Where Does Your Trash Go?

A Washington State Waste Generation Analysis

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Warning!

Motivation

- Solid Waste is Constantly Generated. (Municipal Solid Waste)
- We want to investigate and understand how solid waste is distributed in Washington state.
- Visualize garbage production and movement to landfills.

Key challenges

Much of Puget Sound appears to be vibrant, clean, and healthy, but our scientific studies show that this unique marine estuary has a variety of environmental issues and problems.

Changing water chemistry is making marine waters more acidic. As the Pacific Ocean and Puget Sound absorb more carbon dioxide from fossil fuel use and deforestation, the acidification of the water negatively affects marine organisms that need strong shells and skeletons such as shellfish, plankton, and fish.

Bacteria in Puget Sound can come from a number of sources but especially animal waste, human waste from faulty septic systems, waste discharges from boats, sewage overflows, wastewater treatment plants, and contaminated stormwater runoff. Too much bacteria pollution can close harvest of shellfish beds or make saltwater beaches unsafe for swimming.

Low levels of dissolved oxygen combined with high levels of nitrogen can stress and even suffocate marine life. While some natural influences can lower oxygen levels, many human-generated nitrogen sources contribute to the problem, including heavy fertilizer use, livestock manure, septic systems, and wastewater treatment plants. Too much nitrogen fuels excessive marine algae growth, which then die and decompose, consuming oxygen.

Toxic chemicals in Puget Sound enter, in large part, from the small, steady release of toxic chemicals in everyday products, such as the brakes on our vehicles, flame retardants in our furniture, softeners in plastic, and building and roofing materials. As we use and dispose of these products, the toxic chemicals they contain can enter rivers, lakes, and the sound. Toxics accumulate in fish and marine mammals.

The ecology.wa.gov is warning citizens of Washington State that we are poisoning our own eco-system with our waste making our Puget Sound TOXIC, ACIDIC & BACTERIA INFESTED ...

Audience

All Washington State Residents

Our visualization is intended to encourage Washington Residents to be more aware of their waste generation and its impact on the environment

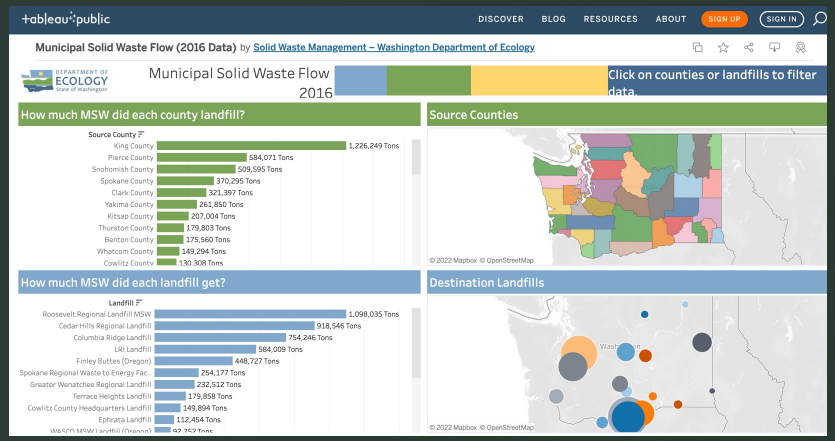
Main Questions

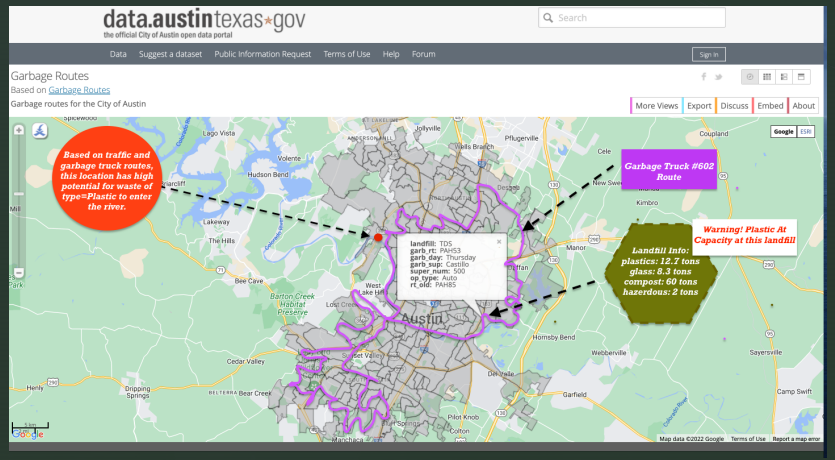
- Trends in Municipal Solid Waste by County in WA?
- The most common waste generated by Counties in WA?
- How much of waste is going to each landfill in Washington?
- How much waste is recycled?
- Municipal Solid Waste (MSW) generation and rate prediction
- The impact of households if they produce less waste and recycle more?

Tools

- Good Notes 5 for Designing
- Pandas and Numpy
- Excel
- Tableau
- PowerPoint
- A Team Of 4 Exceptional MSCS Students

Related Work and Difference





- Opportunity to use graduated colors.
- More interactive. Uses map as the corner stone for exploration.
- Different waste types, multiple years, future predictions.
- A balance between too much detail and not enough.

DEMONSTRATION

LINK TO LIVE PAGE

LINK TO CSS

Design Rationale – 1/2

- The map is cornerstone to explore information.
  - Clicking on the map triggers further information display.
  - A choropleth map that shows per capita waste.
  - A proportional map showing all the landfills in the WA.
- Intuitive usage: e.g., clicking on county highlights landfills where the county's waste goes to.
- Intuitive Measures to describe the waste quantity created (Boeing 747 and Titanic as reference size)

Design Rationale – 2/2

- Color scheme:
  - Avoided using red and green to de-mark predictions.
  - Waste grouping are colored using the color-blind color palette.
- Avoiding too many pie slices: Treemap vs. Pie Chart
- Clear predictions using Tableau's in-built forecast module.
- Interactively see the impact of waste reduction to motivate residents

Insights – 1/2

- Washington sends waste to landfills in beautiful Oregon. Columbia Ridge and Roosevelt Landfills get the most waste.
- King County is the highest contributor to waste in Washington
- Cowlitz county has an unusually high per capita waste generation. Lots of construction waste and a low population.
- County's show different pattern when it comes to waste types
  - Highly urbanized counties like King generate a lot of "Construction Waste" and "Electronics and Appliance" .
  - Rural counties produce more "Paper " or "Metals and Minerals"

Insights – 2/2

- King County like majority of the counties in WA is showing an increasing trend of waste generation.
- King County is the largest contributor to waste (39%) which equals 8798 Boeing 747 (= 450 tons) planes and 76 Titanic ships(= 52,310 tons).
- There are some counties like Snohomish and Kittitas that are having a downward trend.
- If we all reduce our waste generation by a modest value of 15% we can make a significant change.
- A difference of around 700,000 tons annually and equals 1,534 Boeing 747 (= 450 tons) planes and 13 Titanic ships(= 52,310 tons).

Future Work & Questions

- Use a connected map that dynamically changes with each years
- Add more years from 2001 to 2013 and improve predictions
- Questions ?

Information References

- Data from: ecology.wa.gov
- https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Issues-problems
- https://wsdot.wa.gov/construction-planning/protecting-environment/litter-state-highways#:~:text=The%20problem%20with%20litter,county%20roads%20during%20this%20time.