**Emergency Preparedness Visualization Proposal for the State of Connecticut**

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DAT 530: Present & Visualize Data

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22 May 2022

**Background**

The National Centers for Environmental Information aggregates data about severe weather events across the country. The State of Connecticut would like to use this data to budget for emergency needs, evaluate risk, and inform the public. They have asked for visualizations to present to three different audiences: the state budget office, the state Emergency Management Agency (EMA), and the public.

The data set provided includes 380 events that occurred in Connecticut from January 2015 through December 2016. The information contained in the data set for each event includes the dates the events occurred, county, type of weather event, number of direct and indirect injuries, number of direct and indirect deaths, and the dollar amount of property damage as a result. Information on the source that reported the weather event as well as a description of the event.

With this information, the government hopes to be able provide the funding and resources to the specific areas within the state that need it most. For this, the locations with the most severe events will be highlighted. Additionally, creating a dashboard for the EMA to refresh in real time will allow the communication of risk assessment, where to dispatch emergency equipment and resources, and damage estimates. Finally, in creating a pamphlet with the storm safety information for the residents of the State of Connecticut that highlights the need for preparedness for different events in various parts of the state, as well as potential negative outcomes to be aware of should those events occur, such as injuries, deaths, and property damage.

The results from this data may be better informed with a longer period of data collection that includes some other weather events that occur significantly more rarely in Connecticut, such as tornados. There is a level of uncertainty with the information as presented. Since there are years that have particularly mild or harsh weather events and others that do not, these events are not necessarily reflected by the data, or may represent a greater share of the weather events in this data. The information provided does give a reasonable expectation of events, though, given the data spans two years and addresses many of the seasonal weather threats that do occur.

**Audience Analysis**

The three primary audiences for this data presentation are the state budget office, the state Emergency Management Agency (EMA), and the residents of Connecticut. The messages for each of these audiences will change due to the level of information needed by each as well as the depth of understanding each audience has. The EMA knows more technical information and understands scientific-level explanations of the data. Their level of understanding of specific weather terminology is greater than the other two groups.

The EMA will need an interactive dashboard that updates in real time. Since the EMA’s role is emergency response, their information will need to be immediate and responsive to current conditions. This will allow them to pull information as needed for immediate response as well as requests from media on information. The dashboard will allow for filtering by groupings such area affected by the event and damages.

The public will need to understand and need only the most basic information including how it impacts them directly and what they need to do. The education levels of the public will range from the most remedial to advanced, with some individuals having little to no reading skills. There are also numerous individuals whose first language is not English, and this presentation will not be represented in all languages. Therefore, the expectation is for the information to be presented in a way that is easily understood by all, with minimal writing and no jargon.

The purpose of the visualizations for the public are to inform of the potential for storms, what the possible outcomes are, and how to prepare for these events. This presentation will require greater inclusion of visual depictions that needs few words to explain. An effective format for this pamphlet is concise bullet-pointed information with associated graphics.

The state budget office will need a level information that is between the previous two audiences- a more in-depth explanation of the weather events and expectations but without needing the scientific-level breakdown of those events. The data will inform decisions around how to allocate funds, emergency equipment, and resources. So, the types of equipment needed, the level of funding, and resources required will be outlined clearly.

The recommended presentation method for this group is a PowerPoint presentation. This will allow specific areas of need to be broken down for resources and finances with explanations around each. The level of detail needed for this will be as much as necessary to convey where money and resources should go and the general reason for this relative to other factors, such as potentially greater damage or potentially greater harm to people in certain areas due to the type of storm.

**Data Visualization Strategy**

**Platform and Visual Display Evaluation**

***State Budget Office***

The state budget office will be given a PowerPoint presentation for their required information on historical storm events. The presentation will start with an overview of the data that was evaluated. It will progress to identify which types of events have occurred in the state and the time of year those events have happened along a timeline. A representation of the impact of those events, including the amount of property damage and the impact on human safety as measured by injuries and deaths, will outline the severity of the events. A stacked bar chart will likely be the best graphic to show this information according to the type of storm event. The areas of the state that have been impacted most severely will be highlighted on an overlay map of storm events as areas of greatest need for resources. The summary of the presentation will highlight the historical pattern of what, when, where, and cost of the storm events in order to assist in decision making around the emergency funding and resource allocation.

The PowerPoint presentation will be most impactful for this audience as it will allow a progressive display of what the events are, what the impact of those events has been, and the location of those events. This will inform and allow for the state budget office to identify where to allocate stand-by emergency resources, as well as the type and degree of resources necessary. The presentation will also underscore the areas where greatest damage has occurred, and the monetary reserve necessary for preparation of future storm events.

***Emergency Management Agency***

The state Emergency Management Agency (EMA) will have an interactive dashboard that is readily accessible (see Appendix A). This dashboard will update in real time with data as it comes in. The components of the dashboard will include a map of the most recent events and the severity of the impact on those geographical locations. A stacked column chart of the event severity that can be filtered by date and location will also be useful in the identification of more specific and relative information on the property damages and the adverse impact on human safety. A line chart of the damage totals would also be useful to the EMA, updated as additional information comes in. A cluster column chart for the different areas of the state and the number and types of events occurring over time would also be helpful as a tool that can filter and show which types of storms have affected which areas.

This dashboard will allow the EMA to provide information to the emergency response crews to anticipate where they are needed and the magnitude of resources to devote in real time. It also will assist in the assessment of damages as quickly as the data can be entered. The dashboard also will provide context to current events, as well as the current state, for any media relations that occur during the storms.

***General Public***

For the general public, the information will be presented in a pamphlet format (see Appendix B). This will allow information to be presented simply, be readily available, and in a format that can be understood at a basic reading level. It also can be printed in multiple languages or with two sides, each in a different language.

The information contained in the pamphlet will include general information about the different storm events that occur in the state, the frequency that they happen, and ways to prepare for those events. A pie chart of the different storm events would show the frequency of the different types of storms in a way that is easy to understand. A visualization of the different seasons and the most common storm events during those seasons would illustrate for the general public the need to be aware of the different possible events.

The purpose of this information pamphlet is to bring awareness to the public and increase preparation for different storm events. Information on how to prepare for those events would ideally utilize as few words as possible. An example of this would be to illustrate the types of things to have handy should a power outage occur due to a storm, such as a picture of candles, blankets, a first aid kit, and canned goods, or other items that might be kept in an emergency preparedness kit. Different items may be more appropriate for storm events in different seasons as well, which could be identified on this pamphlet.

**Data Visualization Strategy**

**Granularity and sophistication categorization**

***State Budget Office***

The data required by the state budget office is intended to assist in the decision-making for emergency funding and resource allocation. This would require visualizations that do not have a high level of granularity, as the needs are to understand trends and projections to inform those decisions. Visualizations for this should show historical data as well as expectations for potential future storms with regards to location, time or season, and severity. Specific dates that events have occurred is less important that showing if there is a trend for significant weather events in certain months or seasons.

This group consists of educated individuals who are anticipated to have a basic understanding of the data but are not expected to understand the statistical methods behind the data or projections. The complexity of the visualizations should be concrete and straight-forward. There is no need for extraneous information to be included and the interpretations should be obvious when viewing the charts and graphs.

***Emergency Management Agency***

The level of expertise that the Emergency Management Agency (EMA) possesses will require greater granularity than any other target demographic. The information should be direct, detailed, and specific. Graphs may be broken down into smaller intervals as minute-by-minute changes in weather intensity or locations for an event would be necessary. Mapping of areas should be as greatly detailed as possible, with little generalizing, as the more precise location of services in the moment would be more important that the general area. Labeling of the graphics will need to be concise and reflective of what information is contained. The level of verbiage can be technical and does not require additional explanation.

***General Public***

Visualizations for the general public need to be the least detailed and demonstrate the least granularity. General information about the seasons and what weather events are more likely to occur at those times will be significantly more important than particular months or days. The information needed is very basic and includes the type of weather event, when it would most likely occur, and how to prepare.

The information from the provided data that would create this visual could be summarized in very broad categories. Only the most likely weather events during the most likely times of year would need to be highlighted. As well, knowing that some storms may be more likely to damage property while others are life threatening may be helpful. The probabilities of those events and the historical data would not be relevant to this target audience.

**Formatting guidelines**

***State Budget Office***

The formatting for visualizations for the state budget office will be straightforward and informative. Colors will be simple and contrasting for categorical visualizations with the potential use of gradient colors for intensity or frequency. The time series visualizations will show trends and patterns clearly, with groupings of data that more clearly show this. As an example, the seasons may be tracked for storm events compared to months, or counties as opposed to towns.

Titles for these visualizations should succinctly identify what is being depicted, such as Storm Events by Season, or Property Damage Cost by County. With the general ability to read a graph, the data presented in the PowerPoint slides should be able to stand on their own. The viewer should be able to discern what the visualization is showing with minimal verbal or written elaboration.

***Emergency Management Agency***

As the dashboard that will be used by the EMA is updated in real time, with the anticipated use to be for immediate response, the detail and specificity of the information will need to be great, without superfluous coloring or design. The visualizations will need to have filtering capabilities to show the information needed at the moment. The information should be direct and easily interpretable by someone with significant technical knowledge and vocabulary.

The more simplistic and direct the presentation of the dashboard, the easier it will be for the EMA to use. Since the information is needed immediately and time cannot be spent on interpretation, the data must be instantly readable. An example of a dashboard that would be easy to use and direct would have graphics for past twenty-four hour data on damage. A heat map would indicate where the affected locations are. Color coding the severity of impact of the current storm in a visualization may help to draw the attention where it needs to be, on the higher priority locations for damage and potential harm to humans.

***General Public***

The general public is identified as individuals of all educational backgrounds and the formatting of the visualizations for this target audience will need to reflect the wide range of needs to understand the information. Simple graphics with clear print describing the information will be helpful in ensuring it is simple enough to be understood by all. Additionally, the information needs to stand out and grab the attention of the reader in order to not be dismissed or minimized. Bold and contrasting colors will be helpful in achieving this as it will draw the focus to the most important information.

Pictures will be useful in communicating this information as well. Using icons in the legends for any informational visualizations may help reduce the need for reading competency and may decrease the potential language barriers. The pamphlet may also be supplemented with more detailed information on a website available for public information provided by the state with the directions to that website for more information printed on the pamphlet.

**Feedback method evaluation**

***State Budget Office***

The state budget office will be receiving a PowerPoint presentation for the delivery of this information. A printout of slides will be provided to the audience and a copy of the presentation will be made available for those who could not attend. At the end of the presentation, there will be an opportunity to ask questions of the presenter. Clarifications and feedback solicited at this time could help future releases or presentations.

The final slide of this presentation will also direct to the contacts for questions or feedback. A phone number and email address will be provided for individuals who have questions after the presentation concludes, or who are viewing the presentation slides on their own. A liaison for the state budget office will also be identified who can either answer questions or direct the questions and feedback to the data team contact. These methods are anticipated to be reasonable and not expectant of resources or skill in excess of what is available to the state budget office.

***Emergency Management Agency***

The EMA will be working with a live feed dashboard that has constant data input. There will be a phone number for the EMA officials to contact should there be questions about ambiguity of data or feedback on what features may be more helpful or in what way changes could be made to improve the dashboard. Additionally, for lower priority issues that are not considered imminent, an email address will be provided so as to have that feedback addressed in a less time-sensitive way. The dashboard will be created in anticipation of what the EMA will need to respond most effectively, but it will be the end users who will be able to identify in what ways the dashboard is useful and in what ways it can be improved.

***General Public***

The pamphlet that will be presented for the general public will have a website, phone number, and email address where further information can be obtained. Additionally, local government office locations would be identified so as to outreach those who may not have access to technology. Multilingual assistance and support can also be provided through those same channels.

There may be a need for clarification on the likelihood of any particular risk and the actions that can be taken to increase emergency preparedness. The public may also be seeking how to find resources to assist in their preparedness, such as locations where supplies for a severe weather event survival kit can be obtained, possibly for free or reduced cost. It will be important to temper the message of imminence of potential severe weather events so as to not create an overreaction or panic in the event of an anticipated severe weather event, but also a strong enough message for the information to be taken into serious consideration.

**Conclusion**

The proposed visualizations for the State of Connecticut include a PowerPoint presentation for the State Budget Office, a dashboard for the Emergency Management Agency, and a pamphlet of information for the general public. These visualizations all include information about the storm events that impact the state. Each target audience requires a different approach to the visualizations.

The PowerPoint presentation is to inform the State Budget Office about storm events that impact the various parts of the state in order to allocate funding and emergency resources to the appropriate areas. For the Emergency Management Agency, the requirement is for a dashboard that updates instantly. The general public pamphlet is to include information about storms with the intent to prepare for potential storms. Given the different formats, purposes for the information, and general ability of the target audience to interpret the information presented, the approach to all three using the same data set varies in sophistication, granularity, and design.

**Appendix A**

**EMA Dashboard**

***Main Dashboard***

A picture containing graphical user interface

Description automatically generated

***Property Damage Drillthrough Target***

Chart, scatter chart

Description automatically generated

***Injuries Drillthrough Target***

Map

Description automatically generated

***Deaths Drillthrough Target***

Map

Description automatically generated

***Dashboard User Guide***

This dashboard is designed for the Emergency Management Agency as a tool to use in the field. The information contained in the dashboard is updated in real time as information becomes available. The information is intended to provide the basic information needed to speak with the press as well as for the emergency response. Individual visualizations for property damage, injuries, and deaths on the dashboard have drillthroughs for target pages with more in-depth information. These target pages match the colors of the dashboard visualization in order to promote recognition of the category of data that is being viewed, particularly in times of heightened stress such as during an emergency storm event. Property damage data is orange, injury data is purple, and death data is red.

The dashboard begins with aggregate data from the year about the number of each type of storm event. This information would be useful when discussing a current event in the context of the year. It can be filtered by time to give a different range of dates, such as the past week or month, or this same time last year.

Below this visualization is a chart of the totals of property damage, injuries, and deaths by county and region. This data can be filtered for the date range. This provides a quick view of totals as they become known.

The map on the dashboard identifies the locations of the storm events as they are reported. This information can be set to the past several hours with a date/time filter. This will help emergency response to target the areas that are in need the most.

The meter for property damage shows the total property damage for a time range set by the filter. This visualization has a drillthrough that targets the more in-depth page on property damage, so when an individual right clicks on the data, the option to drillthrough to the property damage target page is shown.

Example:

Graphical user interface, application

Description automatically generated

The target page has information for the property damage by month as well as by county. The map shows the locations of reported property damage with the corresponding bubbles increasing commensurate with the magnitude of damage.

The injuries visualization shows a chart of the number of injuries occurring due to weather events each month. This can be filtered by day as well. The target page for this drillthrough shows the line graph of the number of injuries, assisting in visualizing trends. Filtered by day with a shorter time period, it can indicate whether there are trends in the number of injuries. There are also injury tallies in the bar chart according to county and regions of counties. The map indicates the locations of the reported injuries. The deaths visualization functions in the same way, with a drillthrough to a target page on death data that is representative of county as well as a mapped location of deaths reported due to weather events.

Example of drillthrough for injuries:

Graphical user interface, application

Description automatically generated

Drillthrough for deaths:

Chart, waterfall chart

Description automatically generated

**Appendix B**

**Tri-Fold Pamphlet for General Public**

Graphical user interface, application

Description automatically generatedChart, pie chart, treemap chart

Description automatically generated