Engineering Project Proposals

(Bridging networks between the Manhattan and Brooklyn Boroughs)

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Report Summary

Historically, the Brooklyn-Queens Expressway and Frederick D. Roosevelt have experienced heavy amounts of traffic especially as of lately. The following report contains a proposal for a new East-River bridge that connects Manhattan and Brooklyn. Its purpose is to provide an alternative way for travel between the two boroughs that will help with traffic flow in the New York City area. The bridge is a suspension bridge as it's most efficient in sustaining vehicular traffic over the East River. The bridge will strictly be for vehicular travel so it will have little emphasis on tourism as opposed to the alternative Brooklyn Bridge. The budget for the bridge is $19,280,000.

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INTRODUCTION

This engineering proposal will be geared towards the construction of a new bridge to connect Manhattan and Brooklyn. As traffic congestion continues to be a major issue in this area with NYC ranking second in peak period traffic congestion (Camay et al., 2012), the construction of an additional bridge will provide a much-needed solution to alleviate traffic and improve connectivity between these two boroughs.

The current bridge infrastructure connecting Manhattan and Brooklyn, namely the Brooklyn Bridge and the Manhattan Bridge, are over a century old (*NYC DOT - Brooklyn Bridge*, n.d.) and were not designed to handle the current volume of traffic. This has resulted in severe congestion during peak hours, causing delays and frustration for commuters and residents alike.

The proposed bridge will not only increase capacity and reduce congestion, and be designed to accommodate multiple modes of transportation, including vehicular traffic, pedestrians, and cyclists.

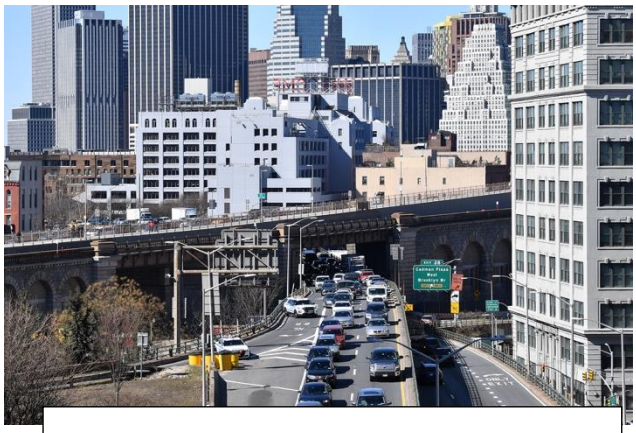

Figure 1. Busy traffic in Manhattan .(Meyer, 2021)

This proposal outlines the engineering feasibility of the new bridge, including design concepts, construction methods, and the costs of the construction, both financially and environmentally.

CURRENT NETWORK OF BRIDGES CONNECTING BROOKLYN AND MANHATTAN

FIGURE 5 - ERB'S TOTAL DAILY CROSSINGS

	FULL TRANSPORTATION OPENING	PEAK YEAR	1989
BROOKLYN BRIDGE 1883	341,000 (1902)	426,000 (1907)	178,000
MANHATTAN BRIDGE 1909	229,000 (1917)	703,000 (1939)	360,000
WILLIAMSBURG BRIDGE 1903	227,000 (1910)	505,000 (1924)	240,000
QUEENSBORO BRIDGE 1909	44,000 (1910)	326,000 (1940)	248,000
TOTAL	841,000	1,960,000	1,026,000

Figure 2. ERB's Total Daily Crossings (Kazis, 2011).

The network of bridges connecting Brooklyn and Manhattan has a rich history that dates to the late 1800s. The Brooklyn Bridge, which opened in 1883, was the first bridge to connect the two boroughs, and it quickly became an iconic symbol of New York City. The bridge was designed to handle the traffic of the time, primarily horse-drawn carriages (Kazis, 2011), and pedestrians, and was not designed to accommodate modern vehicular traffic.

As New York City's population grew, the demand for transportation increased, and the Brooklyn Bridge became increasingly congested. In response to this, the Manhattan Bridge was constructed and opened in 1909, providing

another route across the East River. However, even with two bridges, traffic congestion remained a significant problem during peak hours.

In the years that followed, other bridges were constructed to connect Brooklyn and Manhattan, such as the Williamsburg Bridge, which opened in 1903, and the Brooklyn-Battery Tunnel, which opened in 1950. However, despite the additional infrastructure, traffic congestion remained a significant issue.

Today, the existing network of bridges connecting Brooklyn and Manhattan faces significant traffic congestion, particularly during peak hours. The high volume of traffic restricts the flow of vehicles, causes delays, and contributes to air pollution in the area. To address these challenges, we propose constructing another bridge to provide additional capacity and alleviate traffic congestion.

PROJECT DESCRIPTION

- Confirm feasibility (is it do-able?) How will you find out?
    - Initial feasibility will be confirmed with computer models of the bridge that is to be built in the decided upon region. An example of such a computer program could be SAP 2000 program, which many engineers are familiar with.
    - Another independent engineering firm will be consulted to confirm the feasibility of the project.
    - The city government will most likely hire their own independent experts in addition to city engineers to check the plans.
    - The city's accountants will likewise be asked to evaluate the projected budget.
- Explain the specific benefits of implementing the idea:
    - Reduced traffic will decrease environmental impact from stalled cars
    - Greater rate of transportation will boost economy
    - Construction and maintenance of bridge will increase employment
    - More routes for public transportation (ie buses) will have a positive economic impact as well as social benefit
- and the consequences of not doing it:
    - More and more people are deterred from working in the city because of the long commute that is worsened by traffic jams increased by continuous maintenance of old bridges
    - The air quality continues to worsen as more particulate matter is released from cars in traffic jams.
    - City infrastructure no longer meets the demands of the increasing city population and business.
- Give a detailed description or explanation of your proposed idea or methodology, and the resources needed to achieve goals:
    - Different factors to consider and the ensuing outcomes:
        - Is there a high concentration of chloride in the area?
        - Is there a crosswind environment?
        - What is the effect of the temperature in the area and how is that influenced by the heat from a metropolis such as NYC?
    - Potentially using new materials to make the bridge more eco friendly
    - Exploring the idea of adding sun panels or other non-invasive scientific tools to the structure
    - Discussion of selection of why a suspension bridge is most efficient
- Address potential obstacles or objections; concede where appropriate
    - Disagreement beyond the basic benefits of the bridge for traffic:
        - Ie should the bridge also be a tourist destination?
        - Should the bridge be walkable?
    - Debate over whether adding an additional bridge will have a big enough impact to justify the cost and the inevitable temporarily increased traffic surrounding construction.
        - Why hasn't another bridge already been built?
    - How important should environmental impact be in the construction of the bridge?

        - Is it enough that the bridge will eventually reduce traffic? Should the bridge be made from especially good material for the environment? Does the construction process have to be environmentally conscious?

BUDGET

Details about the graph(s) that will represent the budget:

- Show at least three separate stages:
    - Planning of the bridge
        - his will show the salary of the engineers and the involved government and private agencies
        - Cost could include purchasing computer programs to model the bridge
    - Building the bridge
        - Cost of resources
        - Cost of construction company
        - Salary of engineers and inspectors
    - Preparing the bridge for public use
        - Cost of inspecting the bridge after construction
        - Initial maintenance
        - insurance
- Potentially many graphs to represent the different groups involved, showing where involvement is the highest in the process
- One large aggregate graph that attempts to combine all of the elements to give a rough approximation of the progression of the budget throughout the project

Construction	**Cost (U.S. Dollars)**
Materials	$14,000,000
Contractor Fees	$ 4,000,000
Interior	**Cost (U.S. Dollars)**
Engineer Firms	$400,000
Government Agency	$180,000
Inspector & Maintenance	$500,000
Insurance	$200,000
Total	**$19,280,000**

Conclusion

In conclusion, the proposal to construct a new bridge connecting Manhattan and Brooklyn is not only feasible but also necessary to alleviate traffic congestion, reduce environmental impact, and boost the economy. Through computer models and consultations with independent engineering firms, we will confirm the feasibility of the project. The city government and its experts will also evaluate the plans and projected budget. The benefits of constructing a new bridge are significant, including reducing traffic congestion, improving air quality, and increasing employment opportunities through construction and maintenance of the bridge. Furthermore, more routes for public transportation will have a positive economic and social impact.

In general, the consequences of not constructing a new bridge are equally significant, including deterring people from working in the city, worsening air quality, and inadequate city infrastructure. For this reason, it is necessary to address these challenges through our City College engineering team. The proposed idea involves considering various factors such as high chloride concentration and crosswind environment, using eco-friendly materials, and exploring the possibility of adding scientific tools to the structure. The selection of a suspension bridge is also deemed to be most efficient. Potential obstacles and objections are also considered, such as disagreements on whether the bridge should also be a tourist destination or walkable. However, the benefits of the bridge for traffic and transportation infrastructure outweigh any potential drawbacks.

References

Camay, S., Zielinski, E., & Zaranko, A. (2012). *New York City's East River Ferry: Expanding Passenger Ferry Service and Stimulating Economic Development in the New York City Region*. Transportation Research Record. Retrieved April 17, 2023, from https://doi.org/10.3141/2274-21

Fontanez, R. (2021, April 22). *Earth Day: Reducing Environmental Impact of Construction*. U.S. Bridge. Retrieved April 17, 2023, from https://usbridge.com/reducing-environmental-impact-of-bridge-construction/

Geotechnical Engineering Bureau. (n.d.). NYSDOT. Retrieved April 17, 2023, from https://www.dot.ny.gov/divisions/engineering/technical-services/geotechnical-engineering-bureau

Hu, W. (2020, June 24). *A Bridge From Queens to Manhattan, but No Cars Allowed (Published 2020)*. The New York Times. Retrieved April 17, 2023, from https://www.nytimes.com/2020/06/24/nyregion/nyc-bridge-bike-pedestrians.html

Kazis, N. (2011, April 11). *The Efficient Past and Wasteful Present of the Brooklyn Bridge*. Streetsblog NYC. Retrieved April 17, 2023, from https://nyc.streetsblog.org/2011/04/11/the-efficient-past-and-wasteful-present-of-the-brooklyn-bridge/

Lewis, H. M. (1924). The New York City Motor Traffic Problem. *The ANNALS of the American Academy of Political and Social Science*. Retrieved April 17, 2023, from https://doi.org/10.1177/000271622411600136

Meyer, D. (2021, March 9). *NYC has America's worst traffic congestion*. New York Post. Retrieved April 17, 2023, from https://nypost.com/2021/03/09/nyc-has-americas-worst-traffic-congestion/

Morphet, J., & Crane, E. (2023, March 13). *NYC ranked US's most congested city as motorists spend 10 full days in traffic per year*. New York Post. Retrieved April 17, 2023, from https://nypost.com/2023/03/13/nyc-drivers-travel-just-12-mph-during-rush-hour/

Narasimhan, S. (Ed.). (n.d.). Journal of Bridge Engineering. *ACSE Library*.

NYC Codes - Buildings. (n.d.). NYC.gov. Retrieved April 17, 2023, from https://www.nyc.gov/site/buildings/codes/nyc-code.page

NYC DOT - Brooklyn Bridge. (n.d.). NYC.gov. Retrieved April 17, 2023, from https://www.nyc.gov/html/dot/html/infrastructure/brooklyn-bridge.shtml

NYC Engineering Firm. (n.d.). McLaren Engineering Group. Retrieved April 17, 2023, from https://www.mgmclaren.com/engineers/nyc-engineering/

Singstad, O. (1927). The Relation of Tunnels and Bridges to Traffic Congestion. *The ANNALS of the American Academy of Political and Social Science*. Retrieved April 17, 2023, from https://doi.org/10.1177/000271622713300109

Traffic Impact Study. (n.d.). NYSDOT. Retrieved April 17, 2023, from https://www.dot.ny.gov/CommercialHWP/traffic-impac