Going for Green:
Achieving global leadership in sustainability through innovation and community engagement

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University of British Columbia

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GOING FOR GREEN:

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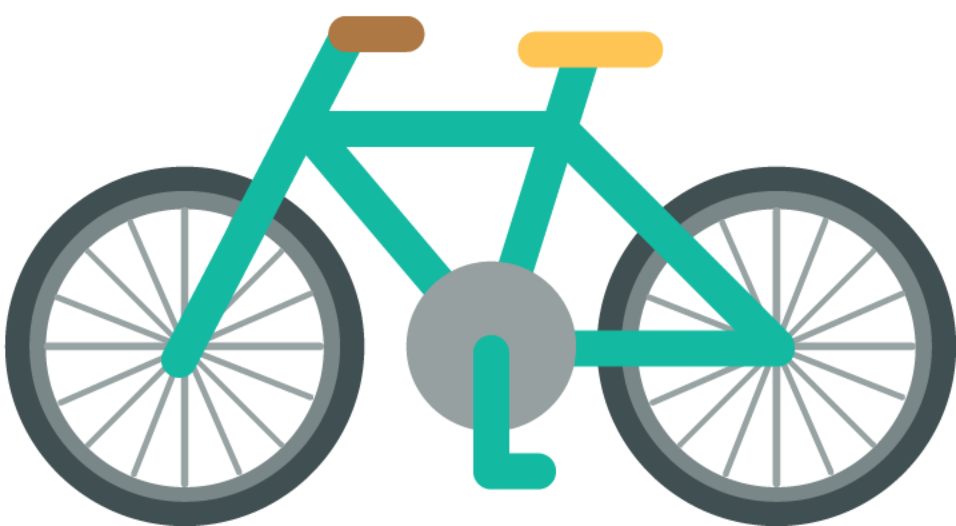

Prepared for:
UBC Fleet Management
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Sam Massooleh

Executive Summary

Introduction

UBC's 2020 Climate Action Plan aims to reduce their GHG emissions by 67% from 2007 levels and has already created a significant reduction to date. This year, 2017, has the potential to become a turning point to achieve UBC's plan. UBC building operation reached agreement to reduce GHG emissions by 67% from 2007 levels by 2020. UBC has already reduced GHG emissions by 30% at the end of 2015, which is significantly lower than 2007 levels, and for the year of 2017, UBC wants to reach a 33% reduction by the end of 2016. UBC also aims to establish a framework to provide technological and financial support to reduce the potential costs for a wide variety of vehicles.

Our strategy is to develop strong relationships with students and building operations by creating the bike-cargo-share program to help them transfer lightweight materials throughout campus.

Decision Making

To achieve the reduction of 67% GHG emissions below 2007 levels by 2020, we are focusing on replacing a potential of 20% of building operations vehicle uses, which we have concluded is the percentage used for transferring lightweight materials throughout campus, with our bike-cargo-share program. This will enable us to align with desired sustainability goals by implementing our bike-cargo-share program with a mobile application to plan and facilitate the communication that would be needed to take place between all players involved.

The bike-cargo-share program involves developing a mobile application to connect UBC student bikers with the Building Operations Department. Once Building Operations makes a request to transfer a package of lightweight materials (typically under 20 pounds) around campus, biker(s) will accept the request for pay and fulfill the delivery. To make the full use of the mobile application and have this program break-even, the mobile application will be applied to the entire campus, which means that students will also get a chance to sign in and make orders with the program. To get a more comprehensive understanding of whether this program will achieve the GHG emissions reduction goal, we will introduce a pilot program that applies only to a small area of campus for approximately year and make adjustments when necessary.

Executive Summary

Risks and Timeline

Although there will be some risks involved with this program such as the mismatching of supply and demand via the mobile application, we are confident that we can mitigate the majority of the risks after adjustments and improvements with our one-year pilot program. After the pilot program, we will apply the bike-cargo-share program to the entire campus and finally be able to reach the GHG emissions reduction goal set.

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Agenda

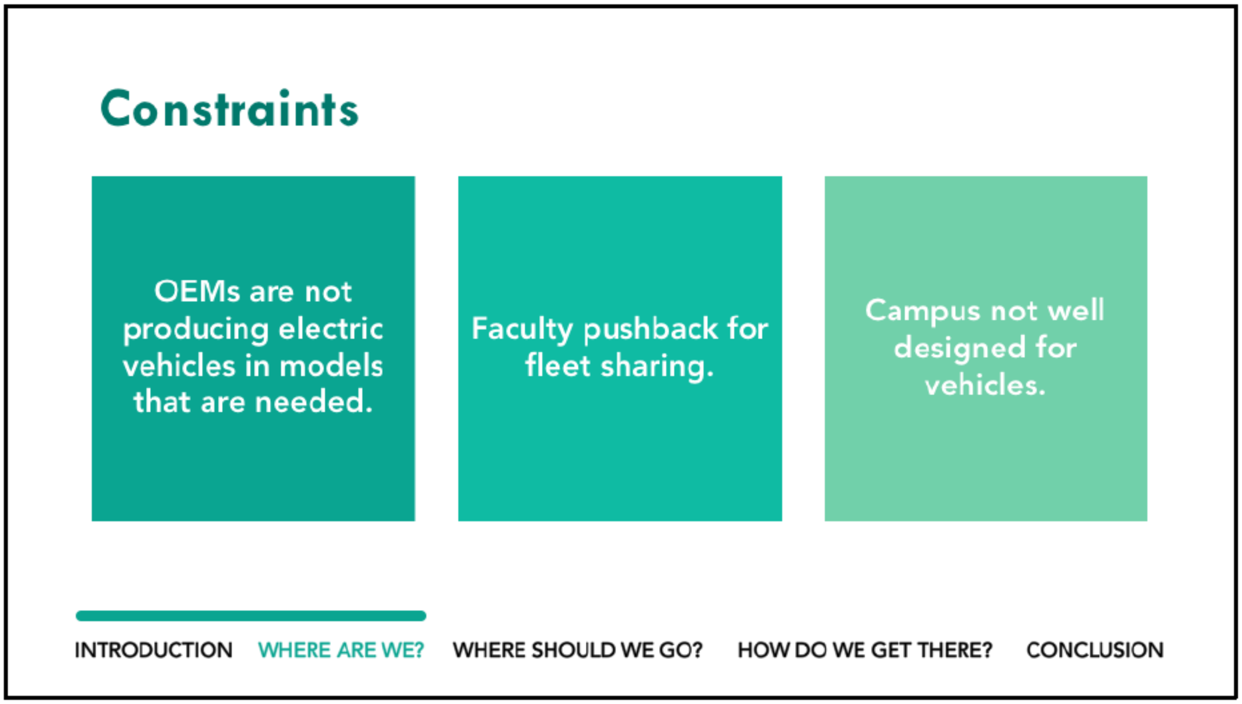
Introduction

Where are we? (Situational Analysis + Problem)

Where should we go? (Strategy)

How do we get there? (Implementation + Pilot Program)

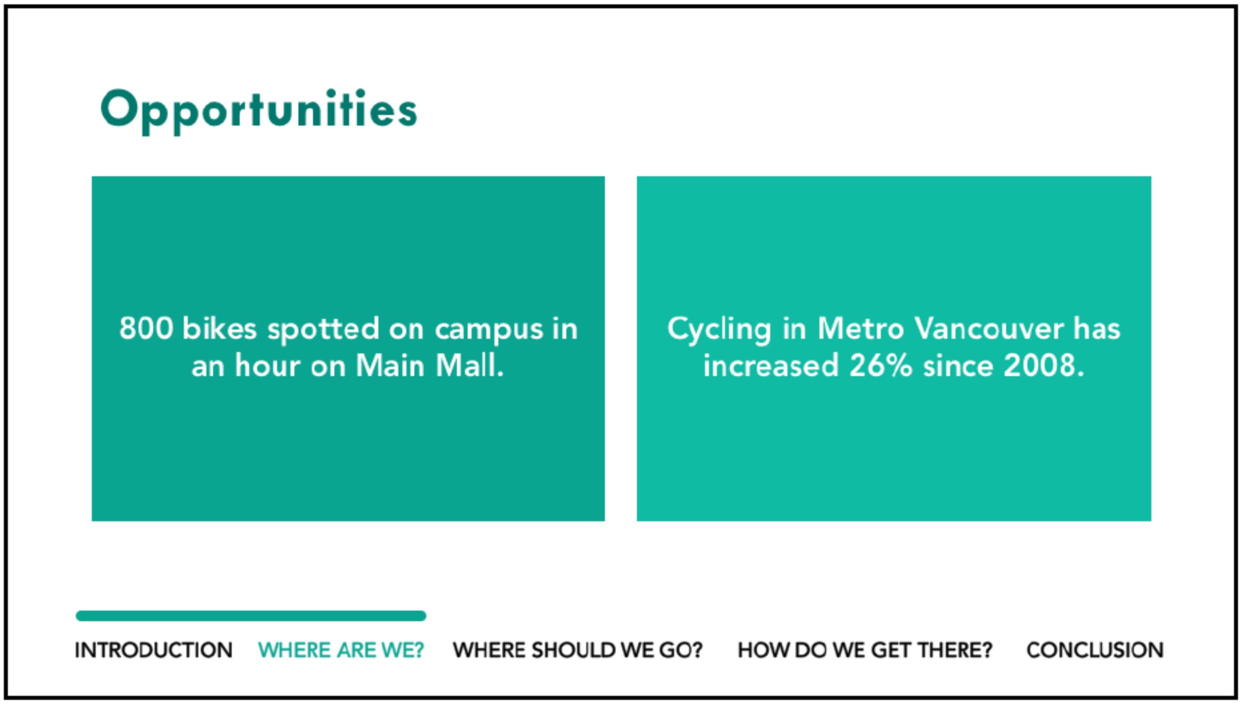
Conclusion



There are many constraints facing this project that knock out the obvious answers for reducing the fleet's GHG emissions. Firstly, OEMs are not producing electric vehicles in models that are needed. For simple passenger use, the fleet has utilized electric smartcars, but other than that it's been tough to sort the right electric vehicles.

According to the client, specific departments [redacted] are resistant to change in their individual vehicle fleet, which pose a constraint to possible vehicle-sharing programs.

Lastly, our campus is just not well-designed for vehicles. In an analysis that we ran, we found that sometimes to get to a location, a car may have to travel 1.5 kms more than a bike would. In addition to this, there are other issues like pedestrians idling or walking slowly that make a vehicle an inefficient and unsustainable way to get around campus.



In terms of opportunities we think there are underutilized modes of transportation on campus especially given that our campus is not designed for cars. In a single hour on Main Mall, our group counted over 800 unique bikes being ridden by students. On a macro scale, the city has seen a significant increase in bike use. By 2013, the city reported that there were 83,000 trips taken on a bike. By the following year, this rose to 99,000. By 2015, the number shot up to 135,000. 32% hike in cycling in a single year. 10% of Vancouverites cycle to place of employment.

Strategy

Create campus-wide bike cargo-share program.

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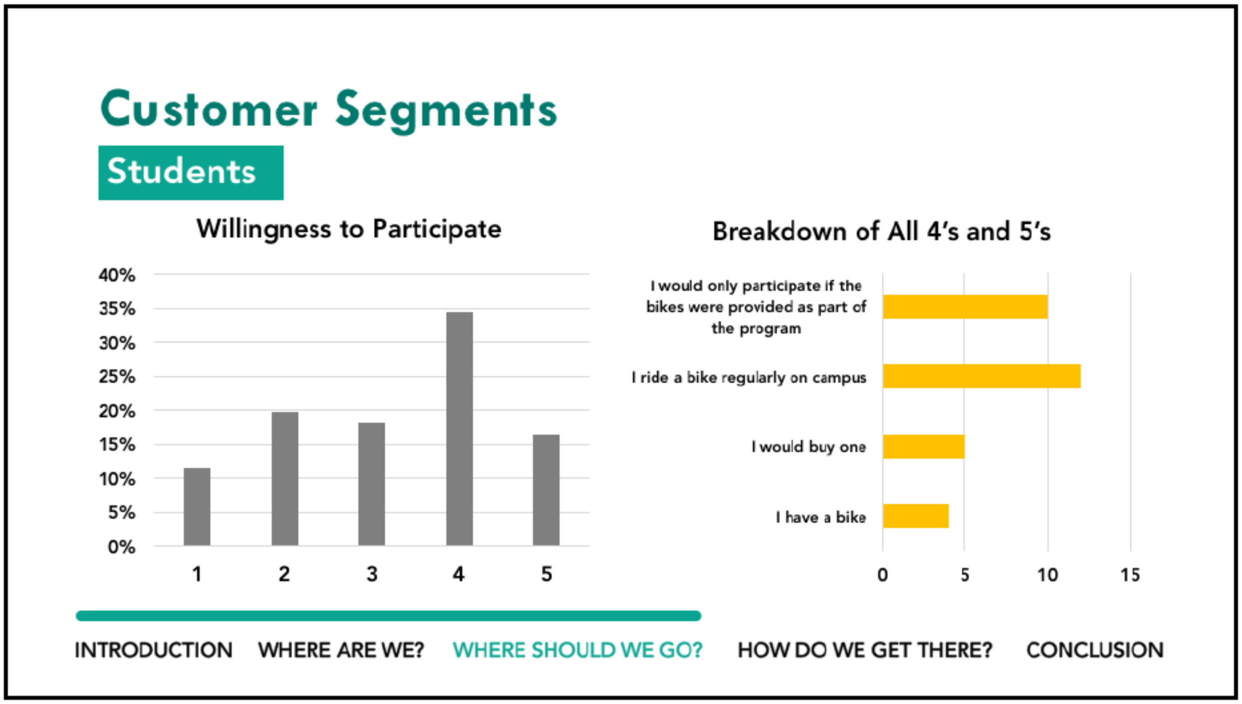
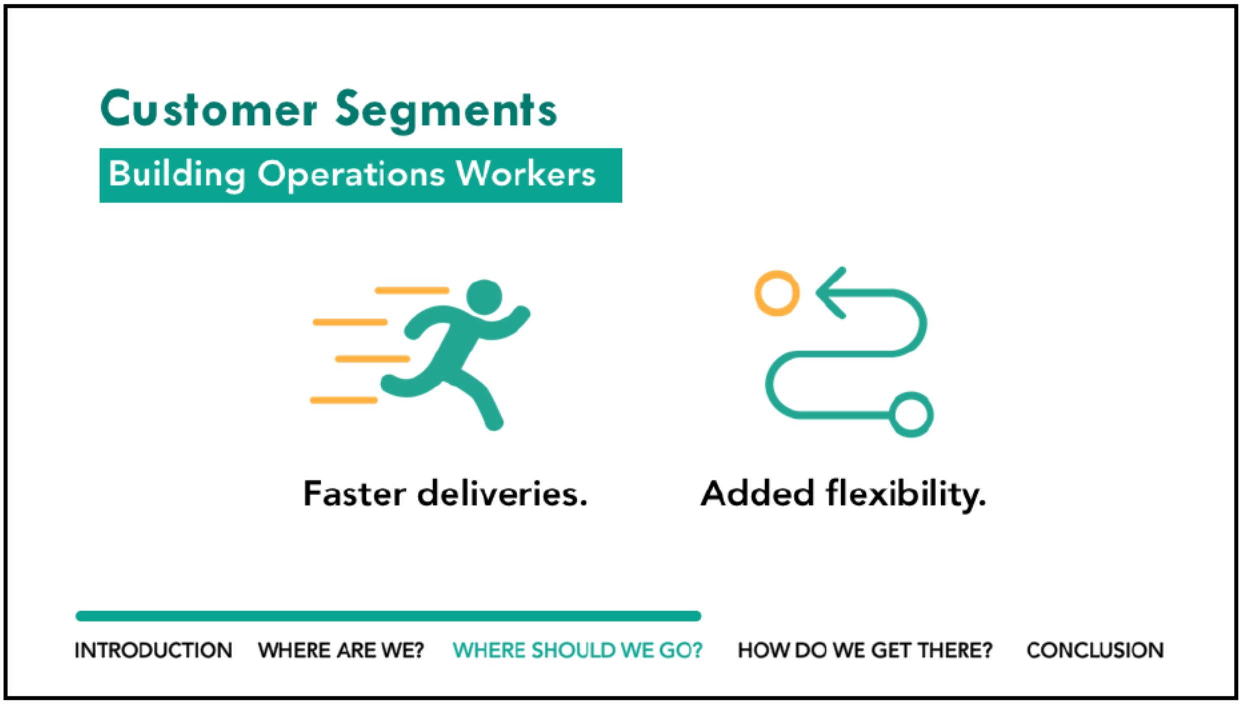
Think of it as an Uber for transporting things around campus. A mobile app will connect available bikers on campus to UBC building operations whenever there is a need to transport materials around campus. Cargo trailers that hook on to the back of the bikes will be provided by building ops to help with transportation. This survey is to help us figure out whether anyone would actually be willing to participate, and how much bikers will be compensated.

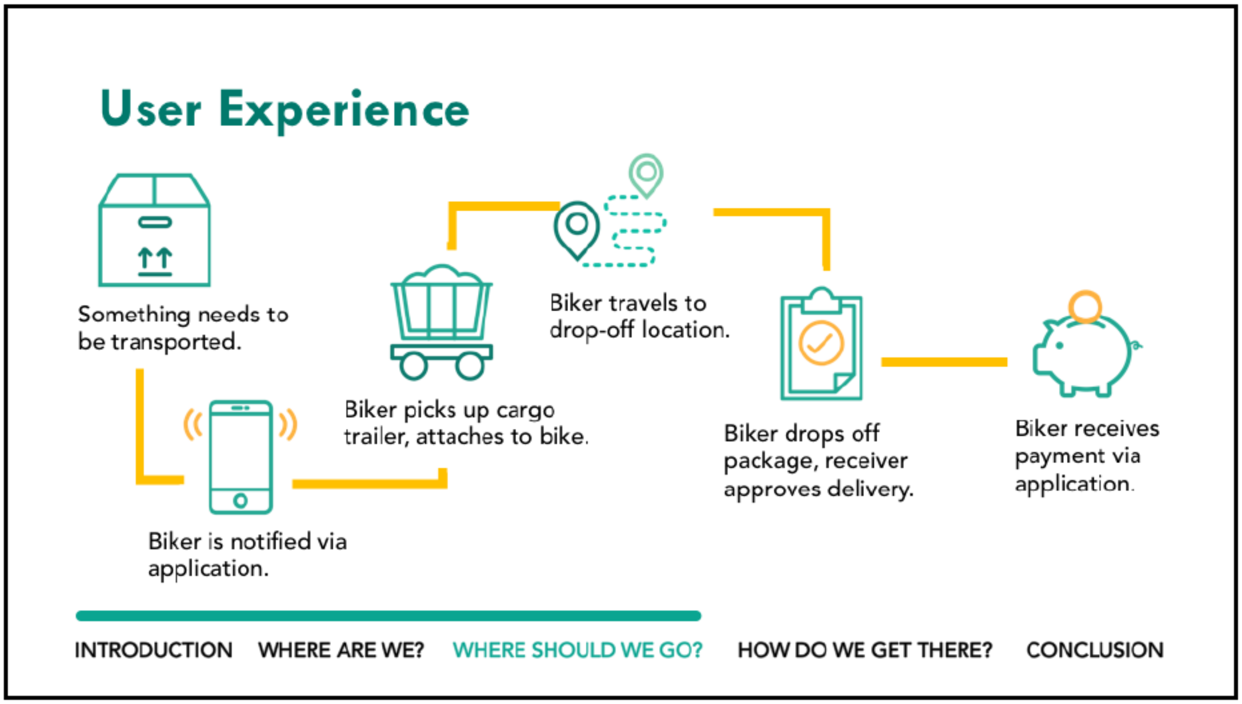


We did the group interview at the Bike Kitchen. After we briefly introduced our project to bikers, most of them showed interests in our program and will be willing to join us. We counted the number of bikes on campus during 2:30pm to 3:30pm in high population density around campus and found that more than 800 bikes were parking or travelling during that one hour. We surveyed 60 students when evaluating the opportunity for implementing our program and here are some highlights: 1. 51% of all students surveyed reported being 4 and 5 in scale of 5 on willingness to participate. 2. 52% of all students who were in scale 4 and 5 owned a bike and were willing to use their bikes for the program, while another 16% said they would purchase a bike to join the program.



We have less information about this segment due to logistical reasons, but we believe that our platform adds flexibility and speed to their workflow. The supply of bikers on campus will be much more liquid than the supply of the car fleet. In addition to this, there are many routes where bikes are able to travel around campus faster than a car, for example, a trip from IKB to Sauder may only take a minute with a bike, but it could take upwards of 4 minutes with a car.

If the client decides to implement our plan, we would recommend further studies be conducted with Building Ops employees to better understand their needs.



All our service will be performed through a mobile application. When building operation employee request a material transporting, they can send the request directly to the app according to different urgency scales. Building operation employees are responsible to load cargo trailer with goods that need to be transported and wait for student bikers to receive the request. The app displays the orders and bikers pick one according to their availability. Biker picks up the cargo trailer and transport the material to the destination requested by building building operation employee. After completing the request, biker receives payment and got rating via application.

Key Activities & Resources

Activities	Resources
Communicating with customers and UBC Building Operations.	1 full-time application manager.
Dispatching of work.	Cargo trailers.
Cargo trailer maintenance.	Mobile application.
Application maintenance.	

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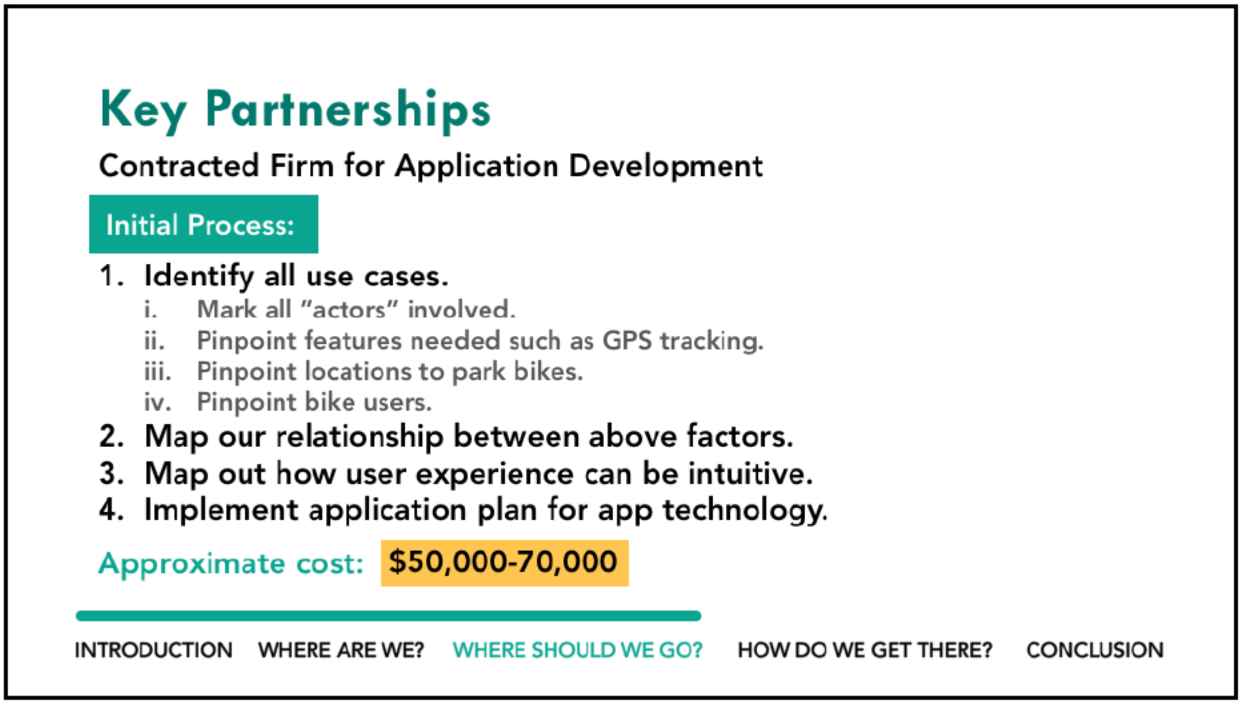
The most important part for our program is based on our activities and resources. So, we need to focus on the three main activities and three resources. At the first, we need to communicate with customers and building operations, that is because we need to let them understand how our program works, and to make sure the materials can be transferred successfully. The second thing we need to do is try to use less money to maintain our cargo trailer, each trailer will cost $150, and we need to make sure our trainers always have a good quality. When bikers finished his or her work , they must return the trailer to the building operation, and one of our customer services need to check the trailer's quality. Our cargo program need to have a strong platform, which is our APP. Our APP is our main communication channel between bikers and building operations, so we need to update our APP regularly and to update our application as soon as possible, that's can make sure we are not miss any transaction. Like we said before the main channel for our program is APP, so we need to make sure our APP is work efficiently, so we need to hire one full time APP manager to help us update the APP vision every month to fix the bug or other issues. In order to make sure each biker can easily transfer the materials we are offering cargo trailer for each biker, we will purchase 50 cargo trailers for this program, and in the future we will probably purchase more. At least but not last, the application, we need to have the application to run our program, so each application will update on the app directly that can easily let building operations and bikers find out the transfer information.



We had a meeting with Hassan Firouzbakht, CTO. Actual application initial process in working with CentralTouch would be to:

1. Identify all of the use cases
    i. Mark all of the "actors" involved including students, building operations, and different technology features needed
    ii. Pinpoint the features needed; for example, GPS tracking feature
    iii. Pinpoint a few locations to park the bikes
    iv. Pinpoint who will be riding the bikes (so just students for the first few phases)

2. Write out how the each of the above relate to each other and the functionalities needed

3. Map out how the user experience will be simple enough (for students)

The two options we have include creating our app through their "CentralTouch Assistant" or to create our app from scratch.

1) The CentralTouch Assistant is a multifaceted approach which enables partner organizations to take advantage of many features.

- Through the CT Assistant, we would make a features list in a 1st, 2nd, and 3rd release phase
- Methodology should be "agile based" (pick most important features and implement them)
- Applications on average take at least 4-5 months to implement with right business logic and backend support
- The details include admin factors and a web app for people to login and register (about 2 months)
- Through their platform, our application would get backend services which uses a cloud-based service to pinpoint bike locations around users
- The cost is approximately $50,000-70,000 depending on complexity & developer involved + fees involved to support the backend services

2) Creating an app from scratch could go up to 10x the amount of the first option; $500,000

Benefits

Fuel Savings + GHG Reductions at X% Replacement Rate (Annual)		
1%	2,760L	4.48T
5%	13,802L	22.41T
10%	27,605L	44.82T
15%	41,408L	67.23T
20%	55,210L	89.64T

Additional Benefits:

Campus engagement.

Visibility – helps emphasize UBC's strong commitment to sustainability.

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Our program could decrease GHG emissions substantially, bringing the fleet closer to its 2020 goal. Depending on the degree to which bike trips replace car fleet trips, fuel savings and GHG reductions will vary, from 2760L of fuel and 4.48 GHG T (1% replacement), to 55,000 L and 90 GHG T (20% replacement). For reference, the 2020 goal is a reduction of 283 GHG T.

Costs

Per Kilometer Traveled

Car

Fuel: $0.25/km
Maintenance: $0.24/km

Bike

Labour: $0.86/km

But, many trips across campus are considerably shorter with bike than with car. Based on sample of different trips, you could lose as much as $0.50 per km travelled, or gain $0.50

point a	point b	km difference	$ difference
ikblc	ponderosa	1	$ 0.19
chan centre	henry angus	0.1	$ (0.24)
brock hall	koerner	1.21	$ 0.48
war memoria	university sei	0.8	$ 0.02
koerner libra	src	0.95	$ 0.15
acquatic cent	power house	0.8	$ 0.21
north	rose garden	0.15	$ (0.11)
wesbrook	west parkade	0.55	$ (0.04)
woodward	detwiller	1	$ 0.34
icics	kaiser	0.4	$ 0.14
bookstore	macleod	0	$ (0.18)
forward builc	dempster	0.1	$ (0.13)
hennings	math	1.23	$ 0.50
eosc	bio	0.85	$ 0.21
beaty	chem	0	$ (0.22)
macmillan	klinck	0	$ (0.28)
forestry	fnh	0	$ (0.24)
st. johns	horticulture	0	$ (0.26)
moa	geo	0	$ (0.18)
gage	buchanan	0	$ (0.22)
fraser hall	coquihalla	0	$ (0.55)

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In order to run a cost-benefit analysis on our idea, we compared fuel and maintenance costs for the ubc car fleet, and the labour costs required of bikers, by kilometer traveled.

Based on our survey results, to attract a critical volume of bikers, we would need to pay our bikers around $14 an hour. This comes down to $0.86 per km traveled. This is more than the $0.50/km it takes to travel with a car.

However, as we mentioned earlier, many trips across campus are considerably shorter with a bike than they are with a car. Based on sample of different trips, you could gain as much as $0.50 per trip (1.23 km difference in trip distance between hennings and math), or lose $0.55 (0 km difference in trip distance between fraser hall and coquihalla).

Costs (Continued)

Fixed Costs

Fixed Costs (Upfront)	
App development	$60,000
Trailers	$21,627
Total recruitment @ $1 COCA	$721
Total	**$82,347**

Fixed Costs (Recurring)	
Trailer maintenance	$3,604
App manager	$41,600
Recurring COCA	$180
Total	**$45,385**

These costs reflect the key resources and activities we showed before. The number of trailers we needed is 20% of number of bikers we need. We estimated the trailer maintenance cost by multiplying the number of trailers we need with $25 maintenance cost per trailer. We considered to hire new bikers every year and this will including to our recruitment cost which is $187.77 per year.

After communicating with IT expertise, our estimated cost for outsourcing the mobile application development is $60000. We will purchase 144 trailers and each trainer will cost $150.

Possible Revenue Stream: Food Deliveries

Gross Margin (per order)	
Revenue per delivery	$3.50
Cost per delivery	$0.86
Gross profit	**$2.65**

Breakeven	
Breakeven orders	23,763
Orders/customer per year	32
Revenue/customer per year	$84.64
Gross profit	**$743**

Additional Benefits:

Incremental revenue for UBC Food Services.

Opportunities for additional revenue streams (e.g. courier service for other departments).

DOORDASH delightful delivery SKIP the DISHES

Average price: $3.50 per delivery
Average delivery time: 50 mins.

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In order to offset the fixed costs mentioned in the previous slide, and to buffer against possible variable costs compared to car trips, we recommend using the program's existing resources to allow for food deliveries. A partnership with UBC food services would mean the UBC students could get their food delivered to them wherever they are, and they would be charged a fee for this.

After competitive analysis of a few local competitors offering the same service, we believe we can be competitive at $3.50 an order, retaining a $2.65 gross profit margin. In order to cover the costs of a 5% replacement, we would only need 743 customers.

This opens up the opportunity for incremental revenue for UBC food services.

This also opens up the opportunity for additional revenue streams like courier services, again taking advantage of existing resources.

Risks & Unknowns

Number of bikers that will participate.

Percentage of trips bikes can replace.

Workflow and operations (ease of use, speed, etc.)

Weather and willingness to participate.

Actual costs and cost savings.

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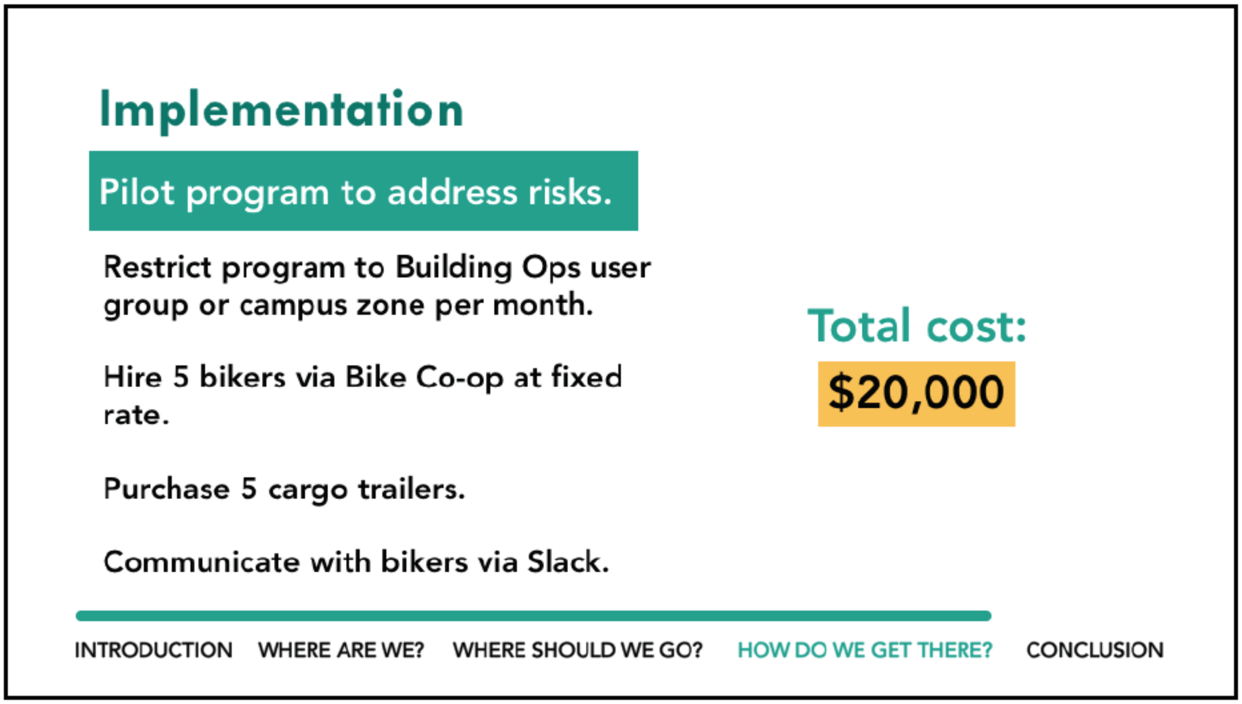
We understand there are risks in our strategy. Matching the number of student bikers available on campus to the number of delivery requests is essential in our program. The key risk involved here is the shortage of number of bikers that cannot meet the requirement from Building Ops, or the lack of requests of transferring lightweight materials around campus. The uncertainty about the number of trips student bikers can replace will results in the uncertainty of the reduction of GHG emission we can achieve.

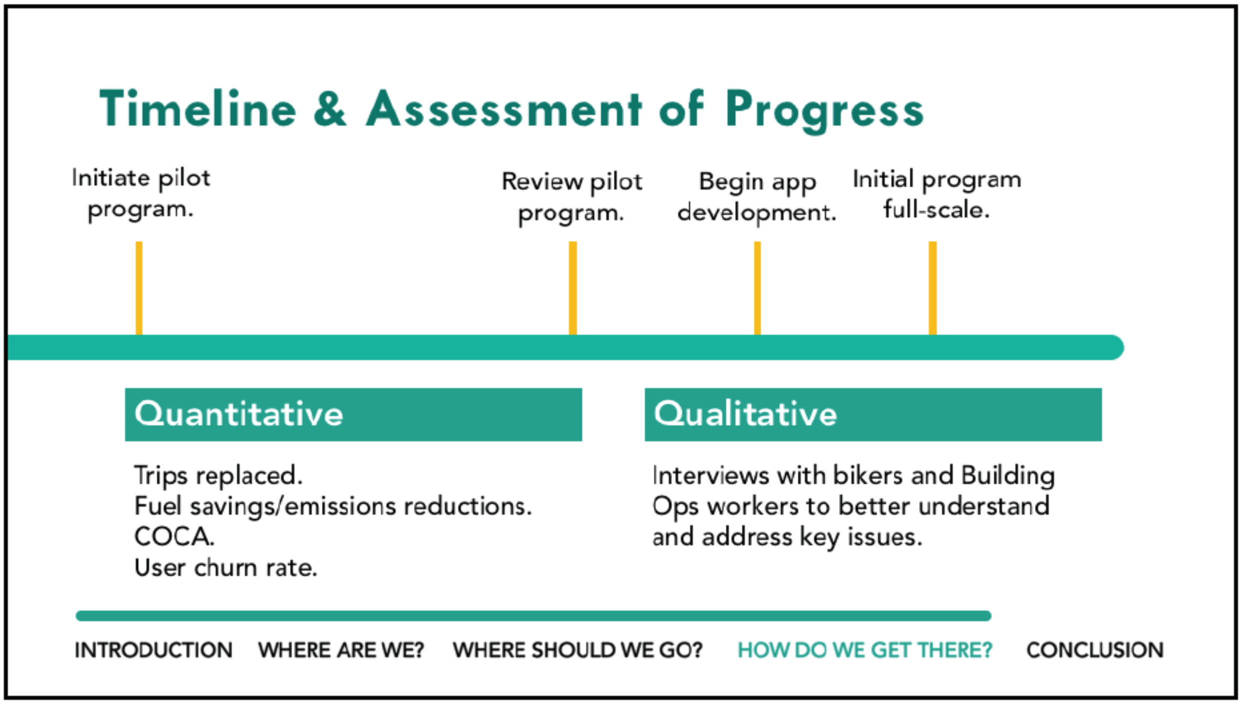
We are uncertain about how user-friendly will this program be for our customers, which means the ease of loading materials on the trailer and transferring materials around the campus. It is also uncertain that how quickly those materials can be delivered to the destinations. Will materials delivered by bikes will be huge different from delivered by cars? This convenience degree will impact the usage of our program.

We also considered the volatility of participation as a key risk since the weather condition will affect the willingness to participate the bike-cargo-share program. By replacing cars with bikers, we are uncertain about whether this program is cost-efficiency when we come to the GHG emission we actually reduced.



We will launch a pilot program to mitigate majority possible risks involved in our bike cargo-share program. We will choose a small corner of campus and start with low cost platform so only students who have and use bikes on campus can participate, in this case we only need to provide 5 cargo trailers to attach to the bikes. Our pilot program will switch to different campus zone every month. We will partner with UBC bike co-op and hire 5 student bikers at a fixed rate to join us at this time. All the communications will be completed via Slack. We are aiming to spend as less as we can in this pilot program and total estimated cost at this time is $20K.
After one year implementation of pilot program, we will be able to determine:
Which Building Operations vehicles had been used mostly for transferring lightweight materials throughout campus, as they will be the vehicles being used far less.
How many potential trips we can replace to further reduce the GHG emission.
How many bikers we need to fulfill the Building Ops' demand.

Once we raise awareness about our program, get more student bikers participated, and get more information on the vehicle usage, we will start to develop a mobile application to make the whole process more quickly and apply our bike-cargo-share program on the entire campus.



Our pilot program will last no more than one year. After acquiring enough feedbacks and information, we will development the mobile application. The development will last 4 months. Once the application is ready, we will apply the full program on the entire campus, paired with the Building Operations' original car replacement plan, we aim to achieve our GHG emission goal.

We split our metrics into both quantitative and qualitative parts:
We will analyze how many trips we actually replaced after implementing our bike cargo-share program to determine how much fuel if otherwise Building Ops stuff drive themselves to transfer materials.
We will compare baseline fuel consumption levels from 2017 data in Pegasus Phase Z Excel Spreadsheet to baseline fuel consumption levels found a year after our program is fully active.

Determine how much more GHG emission reduction achieved by implementing our program. Calculate the differences for each building operations vehicle, pinpoint the largest reductions in fuel consumption, and therefore be able to eliminate vehicles that are underutilized.

We will analyze cost of customer acquisition to figure out our costs associated with the project.
We will analyze how many active mobile application users in our platform by calculating the mobile application churn rate. In this case, we can determine whether the number of student bikers matched with the number of delivery request.
We will also interview with our customers (student bikers and Building Ops users) to understand and address key issues involved in our program.

Conclusion

Key Benefits

Lower GHG emissions.

Cost-neutral.

Additional Benefits

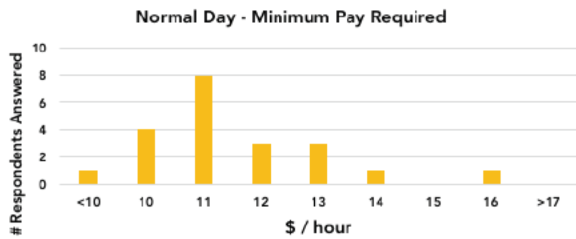
Campus engagement.

Visible commitment to sustainability goals.

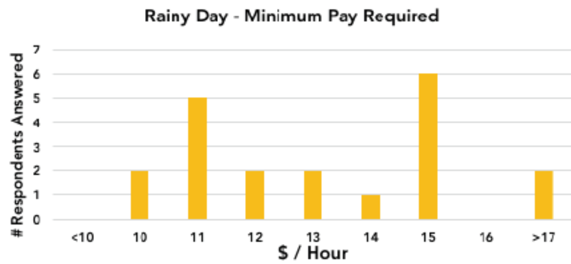
One Step at a Time

Pilot program that mitigates risk.

Appendix A: Biker Pay Distributions

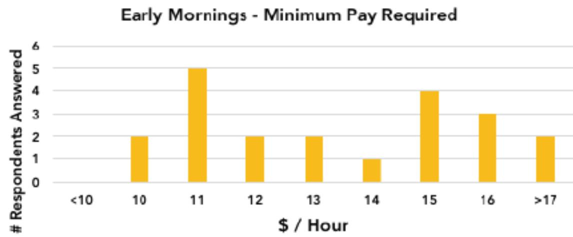


average	11.43
Min	7
Q1	11
Q2	11
Q3	12
Max	16



average	11.43
Min	10
Q1	11
Q2	13
Q3	15
Max	20

Appendix A: Biker Pay Distributions (Continued)



average	13.57
Min	10
Q1	11
Q2	13
Q3	15
Max	20

average	12.71
Min	10
Q1	11
Q2	12
Q3	15
Max	20

Appendix B: Derivation of Costs per KM for Bikers

	Regular	Rainy	Morning	Weekend
Wage / hr	12	15	15	15
Total Time	60	60	60	60
Loading / Rest	10	10	10	10
Travel Time	50	50	50	50
Mins / KM	3	3	3	3
KM / hr	16.67	16.67	16.67	16.67
Wage / Km	$ 0.72	$ 0.90	$ 0.90	$ 0.90

Appendix C:
Cost for 1% Replacement of KMs Travelled by Fleet

% total		1%
km replaced		12,017.13
litres reduced		2761
GHG reduction		4.48
Variable Costs		
biking hours		721
bikers needed		144
labour cost	$	10,335
Yearly fixed cost		
Trailer Maintenance	$	720.88
App manager	$	41,600
recurring recruitment	$	36.04
total	$	42,356.93
Setup costs		
app		60000
trailers	$	4,325
Marketing	$	144
total	$	64,469

Meal Delivery Requirement		
relative variable cost		
fixed cost	$	42,356.93
setup cost	$	12,893.90
Marketing $	$	1,000.00
total	$	56,250.82
profit/order	$	2.65
Total orders required		21267
Orders/cust/year		32
Rev/customer / year	$	84.64
customers required		665

COCA	$	1.50

Appendix D:
Cost for 5% Replacement of KMs Travelled by Fleet

% total		5%
km replaced		60,085.64
litres reduced		13803
GHG reduction		22.41
Variable Costs		
biking hours		3,604
bikers needed		721
labour cost	$	51,674
Yearly fixed cost		
Trailer Maintenance	$	3,604.42
App manager	$	41,600
recurring recruitment	$	180.22
total	$	45,384.64
Setup costs		
app		60000
trailers	$	21,627
Marketing	$	721
total	$	82,347

Meal Delivery Requirement		
relative variable cost		
fixed cost	$	45,384.64
setup cost	$	16,469.48
Marketing $	$	1,000.00
total	$	62,854.12
profit/order	$	2.65
Total orders required		23763
Orders/cust/year		32
Rev/customer / year	$	84.64
customers required		743

COCA	$	1.35

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Appendix E:
Cost for 10% Replacement of KMs Travelled by Fleet

% total		10%
km replaced		120,171.27
litres reduced		27605
GHG reduction		44.82
Variable Costs		
biking hours		7,209
bikers needed		1,442
labour cost	$	103,347
Yearly fixed cost		
Trailer Maintenance	$	7,208.83
App manager	$	41,600
recurring recruitment	$	360.44
total	$	49,169.28
Setup costs		
app		60000
trailers	$	43,253
Marketing	$	1,442
total	$	104,695

Meal Delivery Requirement		
relative variable cost		
fixed cost	$	49,169.28
setup cost	$	20,938.95
Marketing $	$	1,000.00
total	$	71,108.23
profit/order	$	2.65
Total orders required		26884
Orders/cust/year		32
Rev/customer / year	$	84.64
customers required		840

COCA	$	1.19

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Appendix F:
Cost for 15% Replacement of KMs Travelled by Fleet

% total		15%
km replaced		18025691%
litres reduced		41408
GHG reduction		67.23
Variable Costs		
biking hours		10,813
bikers needed		2,163
labour cost	$	155,021
Yearly fixed cost		
Trailer Maintenance	$	10,813.25
App manager	$	41,600
recurring recruitment	$	540.66
total	$	52,953.91
Setup costs		
app		60000
trailers	$	64,880
Marketing	$	2,163
total	$	127,042

Meal Delivery Requirement		
relative variable cost		
fixed cost	$	52,953.91
setup cost	$	25,408.43
Marketing $	$	1,000.00
total	$	79,362.35
profit/order	$	2.65
Total orders required		30005
Orders/cust/year		32
Rev/customer / year	$	84.64
customers required		938
COCA	$	1.07

Appendix G:
Cost for 20% Replacement of KMs Travelled by Fleet

% total		20%
km replaced		24034255%
litres reduced		55211
GHG reduction		89.64
Variable Costs		
biking hours		14,418
bikers needed		2,884
labour cost	$	206,695
Yearly fixed cost		
Trailer Maintenance	$	14,417.67
App manager	$	41,600
recurring recruitment	$	720.88
total	$	56,738.55
Setup costs		
app		60000
trailers	$	86,506
Marketing	$	2,884
total	$	149,390

Meal Delivery Requirement		
relative variable cost		
fixed cost	$	56,738.55
setup cost	$	29,877.91
Marketing $	$	1,000.00
total	$	87,616.46
profit/order	$	2.65
Total orders required		33125
Orders/cust/year		32
Rev/customer / year	$	84.64
customers required		1035

COCA	$	0.97

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Appendix H: Example Trailer

http://www.wicycle.com/index.php/products/cargo-trailers/cargo-buddy-trailer

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