

Pete Buttigieg
Secretary of the US Department of Transportation
U.S. Department of Transportation
1200 New Jersey Ave., SE
Washington, DC 20590]

Dear Pete Buttigieg

We, Future Environmental Engineers, would like to submit our proposal in response to the growing number of motorized vehicles. As you may already be aware, our planet is dying from the constant pollution of the waste that we produce that is now affecting not just the land we walk but the air we breathe. If our situation remains unchanged, then sooner or later we will be poisoned by the very gas we release into our atmosphere.

We propose to incentivize the public, through a point system, ensuring more commutes through biking rather than motorized vehicles like cars, trucks, etc. By doing so, it will reduce the number of greenhouse gas emissions and, as a bonus, regulate the health of our populace.

Bicycles are great active vehicles; not only do they allow users to travel great distances, but also keep the user's body in shape, and the best part is that it's air pollution-free, but despite that, not many would pursue bicycles as a means of travel. The reason is, with no harm intended, that most people are generally lazy, which is why we make groundbreaking inventions to make our lives easier; cars and motorized vehicles are no exception. It is because of the convenience that a car brings that a bike is thought of as a second option, but that results in a problem in which there is more demand to travel by car.

As the number of cars increases, so does the number of greenhouse gas emissions, generally CO2. We need a strong incentive to influence the populace's choice in commuting by bike. In this regard, we thought of a gamification policy such as a point system. People respond to rewards; if they can receive something through an action, event, or policy, then many would do it. There are already some findings regarding this type of approach.

We strongly believe our proposal will make great changes to not just our society but to the environment as well if you were to hear us out. Right now what's stopping the implementation of our proposal is both the budget the and current infrastructure of New York. With the current infrastructure of the US highly supporting motorized vehicles, we need to make changes to better allow more biking activity, for that we need the support of the US Department of Transportation We await your response. If needed, here is the contact information for further discussion: +1 929-434-7556, wenzqiz9049@gmail.com. Thank you for your consideration.

Sincerely,



Wen Qi Zhang, Abkariyyah Ahmed, Mohammed Mohammed

Public Bike Points System

Technical Project Phase 3

By

Wen Qi Zhang

Abkariyyah Ahmed

Mohammed Mohammed

[Pete Buttigieg (Secretary of US Department of Transportation)]

[U.S. Department of Transportation

1200 New Jersey Ave., SE

Washington, DC 20590]

[(202) 456-1111]

[@SecretaryPete]

Advisor: Corinne Shearer

Assigned: March 13, 2024

Due: April 10, 2024

Abstract Summary:

The promotion of active and sustainable transportation modes is the key to reducing air pollution, road congestion, and adverse health outcomes of sedentary lifestyles. Our group proposes a public bike system to incentivize people within the US roughly 12-35 years old to commute more through biking rather than driving on cars or motorized vehicles. The system we propose works under a gamification approach, in which people could earn points by riding bicycles for a certain distance and exchange them for rewards or money. Similar approaches have already appeared in our modern time and have shown positive results, for example, the Cycling May policies that were proposed in Poland. The results have shown that there has been an average increase of 18% in the daily bicycle traffic. Our improvised proposal system includes financial rewards in addition to material rewards. The user could exchange for products like water bottles and T-shirts or convert the points into cash, which is set by a ratio of 1,000 points to \$1. Material rewards will be delivered to the user's preferred address within 5-10 days or to the nearby UPS store from the posted address by the user.

To test our proposal's effectiveness, we will first apply a quasi-experimental design in New York City based on observing bicycle counts in targeted boroughs such as Manhattan and Staten Island, and compare them to the other boroughs. We anticipate that our proposal will result in a significant increase in the number of bike users in the targeted borough where we implement our proposal. If such results were to be found positive then we would like to implement our proposal on a larger scale. Promoting biking will not only benefit the environment but also regulate our everyday health.

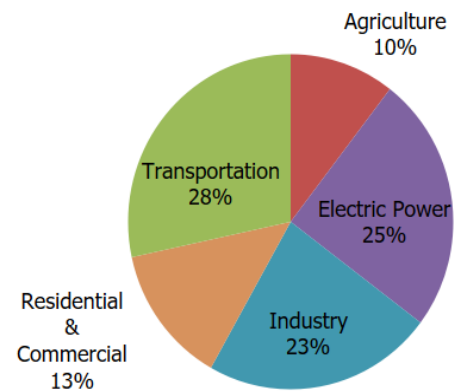
Table of Contents

Literature Review.....	5-7
Methods.....	8-9
Anticipated Results.....	10
Conclusion.....	11
References.....	12

Literature Review:

Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022

Greenhouse gas emissions remain a significant problem worldwide, largely due to the growing numbers of people using motorized vehicles, like cars, motorcycles, trucks, etc. According to the US Environmental Protection Agency, the transportation sector within the United States accounts for the most considerable emission rates of the greenhouse gas by about 29%. From 1990 to 2021, the total greenhouse gas emission by transportation has increased by 18.8 percent. This increase in the number of the transportation sector is mainly due to the boost in demand for travel, influenced by population growth, boost in the economy, increase in urban areas, and periods of low fuel price (EPA, 2024, page 2-36). This shows how deeply rooted we are in using transportation in our daily lives, but rather than promoting vehicles that cause environmental harm, promoting active transportation, like bicycles, will not only benefit the environment but also ourselves.



Current emission percentage within US 2024 (EPA, 2024)

Impact evaluation of a cycling promotion campaign using daily bicycle counters data

In the world of economics and real life, people respond to incentives, in other words, temptation, intervention, events, or policy that cause behavioral changes. Incentives like rewards or competition are generally what drive people to do certain actions. According to joint research by the University of Bologna's Department of Statistical Sciences and Gdansk University of Technology's Faculty of Civil and Environmental Engineers, the gamification policy approach, based on competition and relative rewards, has proven to be the most effective in promoting cycling behavior. Throughout their observation between countries like Gdansk, where it's implemented, and Lodz, where it's not, the result has shown a 14% increase in cycling activity in countries where policy was implemented than it is not. (Biondi, Romanowka, Birr, 2022, page 347) This was further verified, by another study from the University of Sheffield's School of Architecture and the University of Leeds's School of Geography. The two universities

implemented the “Cycling Challenge” to examine commuting behavior and possible long-term behavioral shifts toward cycling among staff members and students. The result observed an increase of 26% in the cycling frequency that was sustained for 2 years after the original Cycling Challenges (Lovelace, Uttley, 2016, page 139). Although the increase in cycling frequency did not last long in the long term, the results still show that incentives like rewards and competition can produce a positive effect in getting people to ride bicycles. This is particularly important because depending on the incentives it can highly influence the public’s opinion and choice of action, in this case, riding a bicycle.

Congestion as a result of the increase in Automobile

Transportation within New York City poses significant challenges for commuters, with overcrowded streets, long wait times, and environmental concerns being just a few of the issues. The city's reliance on traditional modes of transportation, such as cars and public transit, has led to chronic traffic congestion, increasing stress levels, and reducing overall efficiency. According to the INRIX Global Traffic Scorecard, NYC ranked as one of the most congested cities in the United States, with commuters spending an average of 100 hours stuck in traffic each year (INRIX, n.d. 2022). This congestion not only leads to wasted time and productivity but also contributes to air pollution and greenhouse gas emissions, further impacting public health and the environment. In the face of these challenges, promoting biking as a smarter transportation option emerges as a compelling solution. By encouraging more residents to embrace biking as a viable mode of commuting, NYC can alleviate traffic congestion, improve air quality, and enhance overall urban mobility. This introduction sets the stage for a discussion on the benefits of biking as a sustainable and efficient transportation alternative in the context of New York City's commuter landscape.

Impact of promoting biking on road congestion

Encouraging more people to ride bikes in New York City can really help ease traffic jams. Because bikes take up way less space on the road than cars, if more people choose to bike instead of drive, it means less crowding on the streets, especially during busy times like rush hour. Studies show that promoting biking can lead to a significant drop in traffic congestion. For instance, research from the National Association of City Transportation Officials found that in

cities with strong bike infrastructure, bike commuting increased by 43% between 2000 and 2010, contributing to reduced traffic delays (National Association of City Transportation Officials, 2015). This is good news not just for bikers who enjoy quicker trips but also for everyone else on the road, including drivers and bus riders. Overall, making biking a bigger part of NYC's transportation mix can make getting around smoother and faster for everyone.

Health improvement behind daily biking

Riding bikes has become an integral part of people's daily lives, the way people move from one place to another while exercising and maintaining their health at the same time. However, positive opinions have been raised about the potential beneficial impact of riding bikes on health, the environment, air pollution, and Deforestation. According to the University of Montana, Cycling is one of the healthiest and most beneficial impact forms of exercise that can lead to burn calories, build strength, increase balance, build endurance and stamina, increase flexibility, define shape and muscle tone, increase cardiovascular fitness, and improves joint mobility. This indicates that cycling reduces the risk of certain diseases and health problems, such as heart attacks, strokes, and diabetes. It is important because somehow people's lives are being saved from a great danger that threatens their lives. In addition, according to the University of Montana Research, If all the people in the world who use cars to go to work use bikes for one day a week instead, that would reduce greenhouse gas emissions by 5 million tons a year. That's the equivalent of 1 million people getting rid of their cars. And it would save over 24 billion gallons of gas. This illustrates that biking can save our environment and our health.

Cycling can improve both physical and mental health and can reduce the chances of experiencing many health problems. According to the Better Health channel, Cycling is a good way to control or reduce weight, as it raises your metabolic rate, builds muscle, and burns body fat. This shows that you should be burning at least 8,400 kilojoules about 2,000 calories a week through exercise. It is important because Steady cycling burns about 1,200 kilojoules, about 300 calories per hour. Regular cycling stimulates and improves your heart, lungs, and circulation, reducing your risk of cardiovascular diseases. In addition, research has shown that if you cycle, the chance of bowel cancer is reduced. Some evidence suggests that regular cycling reduces the risk of breast cancer.

Methods:

In New York City, there is already a points system for public bikes, but that is limited to membership and the amount of time that they check in daily. We are proposing an improvised public bike points system, in which people could earn points not just from daily checking but also by the amount of distance (miles) they travel per hour. Then, like any other points system, the user can exchange the points they earn for rewards.

Our improvised proposal system includes financial rewards in addition to material rewards. The user could exchange for products like water bottles and T-shirts or convert the points into cash, which is set by a ratio of 1,000 points to \$1. Material rewards will be delivered to the user's preferred address within 5-10 days or to the nearby UPS store from the posted address by the user.

The progress of every individual will be monitored through the mobile app, "Public Bike Point Exchange (PBPE)". Users will have to create their login account for the app to be used. Only by downloading this app will the user be able to use the public bike, otherwise, the bike will not be removed from the dock. This app will not only consist of an option for reward exchange but also keep track of the points that the user earns, as well as monitor the time that the user spends on riding a public bike, and record the additional fee that the user needs to pay. Whenever the user wants to use a public bike, they will need to type in the bike's code on the mobile app for the lock on the bike to be removed.

To prevent our system from being taken advantage of, our point system will work under share bike policies, in which the public bike will be charged \$4.49 for the initial fee and an additional fee of \$0.17 per minute if time goes above 1 hour, and membership will be charged for \$0.15 per minute. The process will continue until the bike is returned to a dock at any station, and the payment will come right after by scanning or paying through the mobile app.

People who signed up to ride public bicycles each day will be rewarded with 5 points daily. After that, points will be provided according to the distance traveled in miles per hour they travel on the bike. For every mile per hour, the user will earn 20 points.

$$\text{Points} = [20[\text{Distance(miles)}]]/\text{Time(hour)} + (5)$$

This will be tracked by the GPS tracker installed on the public bicycles, which will transmit the distance that was traveled into the mobile app and convert the value into points; the function is

similar to Google Maps. The greater the distance traveled, the greater the points provided to the bike rider. There will also be promotions for all people who return bikes to their designated places where they should be. The promotion means an increase in the reward, so when the user goes biking the next time they will earn 50 points for every 1 mile per hour.

Our goal is to incentivize young people (18-30) to ride bicycles more and decrease the number of car users in the hope of lowering greenhouse gas emissions.

We will first conduct an experimental phase in which we will observe for 6 months how our points system will affect the public's means of transportation within New York City. Each borough of New York City will be divided into two factions, one with our bike point system and one without. We will compare the number of bike users in the borough with and without the point system. If the results are proven to be positive and our point system ends up promoting more bike users, we would like to expand our proposal throughout the US.

Anticipated Results:

The proposed improvised public bike points system presents a promising avenue for incentivizing bike usage and promoting sustainability within New York City's transportation infrastructure. By offering both material and financial rewards based on the distance traveled and time spent riding public bicycles, the system encourages increased participation and engagement from users.

Anticipated results of this proposal include a significant uptick in bike usage throughout the city. With the allure of rewards, individuals are likely to opt for biking as their preferred mode of transportation, especially for short to moderate distances. This shift away from traditional vehicular travel not only alleviates congestion on roadways but also reduces carbon emissions, contributing to a cleaner and healthier urban environment.

Moreover, the emphasis on returning bikes to designated locations fosters responsible usage practices and ensures the availability of bikes for other riders. The promotion for returning bikes to their designated places further incentivizes users to adhere to proper bike-sharing protocols, enhancing the overall efficiency and accessibility of the system.

In addition to the environmental benefits, the introduction of a points-based reward system makes it more engaging and enjoyable for participants. This gamified approach has the potential to cultivate a sense of community among riders and foster a culture of active and sustainable urban mobility. Biking has become a popular and affordable way to get around New York City, with an annual increase of 150% in bicycle trips over the past decade. Biking has many benefits for the city, including Transportation, Health, Environment, and Infrastructure.

Overall, the proposed system not only promises to revolutionize the way people navigate the city but also underscores New York's commitment to innovation and sustainability in urban transportation. Through strategic implementation and promotion, this system has the potential to become a cornerstone of the city's public transit network, setting a precedent for other metropolitan areas to follow suit in promoting eco-friendly transportation alternatives.

Conclusion

In conclusion, the proposed improvised public bike point system presents a multifaceted solution to some of the pressing challenges facing urban transportation systems, particularly in bustling cities like New York. By incentivizing bike usage through a combination of material and financial rewards tied to distance traveled and responsible return practices, this system not only encourages a shift towards sustainable modes of transportation but also fosters a sense of community engagement and responsibility among users.

Beyond its immediate benefits for congestion reduction and carbon emissions mitigation, the broader impact of this research extends to shaping the future landscape of urban mobility. Through the integration of innovative technology and gamified incentives, this system sets a precedent for the development of more dynamic and user-centric transportation solutions in metropolitan areas worldwide. New Yorkers who bike to routine destinations report better overall health. You can burn calories and improve your mood, as well as prevent obesity, diabetes, heart disease, and many other health problems. Moreover, by promoting active modes of travel, it contributes to public health initiatives and underscores the interconnectedness of urban planning, environmental sustainability, and public well-being. biking is efficient, affordable, equitable, healthy, and environmentally friendly.

In essence, the proposed system represents an innocent approach to addressing the complex challenges of urban transportation, offering not only practical solutions for improving efficiency and reducing environmental impact but also fostering a culture of innovation and community in the process.

References:

- *Benefits of biking.* (2018, January 20). <https://www.umt.edu/transportation-parking-services/news/benefitsofbiking.php#:~:text=Riding%20a%20bike%20also%20reduces,t%20only%20affect%20the%20air.>
- Biondi. B, Romanowka. A, Birr. K, (2022), Impact evaluation of a cycling promotion campaign using daily bicycle counters data: The case of Cycling May in Poland. *Transportation Research Part A: Policy and Practice* (20), 337-351. <https://www.sciencedirect.com/science/article/pii/S096585642200221X>
- Department of Health & Human Services. (2011, November 30). *Cycling-health benefits.* Better Health Channel. <https://www.betterhealth.vic.gov.au/health/healthyliving/cycling-health-benefits#bhc-content>
- EPA (2024), Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022, U.S. Environmental Protection Agency, EPA. <https://www.epa.gov/system/files/documents/2024-02/us-ghg-inventory-2024-main-text.pdf>
- Inrix. (2022). *Global Traffic Scorecard.* <https://inrix.com/scorecard/>
- National Association of City Transportation Officials. (2015). *NACTO Urban Bikeway Design Guide* (2nd ed.). Island Press. <https://nacto.org/publication/urban-bikeway-design-guide/>
- Uttley, J., Lovelace, R., (2016), Cycling promotion schemes and long-term behavioural change: A case study from the University of Sheffield. *Case Stud. Transport Policy* 4 (2), 133-142. https://www.sciencedirect.com/science/article/pii/S2213624X16300013?ref=pdf_download&fr=RR-2&rr=875536ad7f48439a