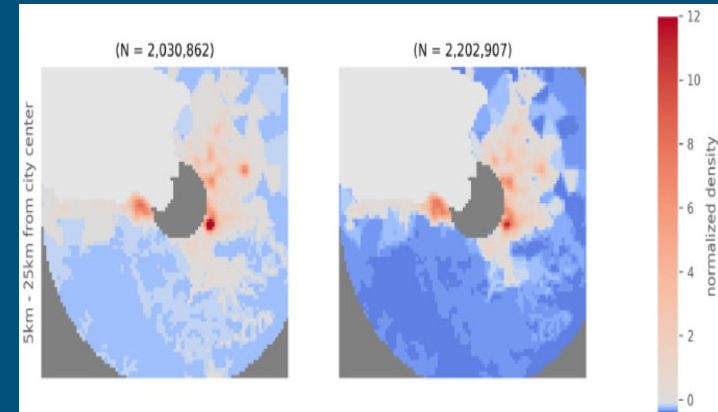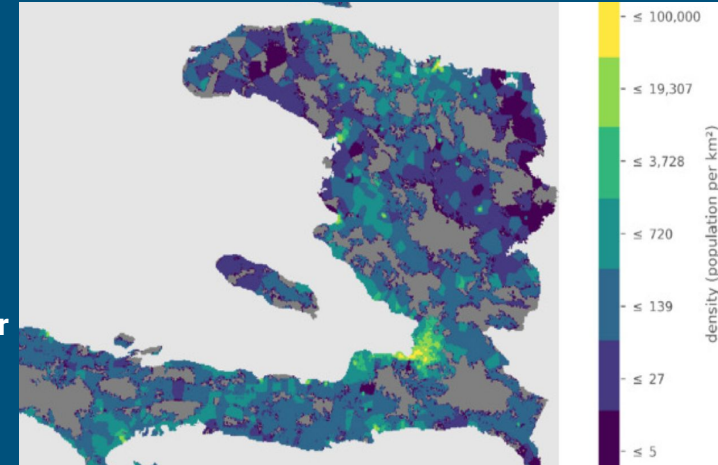# Method 2 - Satellite Imagery

1). Background

- Rapid urbanisation with the absence of economic growth has led to increasing socioeconomic challenges in Haiti - cities now host over 0.5 million more inhabitants than rural areas
- Data on population, job distribution, and on commuting patterns in urban Haiti is scarce, with the last census not being taken since 2003

2). Implementation

- K-clustering (satellite imagery technique), each pixel understood as a three-dimensional numerical vector, with each pixel defined by its values for blue, red, and white spectral bands.
- K-mean algorithm is then conducted (very complex), distributing all those pixels to k different clusters, in our case based only on density.
- This work by assigning each pixel to the cluster whose vector is closest to the pixel, to then re-compute the new mean of each resulting cluster after the new pixel assignments, and doing this until pixels are "stable"

3). Results

- The center of Port-au-Prince increased up to 60,000 people per square kilometer during the evening hours, a contrast of at least 5,000-10,000 people from before 2010 earthquake
- Another urban area, Canaan, saw densities of between 10,000 and 15,000 people during the sampled time period, an ~ 1,800 rise from before quake
- Haitian cities trend: When tragedy strikes and the economic situation worsens, people are forced to flee to cities where job opportunities are more likely.

Research Gap and Error

A Unrepresented Population

- Study 1 used Digicel Haiti, with 2.2 million subscribers and a network that covers 90% of the inhabited areas, leaving other 10% not represented
- Only 61.6% of Haitian people have access to a smartphone (as of 2012), leaving out almost 40% of the population
- These statistics could result in skewed data, error, and population distribution numbers that are larger than expected

When disaster strikes in a burdened nation, how do those impacted respond and how can we effectively track population movement to direct response efforts?

Research Plan

Nationwide Census - Post Natural Disaster

- **Instead of using phone data or satellite imagery, a simple online survey could be used.**
- **At the city hall of each municipality or in a designated area, computer systems could be set up and a backup paper survey could be available if the internet isn't working.**
- **This takes away the need for an electronic device or any device at all**
- **In order to get a proper turnout, some type of incentive could be put into place (most likely money) in order to incentivize Haitian citizens to come fill out the survey.**

Example Survey - Population Mobility

sjcooper01@email.wm.edu (not shared)
Switch account

Please write your full name

Your answer

What Department (State) were you in before the natural disaster?

Choose

What Department (State) are you currently in?

Choose

Submit   Clea

Never submit passwords through Google Forms