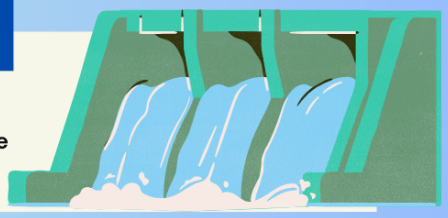
Does Income affect dam removal prospects?

inspired by the success of the tribally driven Klamath River Dam Removal of 2024, we investigated a less obvious, but commonly cited stakeholder effect in dam removal- the income of those living around dam-formed water sources.



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Introduction

- One of the most heavily researched correlations in dam removal is the industrial/agricultural use of water, which is straightforward.
- We wanted to explore lesser known correlations.
- Dams and their removals are highly unique situations, with highly varying effects on the water body and on the nearby population.
- Our background education on news reports and research papers suggests that some dam removal projects are highly resisted by the local populace if that populace owns valuable property along a dam-formed lake.
- Because data is not readily available on changes in property values before and after dam removal, we seek to explore a wealth to opposition relationship via income because this should not be affected by the valuation change of properties after removal.

Objective

Identify income surrounding dams to see if dam removal and nearby income are correlated.

Methodology

- Loaded, cleaned, and merged a set of removed dams from American Rivers, and a set of current dams from the US National Inventory of Dams into California entries with relevant information.
- Used longitude and latitude coordinates of our shared set to batch process in the US Census' Geocoder API and retrieve a GEO_ID census code to append.
- Used GEO_ID codes to search for median income data for each instance of dams, using the American Community 5-year 2022 survey on income.
- All data work was performed in R language and the RStudio environment.

Results

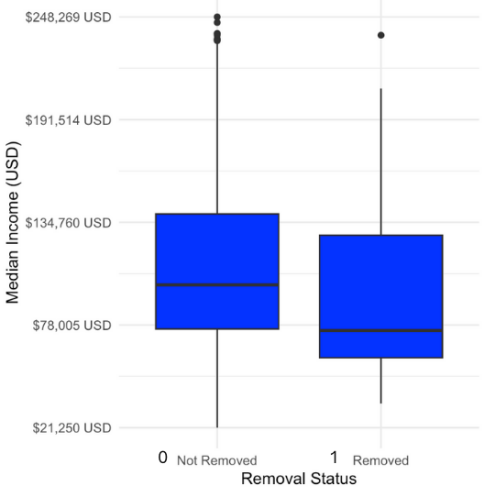
- The correlation between removal and median income is -0.0997, indicating a weak negative correlation.
- The overall interquartile range IQR of median incomes for removed damns is 67710.75 USD, and for not removed dams is 63586 USD.
- The mean of median income for the removed group is higher at 111,075 USD than for the not removed group at 94,942 USD.
- The removed group has a significantly larger sample size (577) than the "not removed" group (60).
- The standard error is lower for the removed group at 1961 USD compared to the not removed group at 6110 USD.
- The 95% confidence intervals for the mean income are wider for the not removed group due to the smaller sample size.

Analysis

- The weak negative correlation suggests a slight tendency for higher income to be associated with dams that were not removed, but this relationship is not strong.
- The relatively wide range of median incomes across the data indicates a diverse income distribution.
- The higher mean income for the removed group might suggest a potential benefit of dam removal, but further analysis is needed to determine if this difference is statistically significant.
- Median income was chosen over mean and Interquartile range was chosen over standard deviation because we look to understand the central point of our data with less regard to outliets.
- The wider confidence intervals for the not-removed group highlight the uncertainty associated with the smaller sample size. The IQR closeness shows considerable spread in the data, but that they are consistent.

Median Income by Removal Status

Distribution of Median Income by Removal Status



Conclusion

Our correlation is present, though weak .

The IQR indicates some reliability of our relationship (as opposed to the standard deviation), but highly limited.

We conclude that the correlation is only slightly predicted.
It is less reliable to the wide confidence interval due to differences in our available data between removed and not removed dams- we feel that study is not currently possible without more data.

More data collection on the locations of removed dams is recommended.

Challenges

- **Finding data:** Some of the data hubs or links were broken and had to be found elsewhere.
- **Uncentralized data and variety of data complexity**: We initially planned to utilize land data to perform a linear regression (requiring at least one more continuous variable), and so we could learn and utilize a tool of 3-D visualization. We quickly found that all across environmental land/dam/water data, very little was shared or uniform. Many surveys, organizations, and software **used specialized organizations of area units**- some dividing into even map squares, some with "catchments" including multiple dams or river puts, some with specialized location based data where we were **missing or requiring an unfeasible amount of linking across many resources** to create a set dam-related land or water data.
- The team learned R for the first time through rigorous scripting, including visualization of data. This meant **scripting and therefore cleaning data was slow** and involved excessive debugging while scripting.

Sources and Literature

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