

Data Report: Noise Pollution on Mass Ave

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Project Summary

Our team has been formed to investigate the benefits of trees in reducing noise pollution, specifically focusing on the Mass Ave Corridor. Our stakeholders include the community residents, local authorities, and environmental organizations (incl. Mass Ave Coalition). Their expectations are to understand the impact of trees on noise reduction, identify areas where trees are currently effective in reducing noise, and determine where additional trees are needed to mitigate noise pollution.

To do this, we are exploring a dataset containing all noise complaint data collected from multiple sources for each neighborhood in Boston. We are also exploring a separate dataset containing data that indicates the amount of trees are in each neighborhood. By exploring and analyzing both of these datasets, we intend to draw conclusions and correlations revolving the relation between the amount of trees in a neighborhood and the amount of noise complaints.

We intend to deliver comprehensive and interactive visualizations that would be used to draw conclusions about the correlations between the two datasets but they are not intended to be used

to declare anything as a fact. For these visualizations, we will be using Altair to create one interactive visualization, matplotlib, and Tableau for data exploration.

Data

The data we chose is about all of the service requests in 2023. The relevant columns for noise pollution analysis include case_enquiry_id, open_dt, target_dt, closed_dt, case_status, case_title, subject, reason, type, queue, department, location, latitude, and longitude. Regarding their data types, most of those columns are quantitative and categorical data, with the columns about time belonging to the ordinal data group. This data helps track noise pollution complaints, their status, and relevant details such as location and timestamps, which can be used to analyze trends and patterns in noise pollution incidents.

In the data cleaning process, we performed steps to reformat the columns. For example, values in columns about datetime are in the wrong format. We changed them all into one uniform format so that it would be easier for the visualization step. Also, in the column case inquiry, the case number is not represented in numerical form, and we reformat it on Excel to fix this error. The most important error appearing in the dataset is probably about the ward where the case is reported. Based on my observation, most of them only contain the numerical part of the ward, however, some of them even include the string “Ward” before the numerical part. I performed Excel functions using if and vlookups to return them to numerical numbers only.

Here is the link to our dataset:

<https://data.boston.gov/dataset/311-service-requests/resource/e6013a93-1321-4f2a-bf91-8d8a02f1e62f>

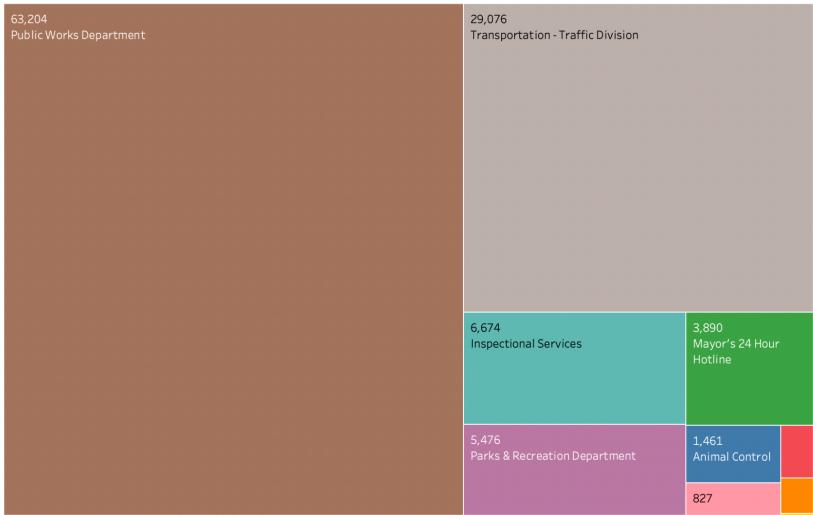
Task Analysis

Index	“Domain” Task	Analytic Task(low-level, “Query”)	Search Task (mid-level)	Analyze Task (high-level)
1	How loud is it typically along Mass Ave?	retrieve value	browse	record
2	What are the primary sources of noise along Mass Ave?	find extremum	lookup	discover
3	Which are the trees currently making a difference in reducing noise, and where are they needed?	filter, correlate	locate	derive

Task analysis description: Our visualization will be primarily developed for the residents and visitors of the Mass Ave Corridor, as well as the people who work at our partner organization (Mass Ave Coalition). These visualizations will mostly be communicative and exploratory. They will explain the problem that is noise pollution, and explain how it is happening in Mass Ave.

Observations & Insights

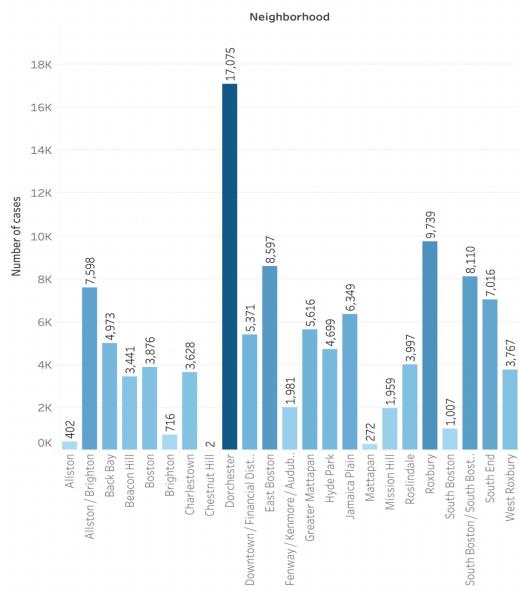
Subjects of Noise Pollution case



In this visualization, we explored the subjects of the noise complaints in Boston. Here you can see that the majority of the complaints come from the public works department and transportation/traffic noise. We did not find any specific patterns in regards to this part of the data, however it

was insightful to understand the average content of a noise complaint. To visualize this, we encoded the data by demonstrating it through an area. Then we created a distinction between the subjects with color.

Noise pollution complaints in Boston areas



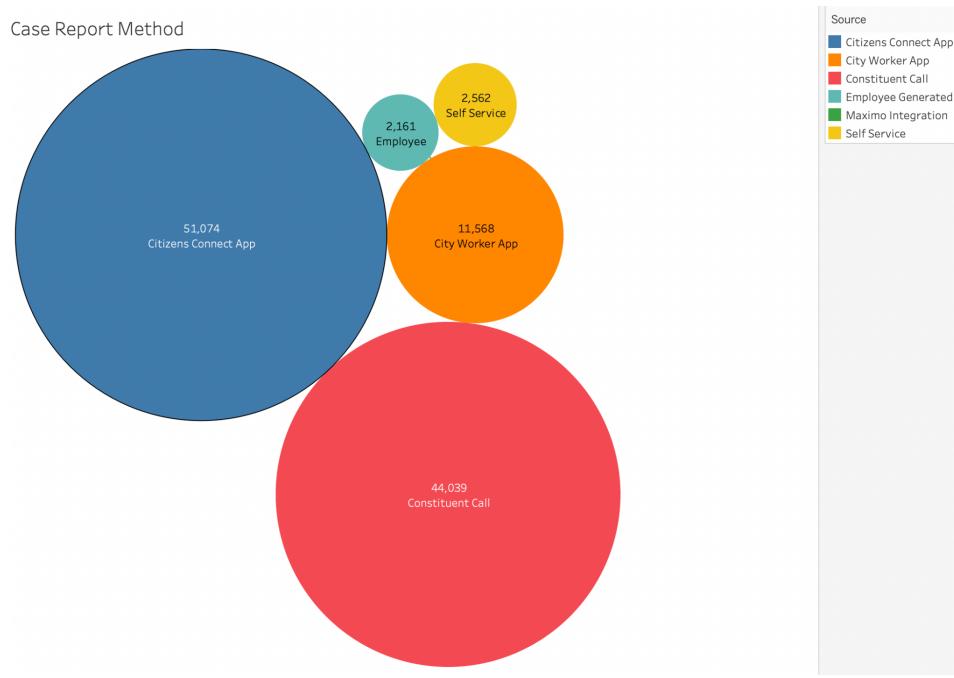
CNT(Case Enquiry Id)

In this visualization, we explored the source of noise complaints in Boston. We see that Dorchester has at least about double the amount of noise complaints as compared to other locations in Boston. While we don't see a

direct reasoning from the data, based on our knowledge about Boston, there definitely are correlations in the urban setting and poverty level of the location which is correlated to the amount of trees in the area. Color saturation and length is visually encoded for this piece of data as it helps us visually understand the density of noise complaints coming from each area. We also

used labels to get a more accurate understanding of that as well.

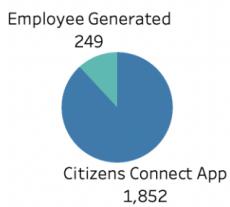
Analyzing the Case Reports



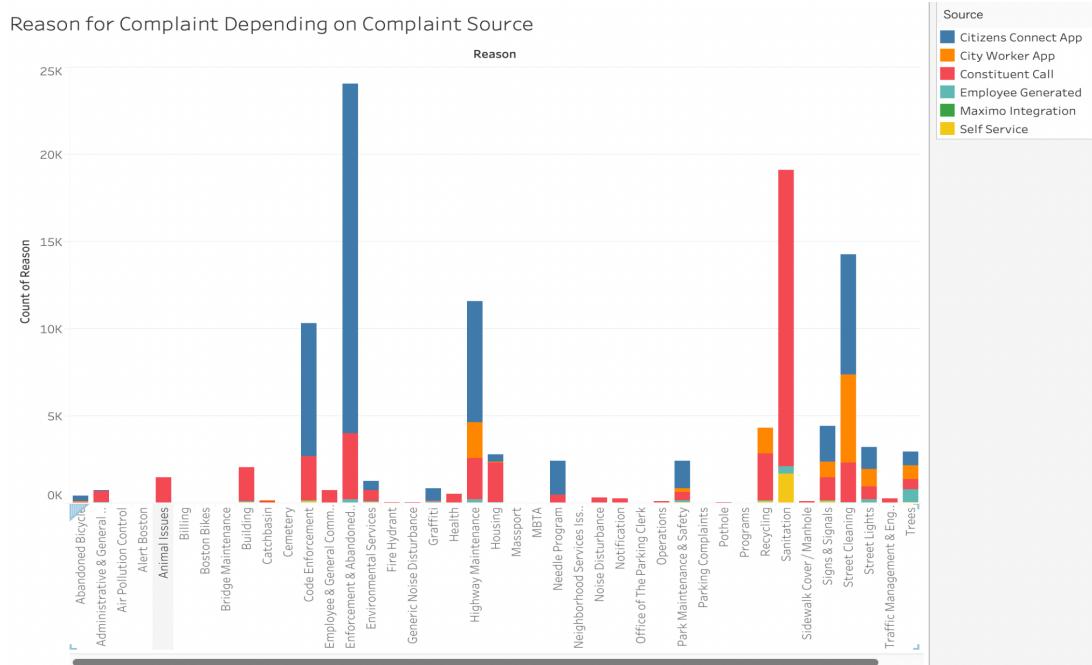
For the reporting method of complaints, we decided to show it with packed bubbles, which includes visual encodings of color hue and area. This visualization shows that most complaints are filed through apps on their phone. This is a clear indicator that accessibility to complaints is

something to consider when looking at the data because we do not know the magnitude of the noise levels for each complaint. This can also mean that some noise complaints can be coming from the same individuals who are avid users of these apps. While this part of the dataset does not really tell us anything about the effect of trees on noise pollution, we found it to lead us to interesting assumptions.

Complaints with photos submitted

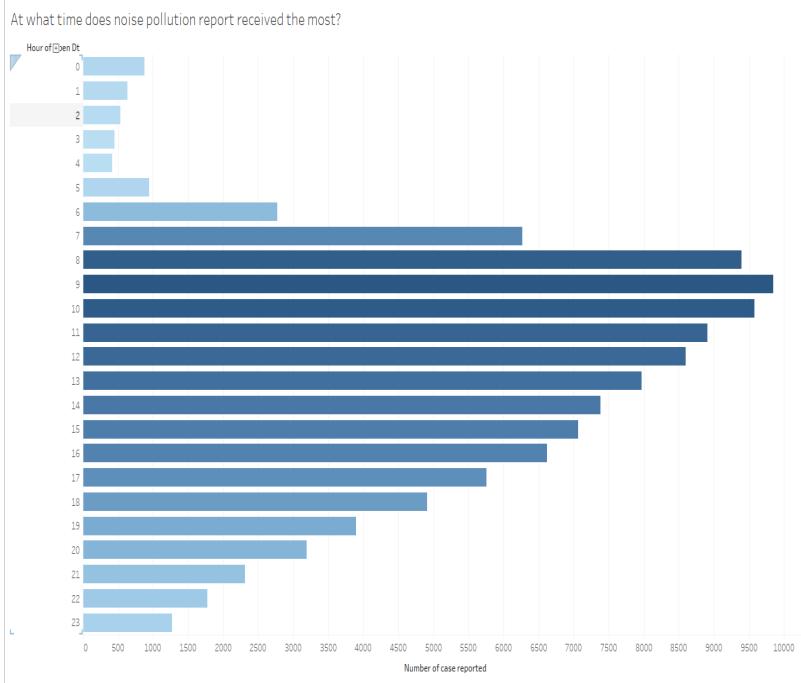


This pie graph shows the amount of complaints that came along with photos. It was interesting to see that the ratio for complaints from the app compared to in person complaints is significantly lower.



This visualization showed us that there were preferred methods of complaining about noise depending on the reason for noise. For example, animal issues and buildings are one of the few reasons that only were filed through constituent calls. Color hue is visually encoded to separate the source of complaint.

At what time does noise pollution recorded the most?



The graph shows us the number of noise pollution cases reported in each hour in a day. Looking at the graph, we can see that most of the noise pollution cases were reported during 7 AM to 12 AM. This is not uncommon in urban settings with traffic noises ramping up as the day starts.

Conclusion

The data about the service requests in 2023 really helps us in understanding more about noise pollution along Mass Ave. From scrutinizing the data, we found out that most of the cases were about transport or public work, which means that it is not the citizens who are causing noise pollution. This means that further investigation about how the city is conducting public work maintenance, building, or renovation is worthwhile.

Also, we discovered that most of the citizens use the Citizens Connect App to report about cases. Therefore, there should be further work put into updating the app with more convenient features and a more user-friendly interface to make it easier for people to use it. Also, the Mass Ave Coalition may consider advertising campaigns to familiarize people more with the app, as many people that we surveyed still do not know about its existence.

Another finding that surprises us is where along Mass Ave does noise pollution often occur. We expect it should be around East Boston (because of the airport) or other areas in the city center (because of dense population and huge traffic). However, it turns out that Dorchester is the area that has the most service requests about noise pollution. The Mass Ave Coalition can consider further investigation to find out the reason behind this

Our most important findings:

- Most of the noise pollution cases are about the public work department.
- Dorchester is the area that has the most noise pollution complaints.
- The preferred reporting method is via the Citizens Connect App.
- Most of the cases are reported during 8AM - 12PM (noon)
- The reason behind most of the case is about enforcement and vehicle abandonment

Still, we have unanswered questions about the importance of the trees in combating excessive noise, as well as the distribution of the trees along Mass Ave. We are also trying to understand the meaning in some of the entries in columns Case Reason or status.

For the direction of further investigation, we would love to ask for more data about the magnitude of noises recorded on Mass Ave for the last few weeks to create a time series plot. Also, to answer the question about how trees can address noise, we need the data about magnitude of noise in Mass Ave before and after the trees are grown. If there is data about different types of trees grown along Mass Ave, we can be able to answer what trees are currently doing to make it less noisy