Resource Prioritizing Recommandation for Hurricane Harvey

by WR

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Background and Scope

Import the Data

Table `stormData` is created with `State, Month, Event_Type, CZ_Name, ...` 16 variables and 57005 observations. In the 2017 storm events data set, Harvey related events are reported beginning August 17th and end September 3rd as the system moved north and east across the United States. Therefore, to study the aftermath of Harvey, we select events that happened after August 17th and ended September 3rd.

```
stormData = importStormEvents("StormEvents_2017_finalProject.csv");
stormData = stormData(stormData.Begin_Date_Time >= '2017-08-17 00:00:00',:);
stormData = stormData(stormData.End_Date_Time <= '2017-09-04 00:00:00',:);
```

Two States Most Impacted by Harvey

The two states most impacted by Hurricane Harvey in terms of total Property Cost are **Texas** and **Louisiana**. More details about the Harvey can be found in NOAA Harvey Report.

```
stormData.Property_Cost(ismissing(stormData.Property_Cost)) = 0;
stormData.Crop_Cost(ismissing(stormData.Crop_Cost)) = 0;
stormData.Total_Cost = stormData.Property_Cost + stormData.Crop_Cost;
propertyCostByState = groupsummary(stormData,"State","sum","Property_Cost");

propertyCostByState = sortrows(propertyCostByState,'sum_Property_Cost','descend');
mostImpactedState = propertyCostByState.State([1,2],1)
```

```
mostImpactedState = 2×1 categorical
TEXAS
LOUISIANA
```

Table of Events for Two Most Impacted States

Preview first 8 rows of events that include only the two most affected states.

```
twoStatesData = stormData(stormData.State=="TEXAS"|stormData.State=="LOUISIANA",:);
```

```
head(twoStatesData)
```

```
ans = 8×17 table
```

...

	State	Month	Event_Type	CZ_Name	Begin_Date_Time	End_Date_Time
1	TEXAS	August	Tropical Storm	MONTGOMERY	2017-08-25 12:00...	2017-08-30 00:...
2	TEXAS	August	Tropical Storm	FORT BEND	2017-08-26 00:00...	2017-08-30 00:...
3	TEXAS	August	Tropical Storm	GALVESTON	2017-08-25 12:00...	2017-08-30 00:...
4	TEXAS	August	Tropical Storm	SAN JACINTO	2017-08-25 12:00...	2017-08-30 00:...
5	TEXAS	August	Tropical Storm	WALKER	2017-08-25 12:00...	2017-08-30 00:...
6	TEXAS	August	Tropical Storm	POLK	2017-08-25 12:00...	2017-08-30 00:...
7	TEXAS	August	Flash Flood	EL PASO	2017-08-23 16:15...	2017-08-23 17:...
8	TEXAS	August	Thunderstorm Wind	EL PASO	2017-08-25 18:10...	2017-08-25 18:...

Visualizations

Figure of Event Types

This histogram shows the type and number of occurances for events related to Harvey in the two states in different colors.

```
% Remove non-occurrance event categories
twoStatesEvent = twoStatesData;
twoStatesEvent.State = removecats(twoStatesEvent.State,{'ALABAMA','ALASKA','AMERICAN SA
    'ARKANSAS','ATLANTIC NORTH','ATLANTIC SOUTH','CALIFORNIA','COLORADO','CONNECTICUT',
    'DISTRICT OF COLUMBIA','E PACIFIC','GEORGIA','GUAM','GULF OF MEXICO','HAWAII','HAWA
    'IDAHO','ILLINOIS','INDIANA','IOWA','KANSAS','KENTUCKY','LAKE ERIE','LAKE HURON','I
    'LAKE ONTARIO','LAKE ST CLAIR','LAKE SUPERIOR','FLORIDA','MAINE','MARYLAND','MASSAC
    'MICHIGAN','MINNESOTA','MISSISSIPPI','MISSOURI','MONTANA','NEBRASKA','NEVADA','NEW
    'NEW JERSEY','NEW MEXICO','NEW YORK','NORTH CAROLINA','NORTH DAKOTA','OHIO','OKLAHO
    'PENNSYLVANIA','PUERTO RICO','RHODE ISLAND','SOUTH CAROLINA','SOUTH DAKOTA','ST LAW
    'TENNESSEE','UTAH','VERMONT','VIRGIN ISLANDS','VIRGINIA','WASHINGTON','WEST VIRGINI
twoStatesEvent.Event_Type = removecats(twoStatesEvent.Event_Type,{'Astronomical Low Tic
    'Blizzard','Coastal Flood','Cold/Wind Chill','Debris Flow','Dense Fog','Dense Smoke
    'Dust Devil','Dust Storm','Excessive Heat','Extreme Cold/Wind Chill','Freezing Fog'
    'Heavy Snow','High Surf','High Wind','Ice Storm','Lake-Effect Snow','Lakeshore Floo
    'Marine Hail','Marine High Wind','Marine Hurricane/Typhoon','Marine Strong Wind','M
    'Marine Tropical Depression','Marine Tropical Storm','Rip Current','Sleet','Sneaker
    'Tropical Depression','Waterspout','Wildfire','Winter Storm','Winter Weather'});

histogram(twoStatesEvent.Event_Type(twoStatesEvent.State=="TEXAS"))
hold on
histogram(twoStatesEvent.Event_Type(twoStatesEvent.State=="LOUISIANA"))
hold off

legend({'Texas','Louisiana'})
title('Texas and Louisiana Storm Events Count in 2017')
```

```
ylabel('Number of Occurances')
set(gca,'XGrid','off','YGrid','on')
```

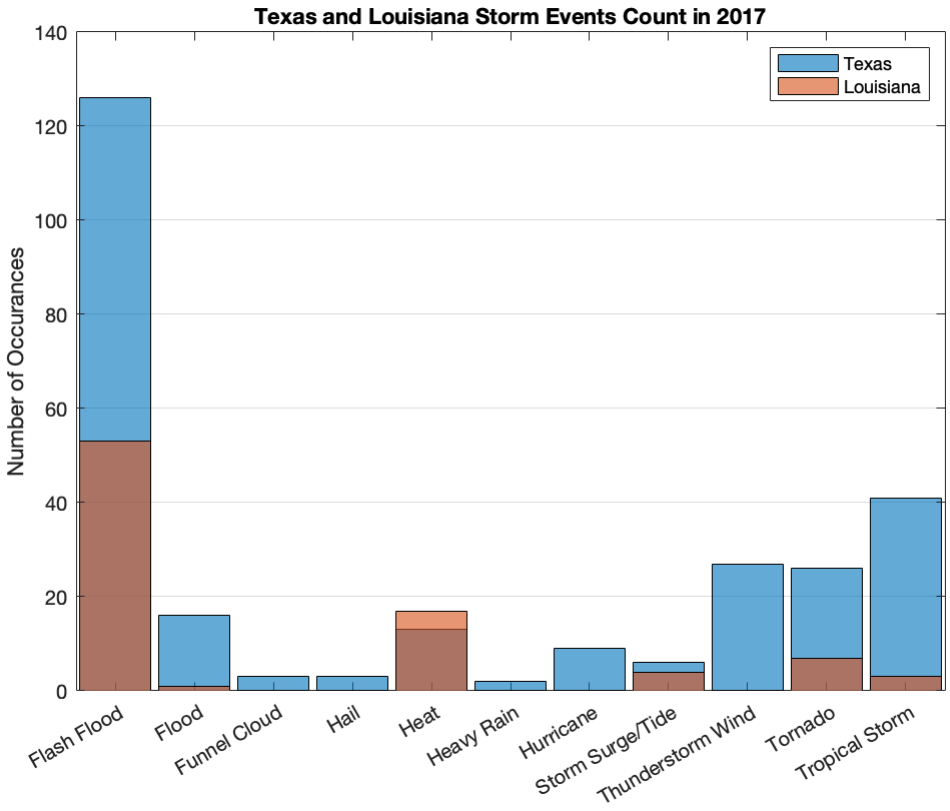
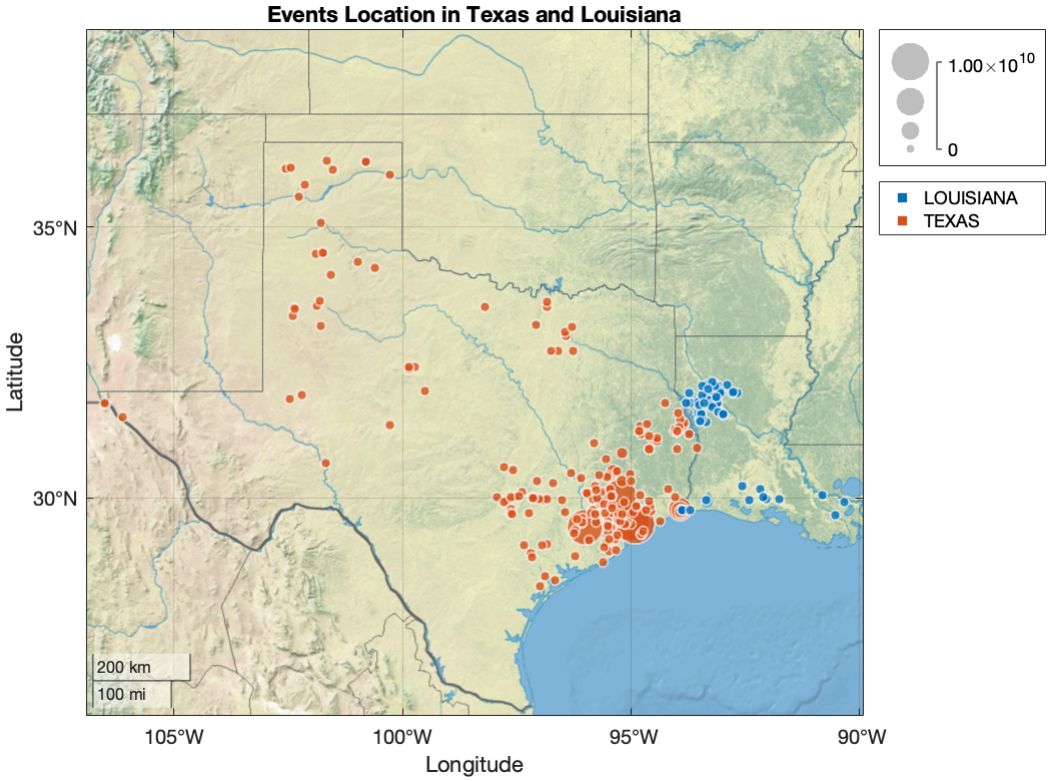


Figure of Event Locations

This geographic plot shows the location of events in the two states. The size of the bubble is depend on its total cost.

```
geobubble(twoStatesEvent.Begin_Lat,twoStatesEvent.Begin_Lon,twoStatesEvent.Total_Cost,t
geobasemap('landcover')
legend show
title('Events Location in Texas and Louisiana')
```



Analysis

In this part, we explore the data to find the counties most affected by Hurricane Harvey.

Three Counties with Most Events in Texas

As displayed, three counties in Texas with most events are **Harris**, **Galveston** and **Fort Bend**. Remove semicolon in the second line to see the whole county list.

```
texasData = twoStatesEvent(twoStatesEvent.State=="TEXAS",:);
texasEvents = groupsummary(texasData,"CZ_Name");
texasEvents = sortrows(texasEvents,'GroupCount','descend');
texasCounty = texasEvents.CZ_Name(1:3,1)
```

```
texasCounty = 3×1 categorical
HARRIS
GALVESTON
FORT BEND
```

Three Counties with Most Events in Louisiana

As displayed, three counties in Louisiana with most events are **Natchitoches**, **Sabine** and **Red River**. Remove semicolon in the second line to see the whole county list.

```
louisianaData = twoStatesEvent(twoStatesEvent.State=="LOUISIANA",:);
louisianaEvents = groupsummary(louisianaData,"CZ_Name");
louisianaEvents = sortrows(louisianaEvents,'GroupCount','descend');
louisianaCounty = louisianaEvents.CZ_Name(1:3,1)
```

```
louisianaCounty = 3×1 categorical
NATCHITOCHES
SABINE
RED RIVER
```

Three Counties with Highest Property Cost in Texas

The `texasCountyProp` table displays three counties in Texas with highest property cost in order: **Galveston**, **Fort Bend** and **Montgomery**. Property cost in dollar unit. Remove semicolon in the third line to see the whole county list.

```
texasProperty = groupsummary(texasData,"CZ_Name","sum","Property_Cost");
texasProperty = sortrows(texasProperty,'sum_Property_Cost','descend');
texasPosProperty = texasProperty(texasProperty.sum_Property_Cost >= 0.01,:);
% bar(texasPosProperty.sum_Property_Cost)
texasCountyProp = texasPosProperty(1:3,[1,3])
```

texasCountyProp = 3×2 table

	CZ_Name	sum_Property_Cost
1	GALVESTON	2.0000e+10
2	FORT BEND	1.6004e+10
3	MONTGOMERY	1.4000e+10

Three Counties with Highest Property Cost in Louisiana

The `louisianaCountyProp` table displays three counties in Louisiana with highest property cost in order: **Calcasieu**, **Beauregard** and **Acadia**. Property cost in dollar unit. Remove semicolon in the third line to see the whole county list.

```
louisianaProperty = groupsummary(louisianaData,"CZ_Name","sum","Property_Cost");
louisianaProperty = sortrows(louisianaProperty,'sum_Property_Cost','descend');
louisianaPosProperty = louisianaProperty(louisianaProperty.sum_Property_Cost >= 0.01,:)
% bar(louisianaPosProperty.sum_Property_Cost)
louisianaCountyProp = louisianaPosProperty(1:3,[1,3])
```

louisianaCountyProp = 3×2 table

	CZ_Name	sum_Property_Cost
1	CALCASIEU	60000000
2	BEAUREGARD	15000000
3	ACADIA	200000

Conclusions and Recommendations

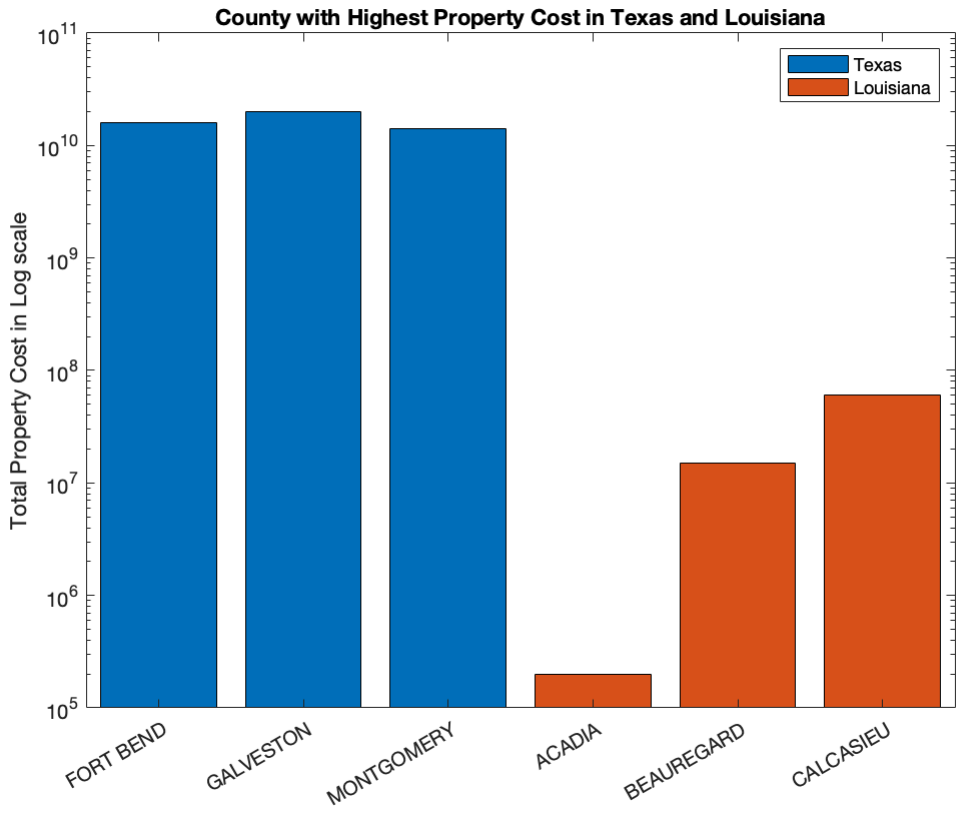
From observations above, we find the two states most impacted by Harvey are Texas and Louisiana. We also analyzed three counties with most event and highest property cost in each state respectively. Thus, these two states are supposed to be our priority to allocate resources.

Furthermore, we compare the level of property damage between top three counties within each state.

```
% texasCountyProp.CZ_Name = removecats(texasCountyProp.CZ_Name,{'5NM E OF FAIRPORT MI T
```

```
% louisianaCountyProp.CZ_Name = removecats(louisianaCountyProp.CZ_Name,{'5NM E OF FAIRP

bar(texasCountyProp.CZ_Name,texasCountyProp.sum_Property_Cost)
hold on
bar(louisianaCountyProp.CZ_Name,louisianaCountyProp.sum_Property_Cost)
hold off
set(gca,'YScale','log')
legend({'Texas','Louisiana'})
ylabel('Total Property Cost in Log scale')
title('County with Highest Property Cost in Texas and Louisiana')
```



From figure 'County with Highest Property Cost in Texas and Louisiana', we can clearly find counties in Texas has much more property cost than in Luoisiana. Therefore, these three couties in Texas are our first priority to estimate damage.