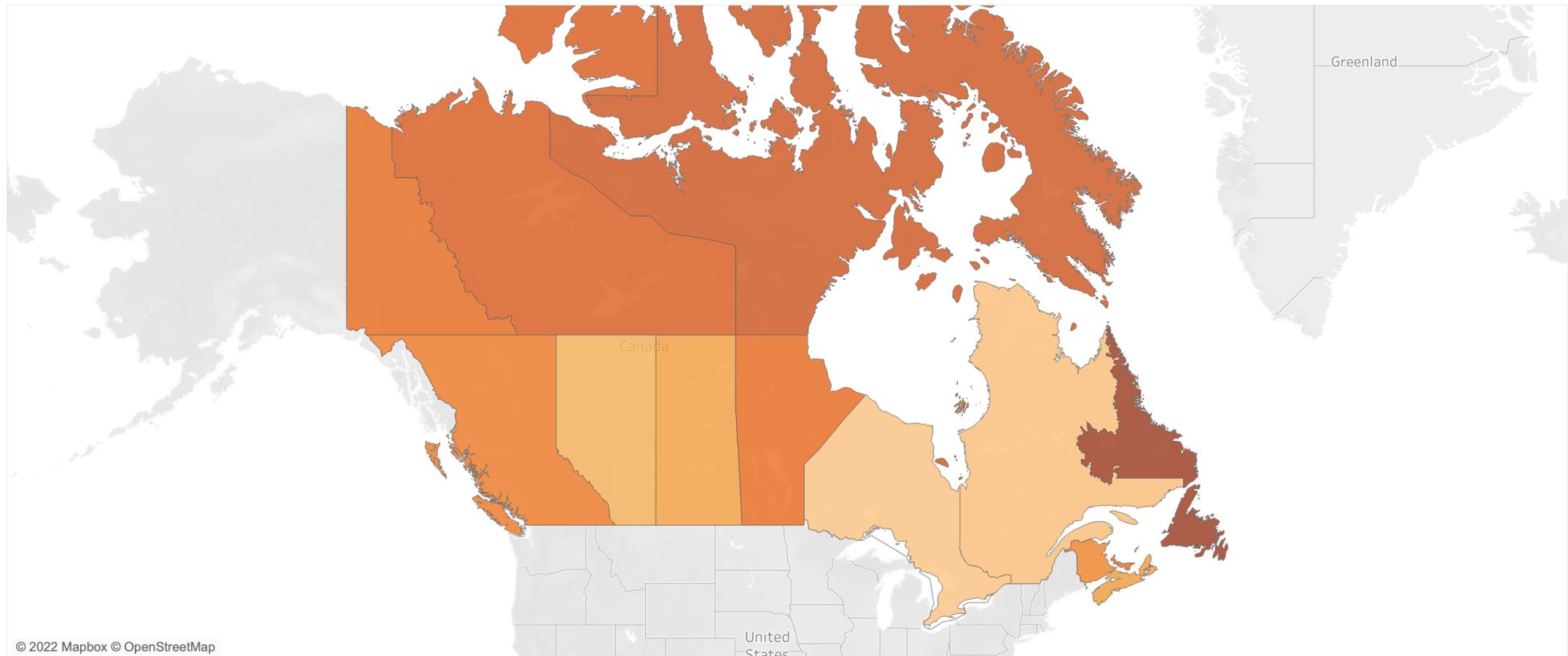


INFRASTRUCTURE PROJECTS in CANADA: 2002 - 2022
Project Management Analysis



INTRODUCTION: Problem Statement

What time-based metrics can be used to evaluate **regional** and **categorical** infrastructure project performance in Canada from 2002 to 2022, to identify those that are **exceeding expectations**, and those in need of additional **project support**?



EXECUTIVE SUMMARY:

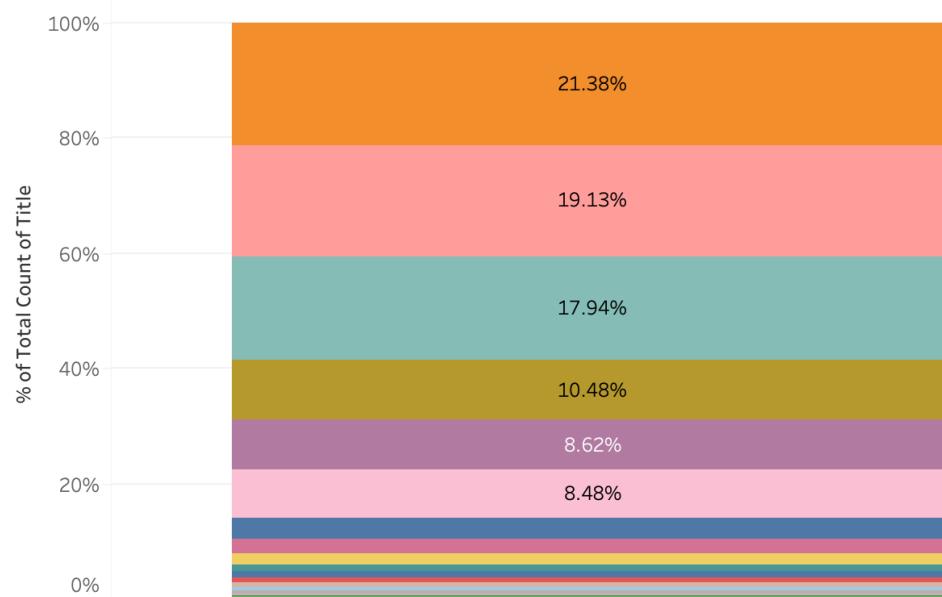
Analysis of **infrastructure project data** collected by Statistics Canada from 2002-2022* including **forecasted** and **actual planning** and **execution** dates points to **4 key time-based ratios** by which to identify **projects** and **regions** in need of **support**:

1. Average Forcasted Planning Period: Average Forcasted Execution Period (**AFP:AFE**)
2. Average Actual Planning Period: Average Actal Execution Period (**AAP:AAE**)
3. Average Actual Planning Period: Average Forcasted Planning Period (**AAP:AFP**)
4. Average Actual Execution Period: Average Forcasted Execution Period (**AAE:AFE**)

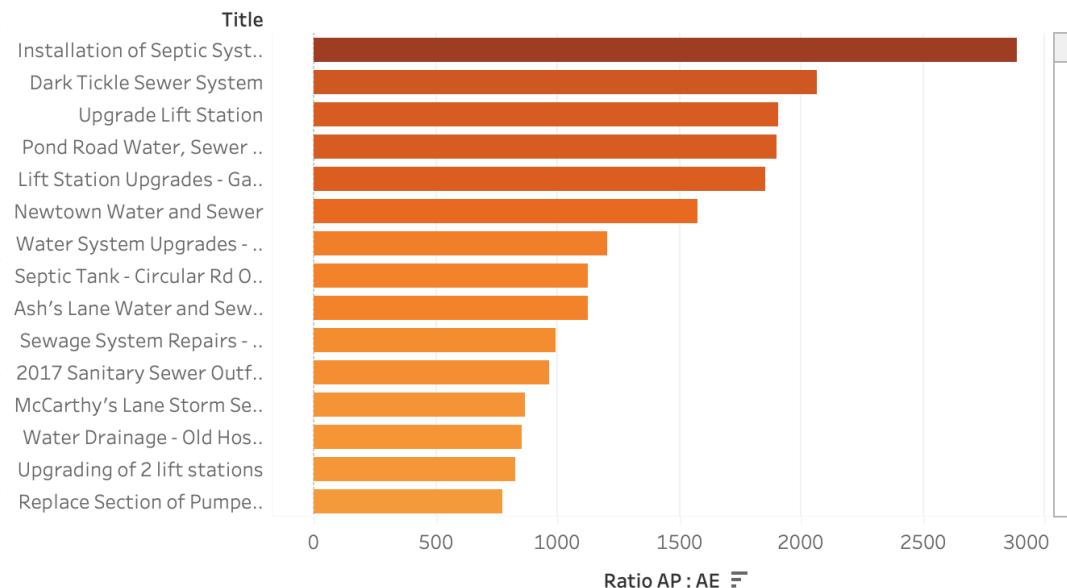
The application of these ratios on a regional and categorical level reveals that **NewFoundLand** could benifit from additional support on project **execution** and that **Wastewater** projects, which make up **21%** of projects overall, could benifit from **additional support** with respect to project **forecasting**.

Next steps should include the application of the **4 key ratios** to the the **180 Wastewater** projects in **NewFoundLand** to identify specific projects for assistance.

CATEGORY: % of Projects > Wastewater



PROJECT TITLES : NewFoundLand > Wastewater

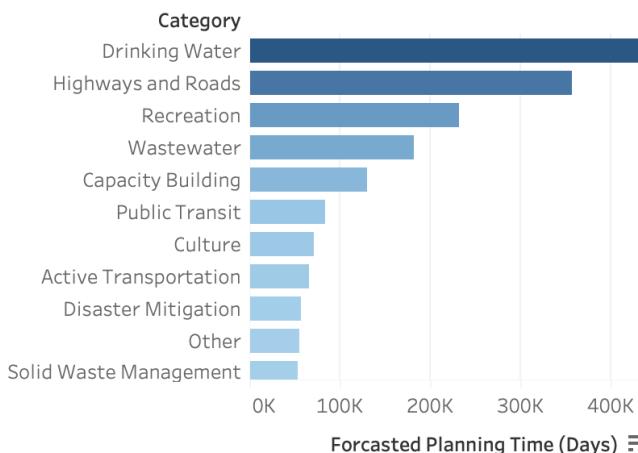


CONTEXT: Project Management Assumptions

Assumption 1 : Longer planning time for a project should result in shorter actual execution (For Example: work plan, sourcing, labour booking etc done in advance).

Assumption 2 : Longer execution period should be accompanied by greater costs.

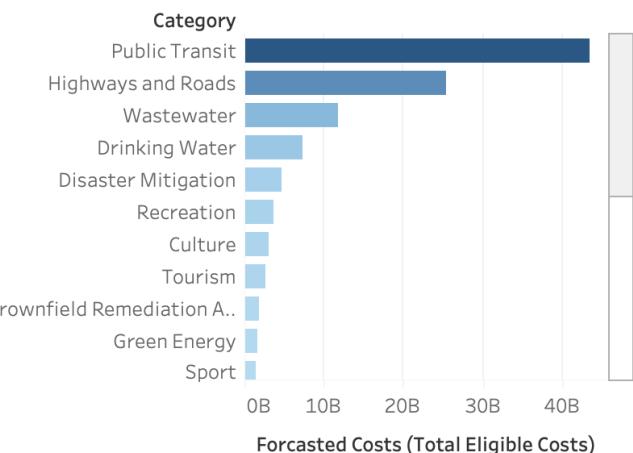
for. planning time



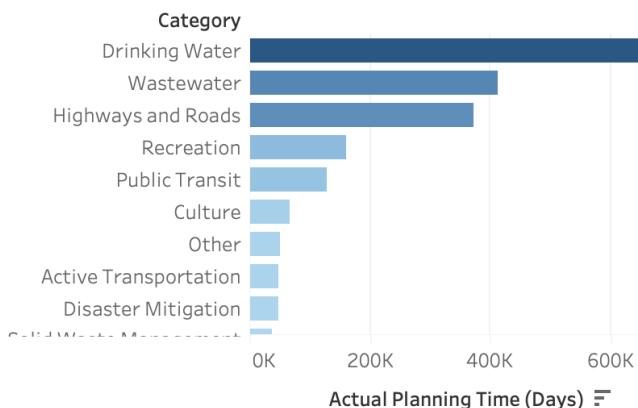
for. execution timeline



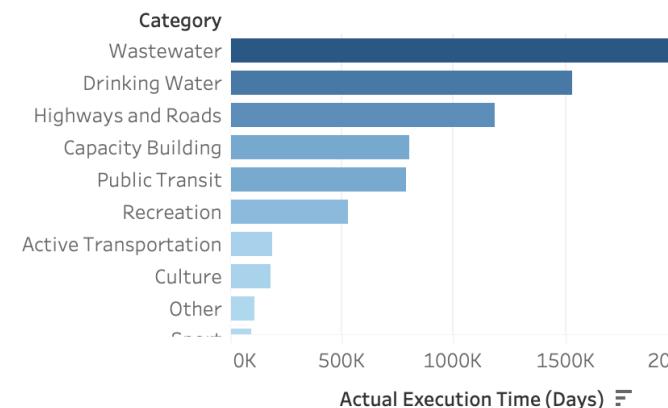
for. cost



act. planning time



act. execution timeline

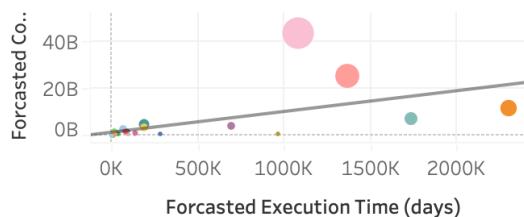


PLANNING & EXECUTION: Relationships

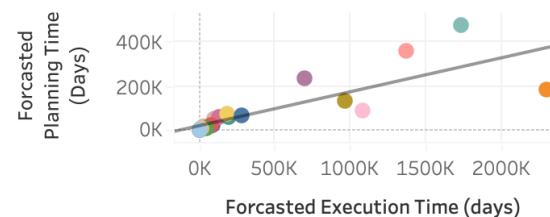
When project categories are placed in relationship to pairs of **Forcasted Planning**, **Forcasted Execution**, and **Forcasted Budget**, **Actual Planning**, and **Actual Execution**, key metrics emerge.

Plot 1) As expected, as forecasted execution period increases, so does forecasted cost...

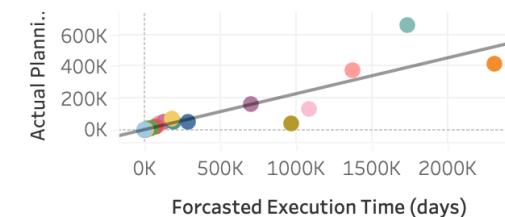
1) for. exec <> for. cost



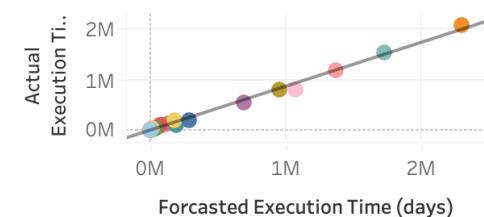
2) for. exec <> for. plan



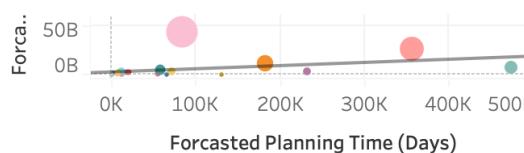
3) for. exec <> act. plan



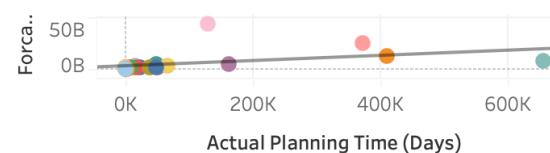
4) for. exec <> act. exec



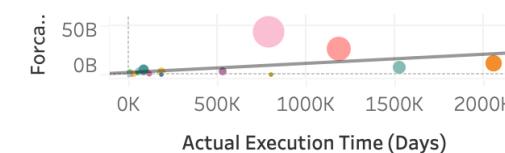
5) for. cost <> for. plan



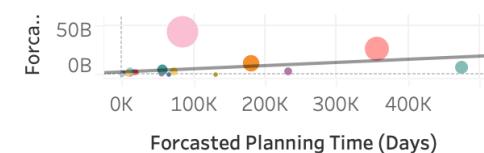
6) for. cost <> act . plan



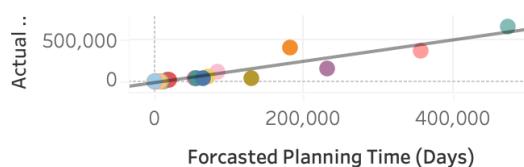
7) for. cost <> act. exec



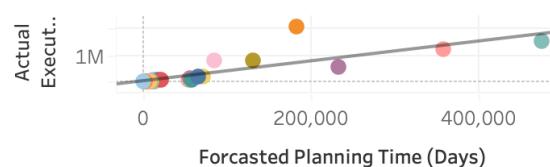
8) for. plan <> for. cost



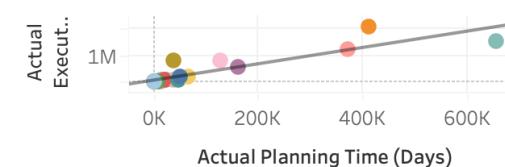
9) for. plan <> act. plan



10) for. plan <> act. exec



11) act. plan <> act. exec



Category

Active Transport..	Broadband And ..	Disaster Mitiga..	Innovation
Administration	Brownfield Rem..	Drinking Water	Marine
Affordable And ..	Capacity Buildi..	Green Energy	Other
Border Infrastr..	Culture	Highways and R..	Public Transit

Forcasted Costs (Total Eligible Costs)

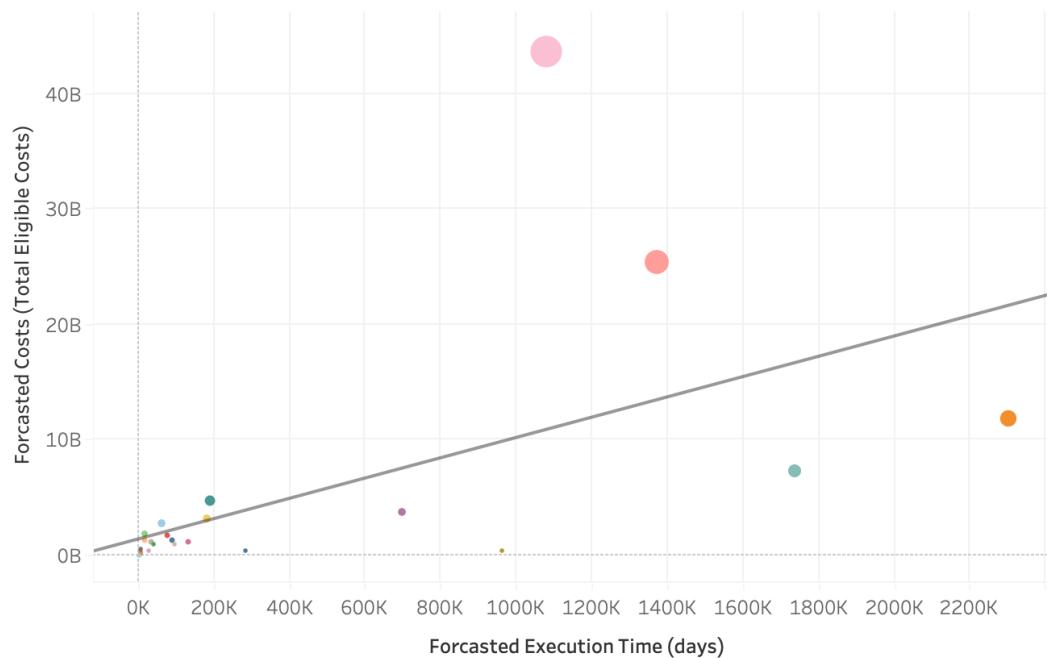
2,450,984	43,564,901,305
10,000,000,000	
20,000,000,000	
30,000,000,000	

COST & EXECUTION : Relationships

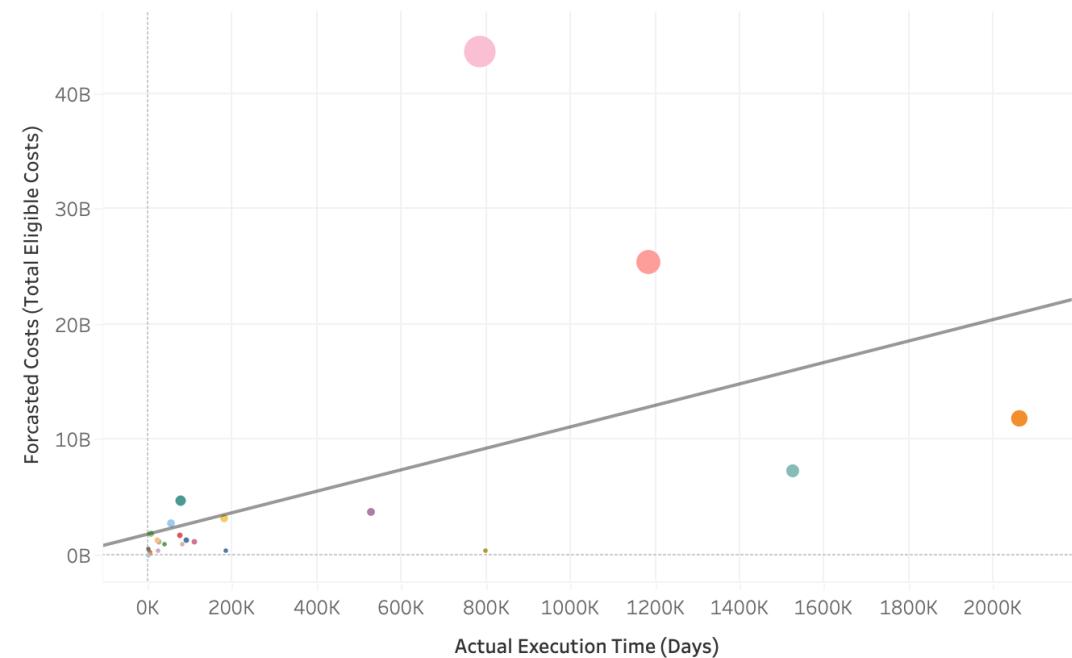
At first glance, the assumption that longer projects are more expensive appears to be true. However, a closer look at the **R squared** of both plots 1) and 7) below reveals a **low dependency** between cost and timeline (26%, and 17% respectively).

There are a number of significant exceptions: **Public Transit** projects tend to be **expensive**, but have relatively **short** timelines. **Capacity Building** initiatives tend to be **low cost**, but of relatively **longer** duration.

1) for. exec <> for. cost



7) for. cost <> act. exec



Category

Active Transporta..	Brownfield Rem..	Green Energy	Public Transit	Sport
Administration	Capacity Buildi..	Highways and R..	Recreation	Tourism
Affordable And ..	Culture	Innovation	Regional And Lo..	Wastewater
Border Infrastr..	Disaster Mitiga..	Marine	Shortline Rail	
Broadband And ..	Drinking Water	Other	Solid Waste Ma..	

Forecasted Costs (Total Eligible Costs)

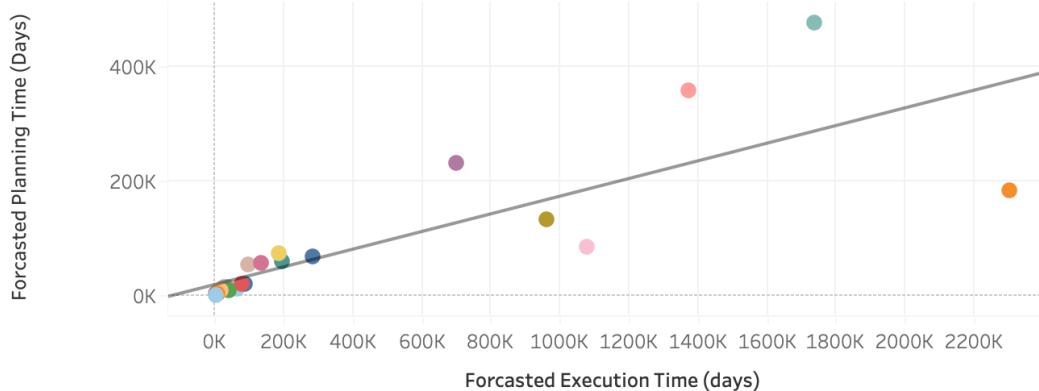
- 2,450,984
- 10,000,000,000
- 20,000,000,000
- 30,000,000,000
- 43,564,901,305

PLANNING & EXECUTION: Key Relationships

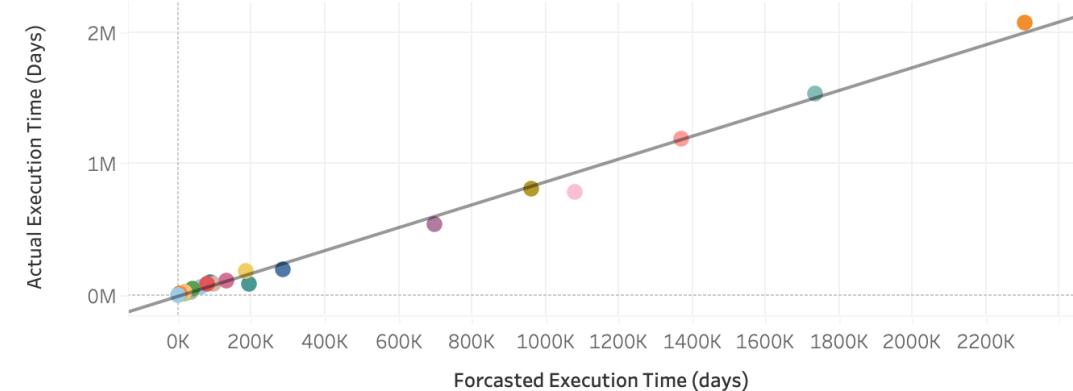
The **best measures** of project performance are the four plots below : **2,4,9 and 11**.

With their **high R squared values (72% - 98%)**, indicating strong dependency between the dependent and independent variables in each set, and **low p values (<0.0001)**, indicating that the regression line modeled is a good fit to the data, they are a reliable set of **key pairs** with which to assess project performance going forward.

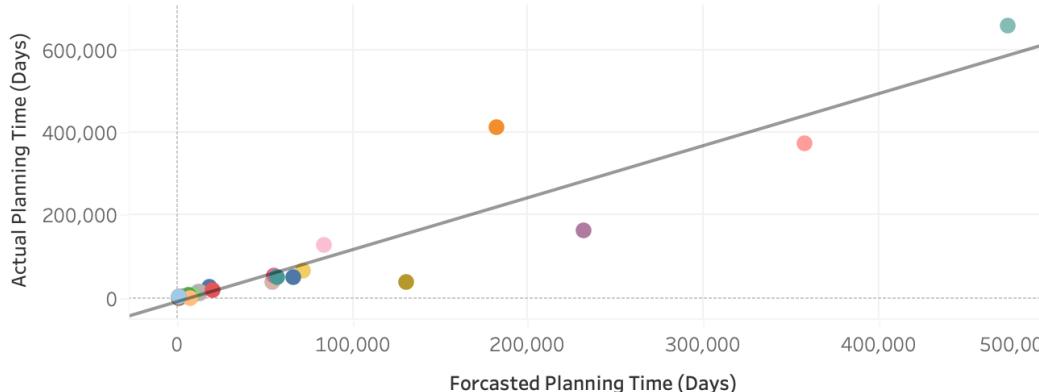
2) for. exec <> for. plan



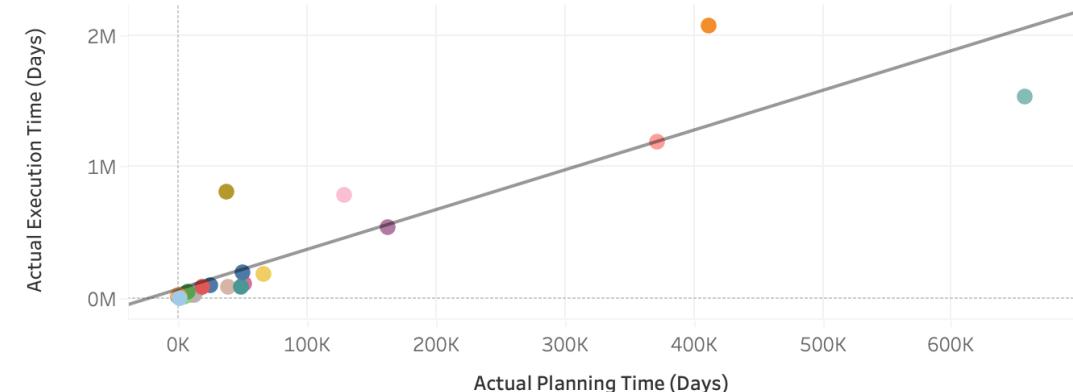
4) for. exec <> act. exec



9) for. plan <> act. plan



11) act. plan <> act. exec

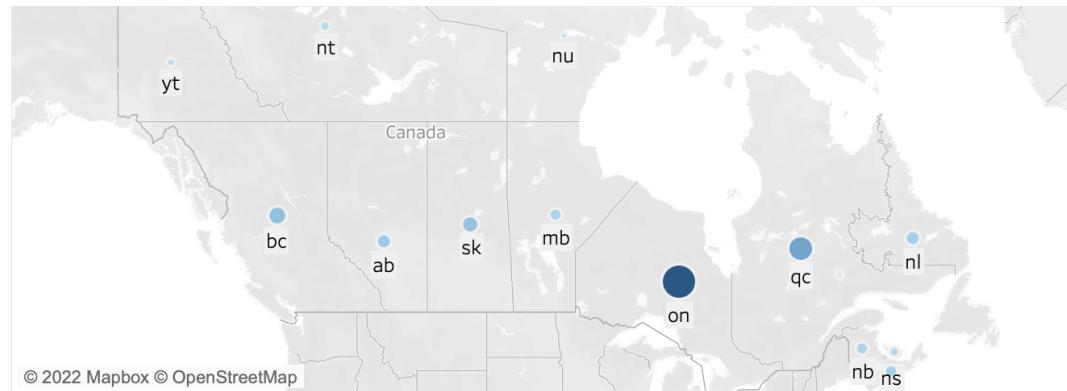


PROJECT PERFORMANCE by REGION: Aggregated

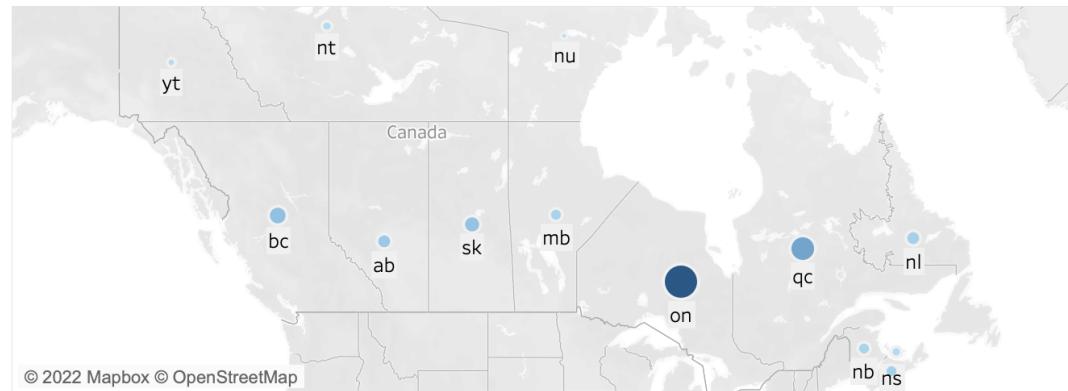
Considering ratios for average **forecasted** and **actual planning** and **execution** time accross Canada can help us understand which parts of the country are successfully managing projects, and which need some additional support.

Ontario shows the **highest** numbers for all **key pairs**, while **Nunavut**, a large territory to the north, shows the **lowest**.

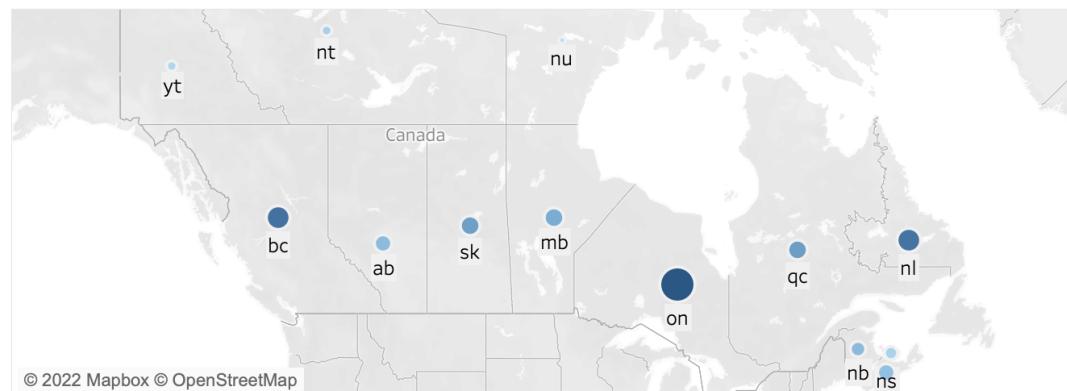
REGION: 2) for. planning <> for. execution



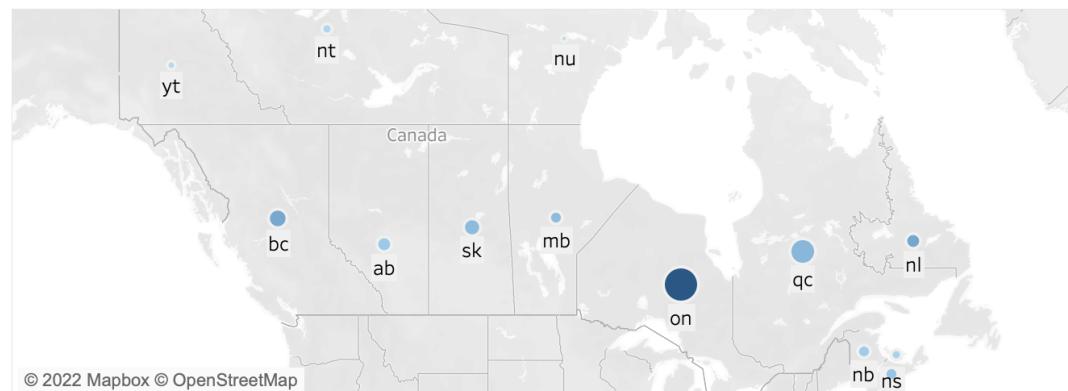
REGION: 4) for. execution <>act. execution



REGION: 9) for. planning <>act. planning



REGION: 11) act .planning <>act. execution



Actual Exec.. • 31,961 ● 1,000,000 ○ 2,000,000 □ 2,997,316

PROJECT PERFORMANCE by REGION: 4 Key Metrics

For deeper nuance into how project regions in Canada perform in relationship to eachother, 4 key ratios are deployed:

1. Average Forcasted Planning Period: Average Forcasted Execution Period (FP:FE)
2. Average Actual Planning Period: Average Actal Execution Period (AP:AE)
3. Average Actual Planning Period: Average Forcasted Planning Period (AP:FP)
4. Average Actual Execution Period: Average Forcasted Execution Period (AE:FE)

NewFoundLand (NFL) could benifit from additional support with project execution. It has the highest actual time for project planning relative to execution (65:1). Despite this long opportunity for planning, NFL's actual execution timelines exceed its forcasted execution timelines at a ratio of 95:1.

By contrast, Nunavut, should be applauded for its ability to most accurately forcast planning time (36:1), and execution time (70:1). Nunavut's ability to adhear to its forcasted timelines is all more admirable considering the extreemly cold climate conditions under which it is executing construction projects.

REGION: FP : FE



REGION: AP : AE



REGION: AP : FP



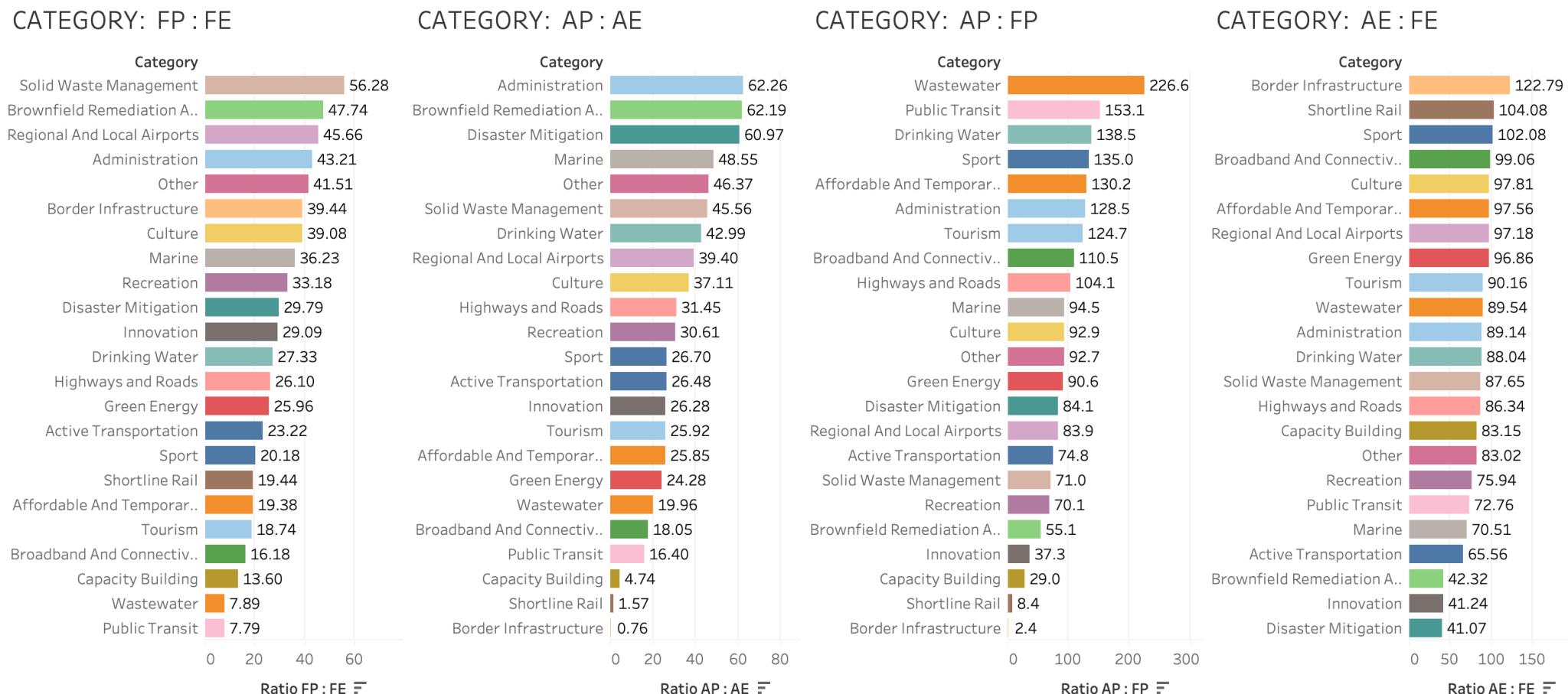
REGION: AE : FE



PROJECT PERFORMANCE by CATEGORY: 4 Key Metrics

Wastewater projects could benefit from **additional support** with respect to project **forecasting**. These projects show a **close relationship** between actual planning time and execution (20:1), in large part due to their rise in both actual planning days (226) and execution days (89) for every 1 that was forecasted.

The ratios for **Disaster Mitigation** offer an interesting example of how **adequate accurate planning time relative to execution (63:1)**, can yield a **strong performance** on actual execution (41:1). This is particularly **noteworthy** due to the **unanticipated nature of disasters**.





CONCLUSION: Time as a Key Metric

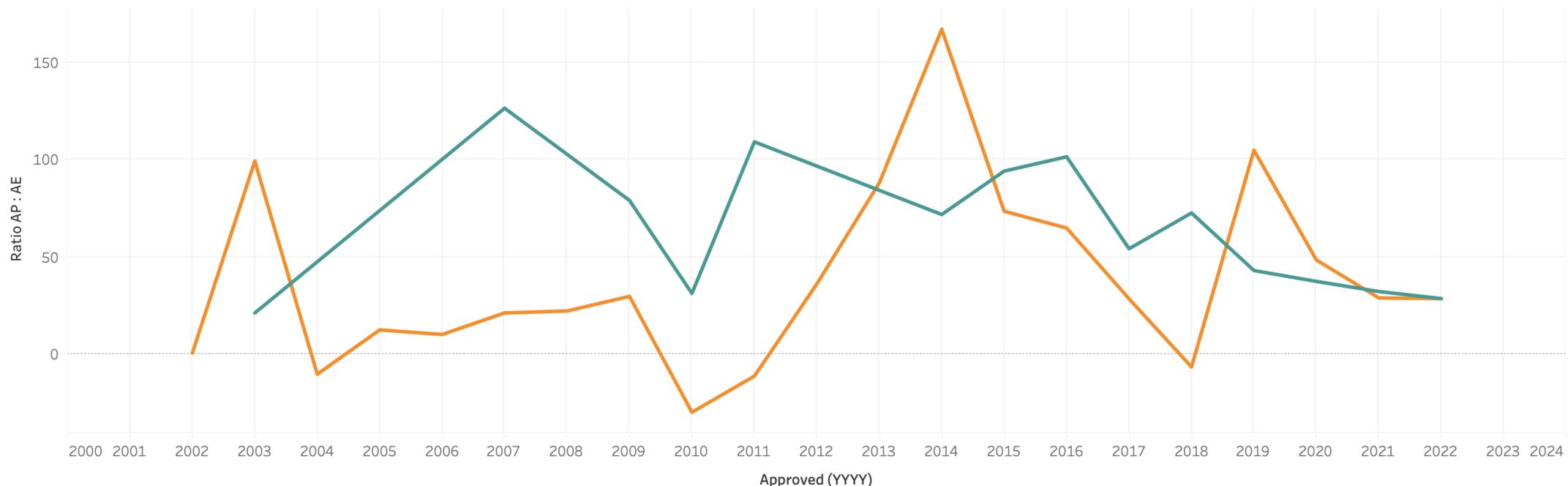
Are longer projects more expensive? Are project forecasts ever accurate? These are questions that project managers and project funders must ask about the project proposals they create and evaluate.

In this analysis, I develop a rubric for understanding project performance by looking at planning and execution time data to start to answer these questions with regards to infrastructure projects in Canada.

With this rubric I was able to identify the categories of Wastewater and Disaster Mitigation as areas for closer analysis. I was also able to identify that NewFoundLand and Nunavut are regions of Canada deserving of greater attention from a project performance perspective.

A deeper dive into the performance of the 260 Wastewater performance in NewFoundLand represents exciting next steps!

Wastewater + Disaster Mitigation > AP : AE x Year



APPENDIX A:

Infrastructure Projects in the Canadian Context:

1. A proposal for infrastructure project funding is submitted to the federal government of Canada, including a **forecasted execution timeline** ("Forecasted Start Date" to "Forecasted End Date"), and a list of **forecasted costs** eligible for federal contribution ("Total Eligible Costs").
2. If **approved** ("Approved Date"), the project team is informed of how much funding the **government will contribute** ("Federal Contribution"), on average **38% of total forecasted costs**.
3. The **actual** period of construction is then **executed** ("Construction Start" to "Construction End").

For the purposes of this analysis, additional periods of time were calculated from the available data, namely **forecasted planning time** ("Approved Date" to "Forecasted Start Date"), and **actual planning time** ("Approved Date" to "Construction Start Date").

