# Edinboat

**Public transport on Edinburgh's waterways**

**dLab(1): Design for Social Change**

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# CONTENT



# 1. Project Background

Design brief, questions, process

# Design brief

Increased car ownership and economic development related travel has led to increasing Greenhouse Gas emissions from the transportation sector. The State of Climate action report (2022) called out the need for behaviour change in a key area- 'Share of kilometers travelled by passenger cars'. The report noted that change is heading in the wrong direction and a U-turn is needed. One of the ways to achieve this is by shifting travel to active modes (walking, cycling) and shared public transport. For our project we decided to focus on the transportation sector in Edinburgh.

## Current transportation trends

The volume of car traffic on major roads in Scotland has more than doubled over the last ten years (Transport Scotland, 2019). The length of these roads has remained almost the same since 2004, at around 3,500 km. Around 12% of journeys were perceived to have been delayed by traffic congestion. 68% of people travelled to work by car in Scotland, public transport was used by 15%, similarly active modes were used by 15% of people, the other 2% used other modes of transport.

## Public transport on Waterways

Edinburgh is endowed with a quite few water bodies that run the length of the city, collectively and individually. The Union Canal is another major water body that is well maintained. The waterways in Edinburgh could serve as an interesting alternate mode of public transport. There is an opportunity to design a new system and try out new ideas. Analysing the waterways, involving people in the design process, and working with experts and local body councils could lead to a well-designed system. This also serves to change people's behaviour by encouraging them to shun car usage and use public transport and reduce emissions.

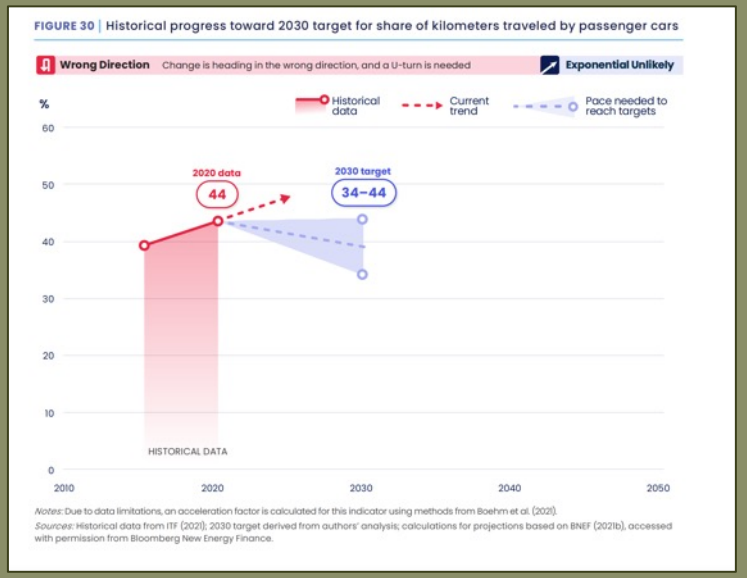



Image 1: Share of kilometers traveled by passenger cars

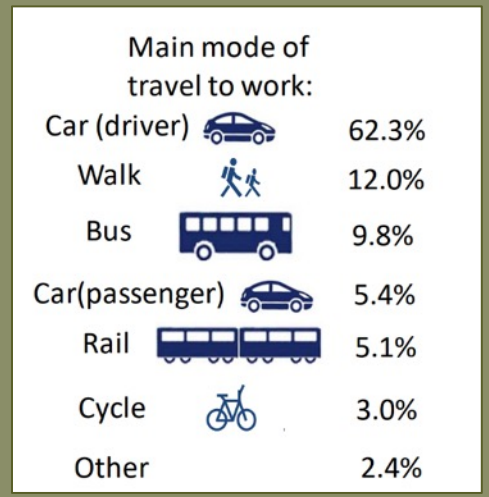



Image 2: Main mode of travel to work in Scotland

# Research questions

**Main research question**:

- How can Edinburgh's waterways be used for public transport and to reduce road traffic?

**Sub-question:**

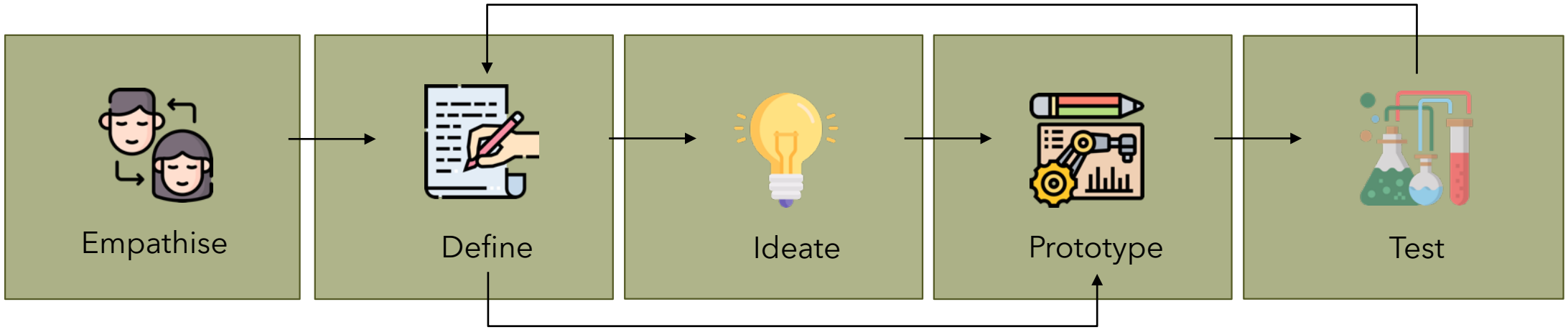
- How can we design an alternate public transport system while involving people in the design process?

**Objective:**

- Design a transport system which would use existing resources to transport people, raise awareness of public transport, and improve the infrastructure along waterways to encourage shared forms of transport.

# Design process

We used some parts of the design thinking process to develop our project.




1. Research user's needs
2. Understand the issues
3. Learn about user's experiences

1. State user's needs
2. Organise information
3. Define core problems

1. Generate ideas
2. Use different ideation techniques

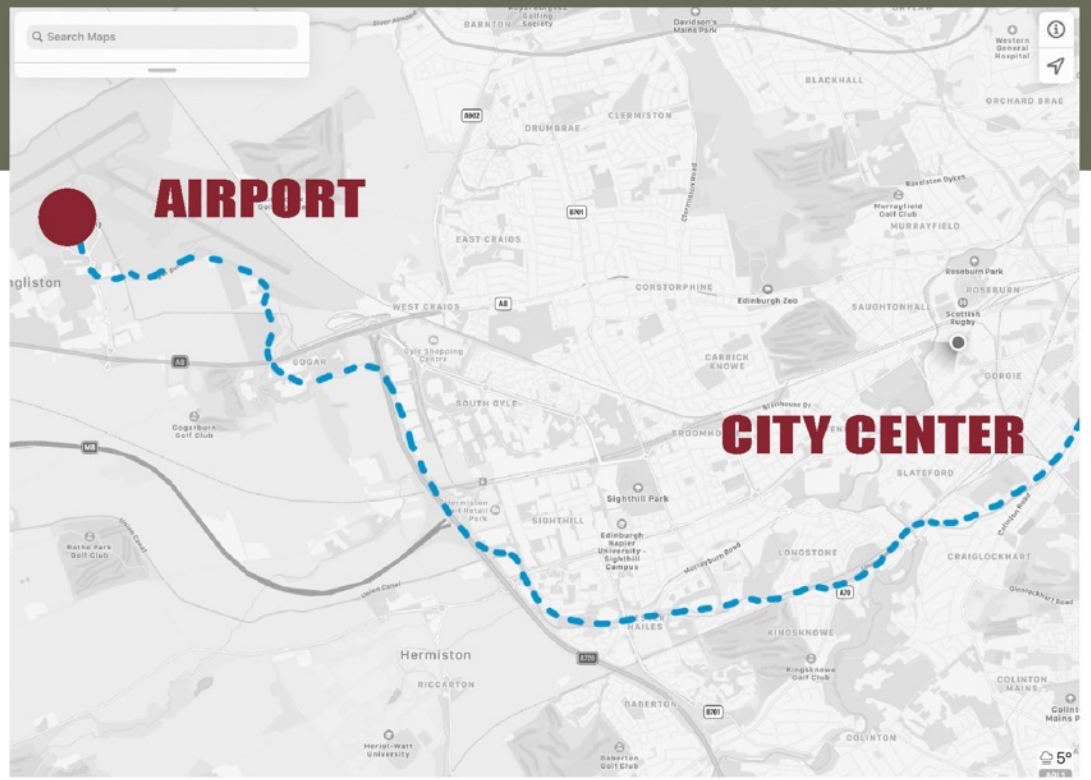
1. Build simple solutions
2. Identify solutions to different problems
3. Understand limitations

1. Define testing criteria and questions
2. Test system with real users
3. Gather feedback

# 2. Research and Preparation

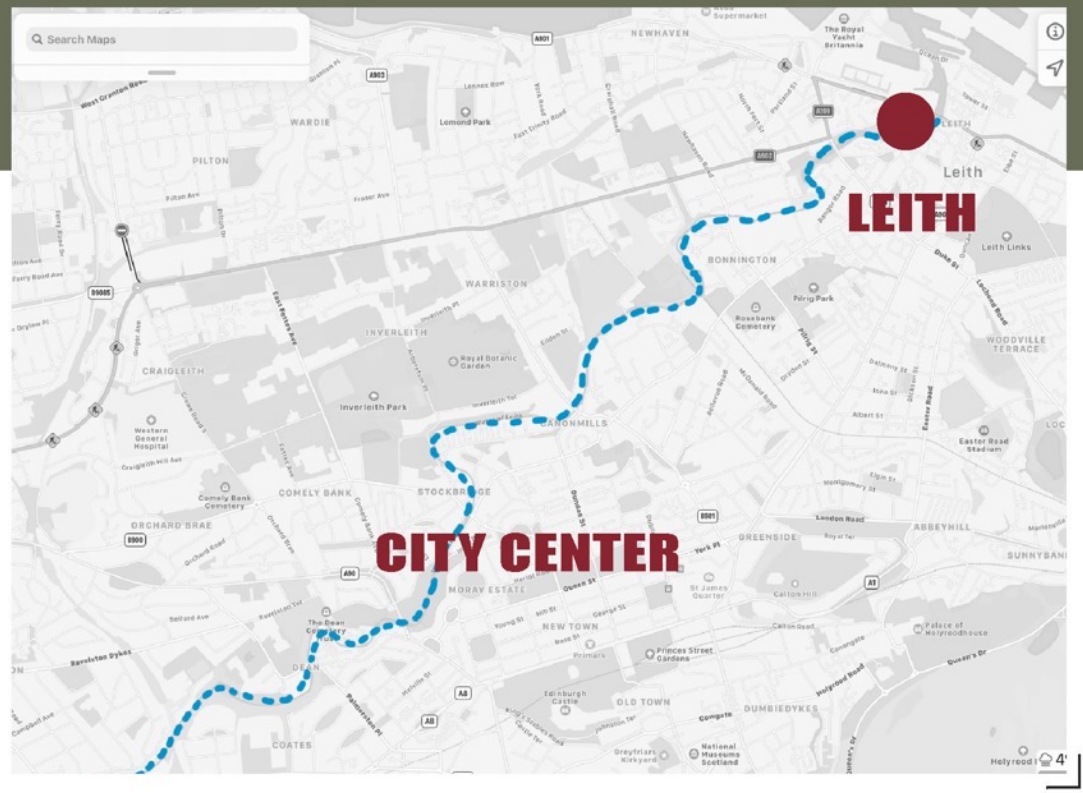
Waterways, surveys, user analysis

# Edinburgh’s existing waterways




Airport—City Center

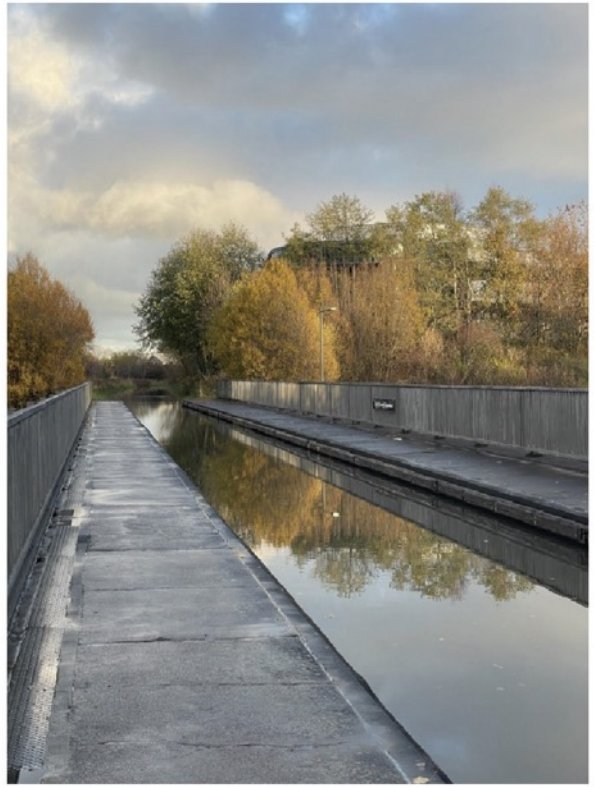
The airport is an important transportation hub, its location is very important for a city, the flow of people is also very large, the river channel is wider than Leith. Therefore, we chose this route to study.




Leith—City Center

Leith's river channel is too narrow and the river flow speed is very fast， Even though his river runs along the city and closer to its center.

# Research



Riverbank Ride:

In order to understand the current situation of theis waterway, our team members rode bicycles to observe the the channel of varying width, smooth water flow,special constructions , gradual change of the enviroment and water level and the terrain.

The previous canal was mainly used to transport coal, and then we went to the fountainpark canal point to observe the current canal, and found the current canal is more life-oriented and entertaining, and people can hold various activies on boat. It also provide a lot of maps and ads for people.



# OPINIONS ON REDUCING CAR USE

## Public Transport

A vast majority of people wanted public transport to be made more convenient and accessible. There was a favourable response towards car–free travel as well. The 20–minute city idea was also greeted with good responses. People were divided on the idea of reallocating road space.

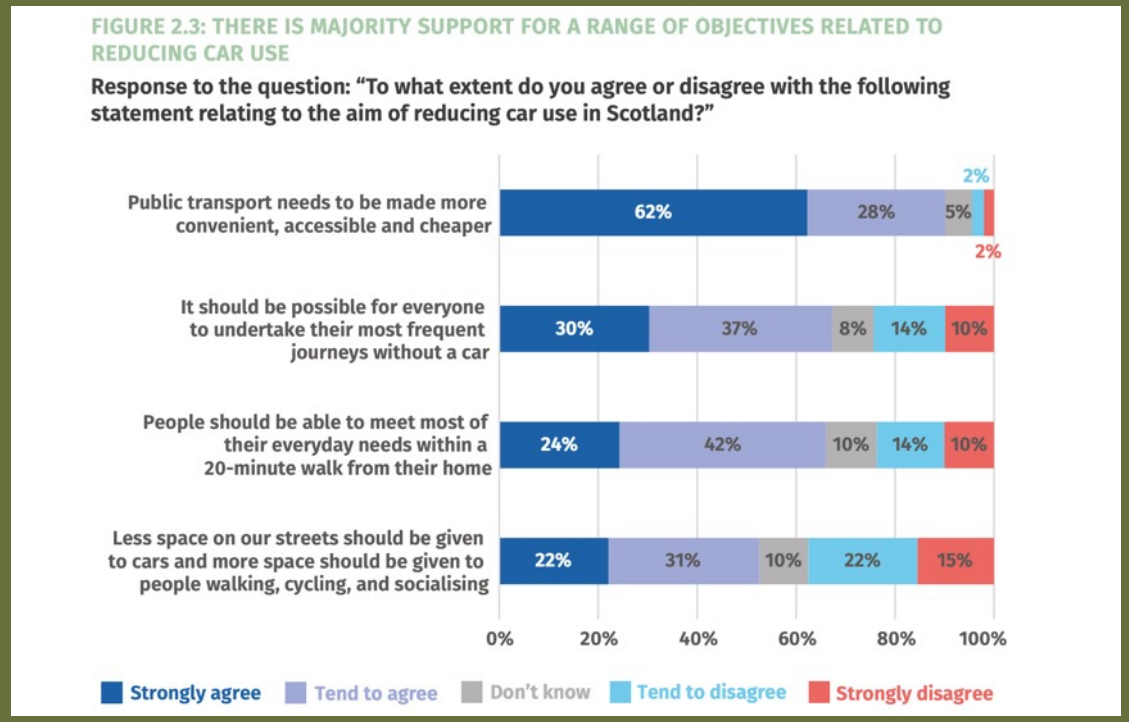



Image 3: Survey by IPPR Scotland on objectives to reduce car use

## Policies to reduce car use

People tended to agree on different policies to make car usage less appealing. Some of the ideas included increasing the cost of parking, creating car–free days, and increasing cycling and walking routes. Most people agreed with banning pavement parking and restricting high polluting vehicles.

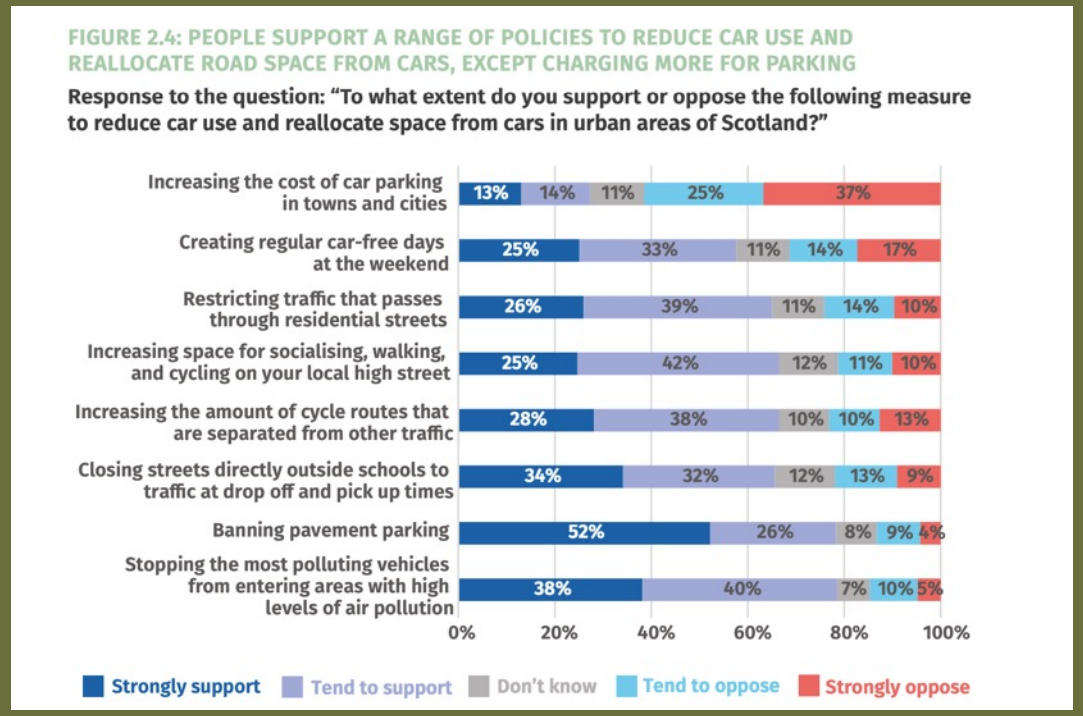



Image 4: Survey by IPPR Scotland on policies to reduce car use

# User Analysis

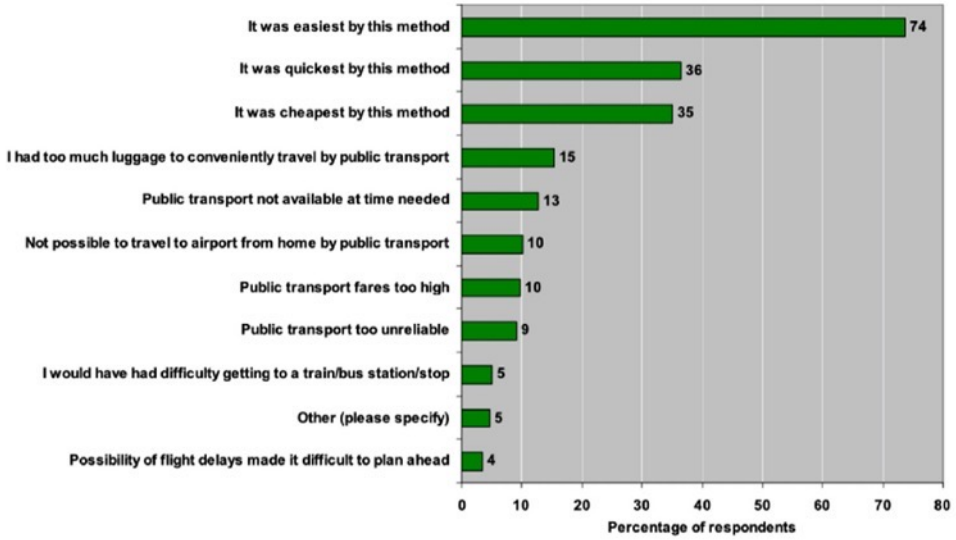
## Airport Users

- **Estimated number of people using the service**

Domestic (2019): 5,338,511. 14,626 per day.
International (2019): 9,409,319. 25,778 per day.
Total: 14,747,830. 40,404 per day.

- **Type of people using the service**

A large majority (87%) of air passengers had travelled to the airport by private transport for their last flight, with 68% travelling by car and 20% by taxi/minicab.

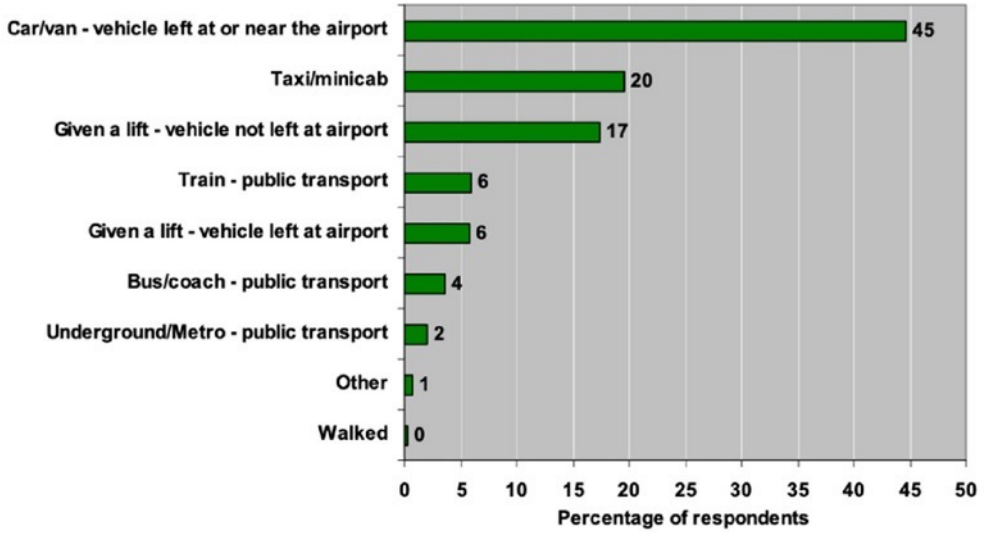



Source: February 2010 ONS Omnibus Survey.
Base number: 395 (Based on respondents who had travelled to the airport by car/van or taxi).
Note: Respondents were presented with a list of options and allowed to choose more than one answer.

Image 5: ONS Omnibus survey on choice of transport to airports in the UK

- **Airport user preference**

Figure 5 shows the reasons respondents gave for choosing to travel by car/van or taxi (private transport) on their last trip to an airport. Nearly three quarters (74%) said they chose this method because it was the easiest and over a third said it was the quickest method (36%) or the cheapest (35%).




Source: February 2010 ONS Omnibus Survey.
Base number: 395 (Based on respondents who had travelled to the airport by car/van or taxi).
Note: Respondents were presented with a list of options and allowed to choose more than one answer.

Image 6: Main mode of travel to UK airport on last trip

# User Analysis

## Local Residents

- **Estimated number of people using the service**

149,417 residents in the northwest region of Edinburgh.

- **Type of people using the service**

Residents living in the areas of Lochrin, Bruntsfield, Shandon, Polwrath, Greenhill, Slateford, Kingsknowe, Wester Hailes, Clovenstone, Hermiston, Gogar, Ingliston.

- **User preferences**

Residents along the canal would prefer alternate modes of transport along the canal. A more convenient option closer to where they live.

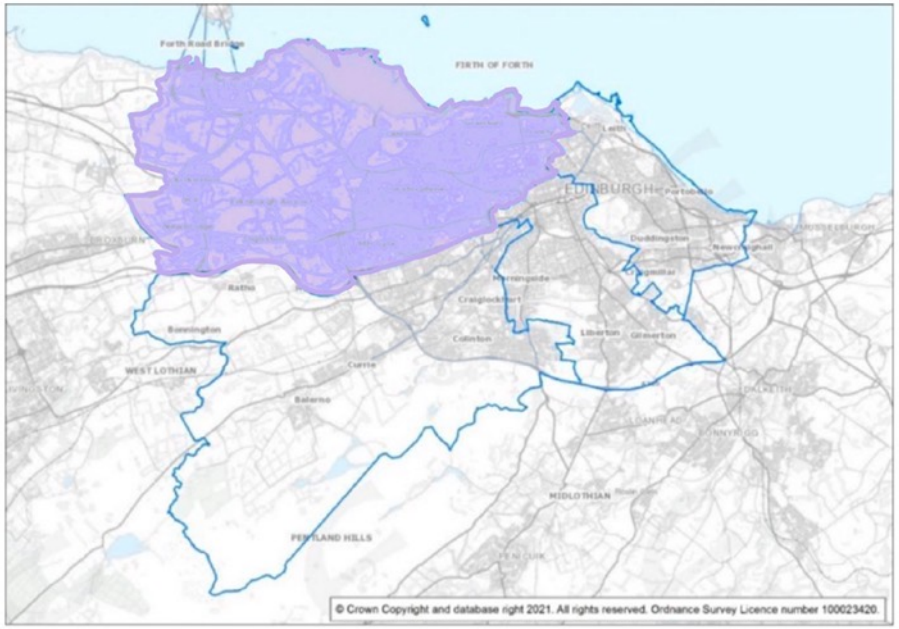



Image 7: Edinburgh locality boundaries

## Tourist

- **Tourist Activities**


Image 8: Popular tourist activities in Edinburgh

"International connectivity is key to growing tourism in Edinburgh,and therefore the Airport has a central role in bringing in morevisitors to Edinburgh and Scotland. Fights to over 120 global destinations, making Scotland's busiest and UK's sixth busiest airport.

- **Estimated number of people using the service**

In 2015, 11.1 million passengers travelled through the Airport,2016 is on track for another record year. Edinburgh Airport is an important economic and tourism asset, generating anestimated £955 million in GVA for the Scottish economy andsupporting 23,300 jobs directly and indirectly.

# WATERWAYS IN OTHER CITIES

## Venice

You can see it at all the major traffic stops in Venice (such as Marco Polo Airport, Santalucia train station, Roman Forum, port, etc.).

The water bus of each line does not stop at every station. The drawing of the first line under the ellipse indicates that the boat stops, while the second line covering the ellipse means that the boat does not stop

## Canal Bus

With unlimited rides for a limited time, visitors can board or disembark from any canal platform marked as follows. Canal Bus has 3 main routes (red, green and Orange lines) and 16 canal platforms throughout the city and close to various scenic spots, including the Anne Frank House, Van Gogh Museum, Central Station, City Hall, etc.

## Amsterdam

## Bangkok

## Canal Water Bus

Each type of ship has its own docking station, starting and ending stations are different, and fares vary by ship and distance.
Blue Sightseeing Boat (tourist boat)

A ship without a flag (grey)

Orange flag boat

Yellow flag Clipper

Green flag Super Clipper

# 3. Prototype

Social Design Proposal

# Social Prototype

Based on our research we decided to build out a prototype for a demonstration in the Union Canal near Fountainbridge. We had 3 main components in our prototype

An awareness board which highlighted the design proposal. There were posters on the board detailing the proposal, emission related data, and transport trends.

A physical model of the transportation system. We designed a boat made of cardboard, two boat station poles, and a pulley system with a rope to move the boat.

A user-driven design for the route map. We sketched out the waterway route from the airport to Fountainbridge and used transparent sheets overlaying the map to help users select stations.

# Social Prototype – Part 1 : Awareness Board, Page 1

## Water Buses In Edinburgh

A new and environmentally friendly way to see Edinburgh

The awareness campaign began with a hook to draw in passersby. We introduced the concept of water buses in Edinburgh along with a picture of the actual waterway with an image of a water bus.

With the queries we sought to draw people's attention to the idea of reducing road traffic and encouraging sustainable travel.

THE UNIVERSITY of EDINBURGH

**Queries**

1. Can we use Edinburgh's waterways to reduce road traffic?
2. How could we use Edinburgh's water-ways to encourage the usage of public transport?
3. What can we do to travel more sustainably?

# Social Prototype – Part 1 : Awareness Board, Page 2

## CURRENT SUSTAINBILITY ISSUES

### Transport preference trends

A large majority of people prefer to travel by private cars. This is leading to increased Greenhouse gas emissions and traffic congestion. A behavioural change is needed to address these unsustainable travel patterns. Increasing the use of public transport, improving the infrastructure of the public transport system, and increasing active modes of transport are recommended solutions.

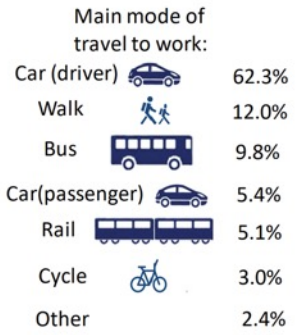



Image 2: Main mode of travel to work

**87%** of people travel to the airport by private cars

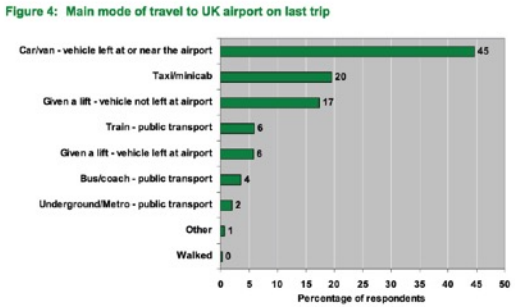
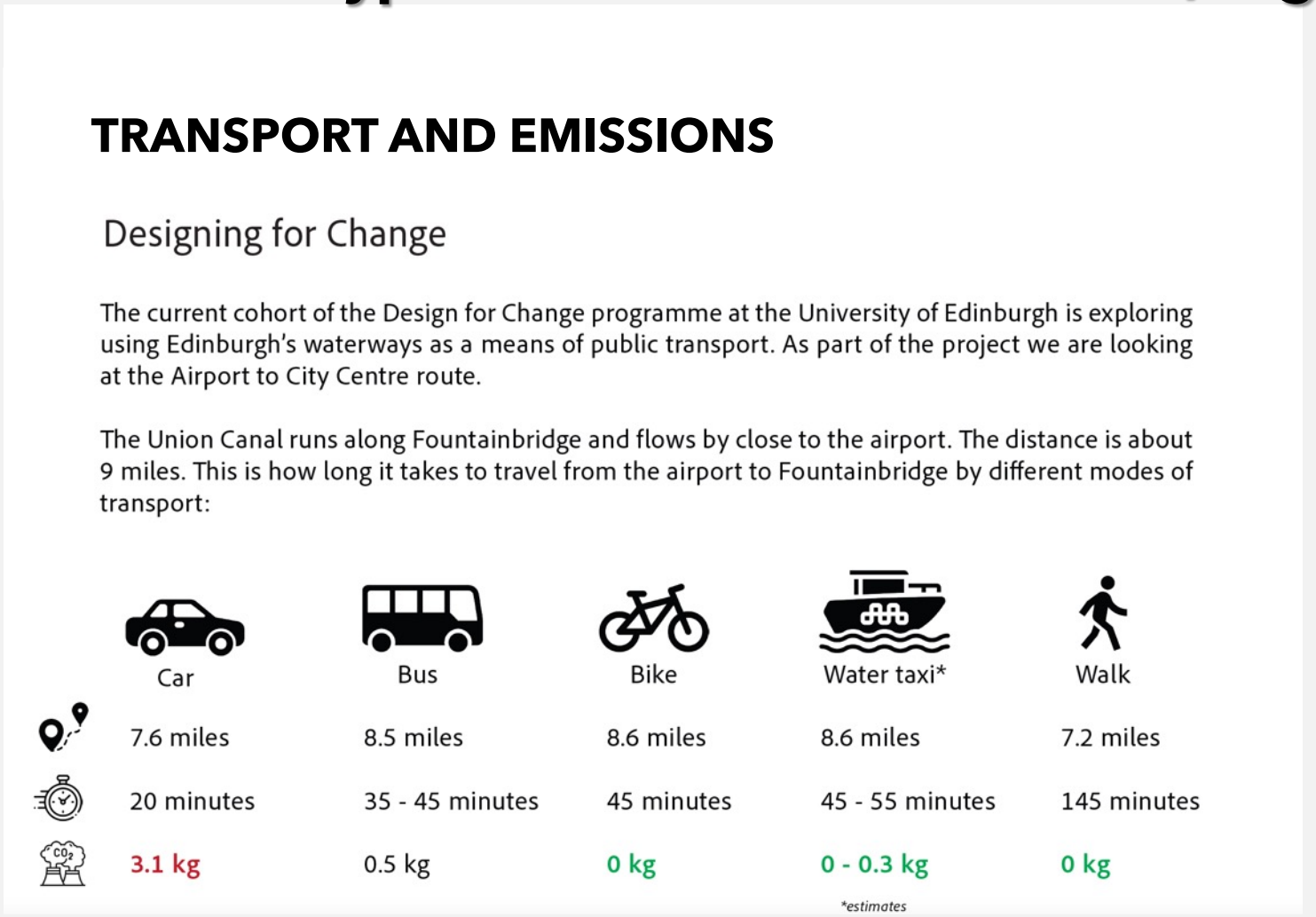



Image 6: Main mode of travel to UK airport on last trip

A background of the problem introduced people to the issue and provided some information about how a large majority of people travelling to the airport used private cars- either personal or taxis.

The poster further delves into a trend of private car usage as a preferred mode of transport and digging into some numbers to highlight the disparity.

# Social Prototype – Part 1 : Awareness Board, Page 3



## TRANSPORT AND EMISSIONS

### Designing for Change

The current cohort of the Design for Change programme at the University of Edinburgh is exploring using Edinburgh's waterways as a means of public transport. As part of the project we are looking at the Airport to City Centre route.

The Union Canal runs along Fountainbridge and flows by close to the airport. The distance is about 9 miles. This is how long it takes to travel from the airport to Fountainbridge by different modes of transport:

| | Car | Bus | Bike | Water taxi* | Walk |
|---|---|---|---|---|---|
| | 7.6 miles | 8.5 miles | 8.6 miles | 8.6 miles | 7.2 miles |
| | 20 minutes | 35 - 45 minutes | 45 minutes | 45 - 55 minutes | 145 minutes |
| | 3.1 kg | 0.5 kg | 0 kg | 0 - 0.3 kg | 0 kg |

*estimates

Image 4: Comparison of different modes of transport to the airport from Fountainbridge. Distances are based on fastest routes. Times are taken using estimates from Google Maps. The CO2 emissions are calculated based on average consumption by vehicles of defined categories.

The next part spoke to our role in this project and what introduced our idea. The comparison of different modes of transport to the airport sought to inform people of the time, distance, and emissions of each mode of transport.

The distance to the airport was calculated from the starting point of the Union Canal. Carbon dioxide emissions were rough estimates based on typical emissions from commonly used vehicles.

# Social Prototype – Part 1 : Awareness Board, Page 4

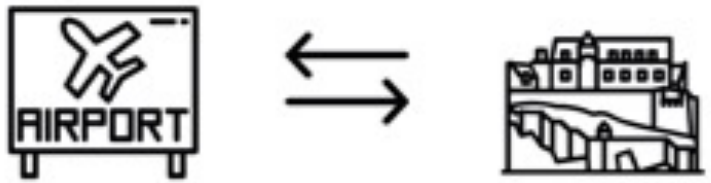
## EDINBOAT: A DESIGN PROPOSAL

### Social Design for Behaviour Change

Edinburgh's canals and waterways offer an interesting alternate transportation option. Reducing private car usage and increasing use of public transport must be strongly encouraged in the future. When looking at waterways, we have an opportunity to build a new sustainable and low/no emission transport system.

We titled our proposal 'Edinboat'. This poster provided a simple overview of our design proposal and featured the proposed routes and power sources for the transport system.

The power sources consisted of a pulley system, like what is used in cable cars. The other two options were electricity and low-carbon fuel.




Proposed routes:
Airport to city centre, City centre to airport


Proposed power source:
Pulley system, Electricity, or Low-carbon fuel

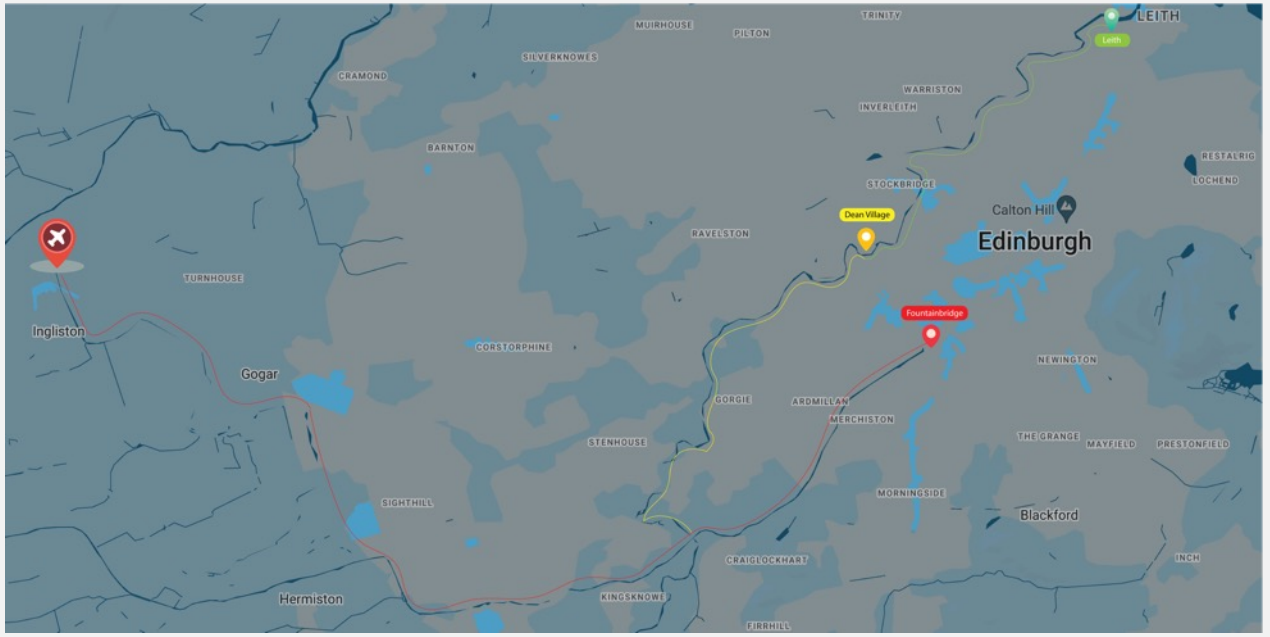
# Social Prototype – Part 1 : Awareness Board, Page 5

## WATERWAYS AS PUBLIC TRANSPORT

### Proposed Route Plan

Finally, we traced out the path of the waterways from the airport to Fountainbridge, Dean Village, and Leith.

The system proposed 3 lines- Red, Yellow, and Green. All lines would initially follow the red line, starting with the Gogar Burn waterway near the airport. The Gogar Burn would join the Union Canal near Hermiston. The Union Canal would join the Water of Leith near Kingsknowe and would continue all the way to Leith. The Yellow line would branch off at Kingsknowe and the Green line would branch off at Dean Village.




Red: Fountainbridge

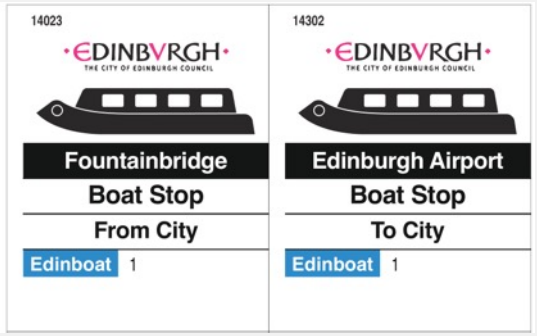
Yellow Dean Village

Green Leith

# Social Prototype – Part 2 : Transport demo setup


*Edinboat Ticket

*Edinboat Cardboard Model




*Edinboat Station Signs

*Edinboat Station Poles

For the prototype experiment, we chose the route from Edinburgh Airport to Fountainbridge.

In the demo, we set up a few essential items, namely a ticket: to give to passers-by to participate in the prototype experience; Cardboard model canal bus boat: used to replace boats in real systems; Stop sign: The design of the stop sign imitates the design of the Edinburgh bus system, aiming to attract the attention of the passers-by with the fake and real; Station pole: The height of the station pole is maintained at 120cm and can be seen by users on shore and in the river.

# Social Prototype – Part 3 : Design for route map


*Edinboat Station Set Up Map

At the end of the session, participants are invited to mark the location of the station they want to set up on the route map. The red route represents the canal route between the airport and Fountainbridge.

The purpose of this session is to collect information from the residents of Fountainbridge about the site's location and the reasons behind it.

# 4. Testing

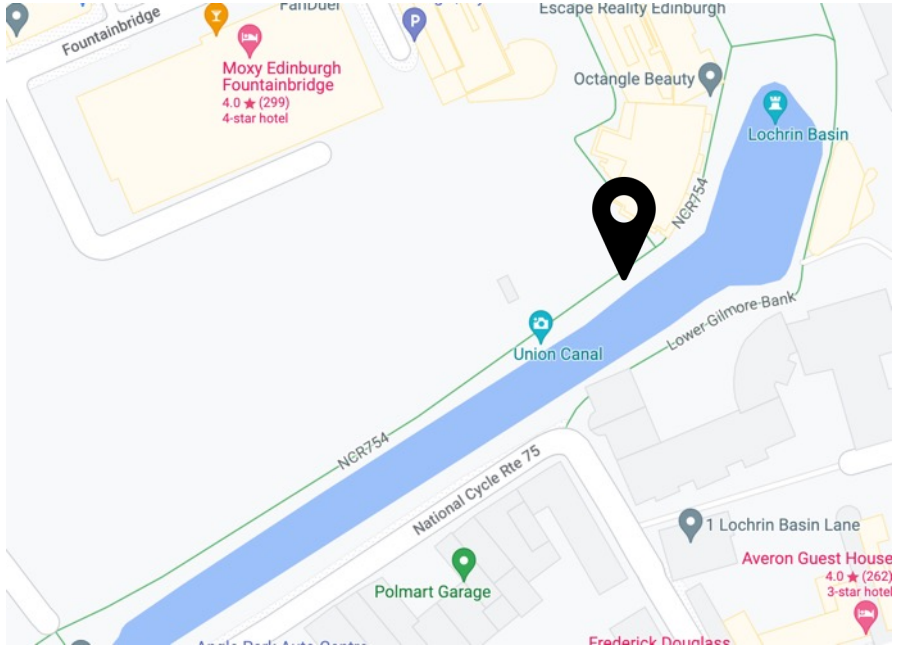
Setup and demonstration

# Testing

We conducted a test of our prototype on the 27th of November 2022 from 12 pm to 3:30 pm at the Union Canal. The process involved setting up our awareness board with informational posters, a table with the route map, and the physical boat demonstration system.

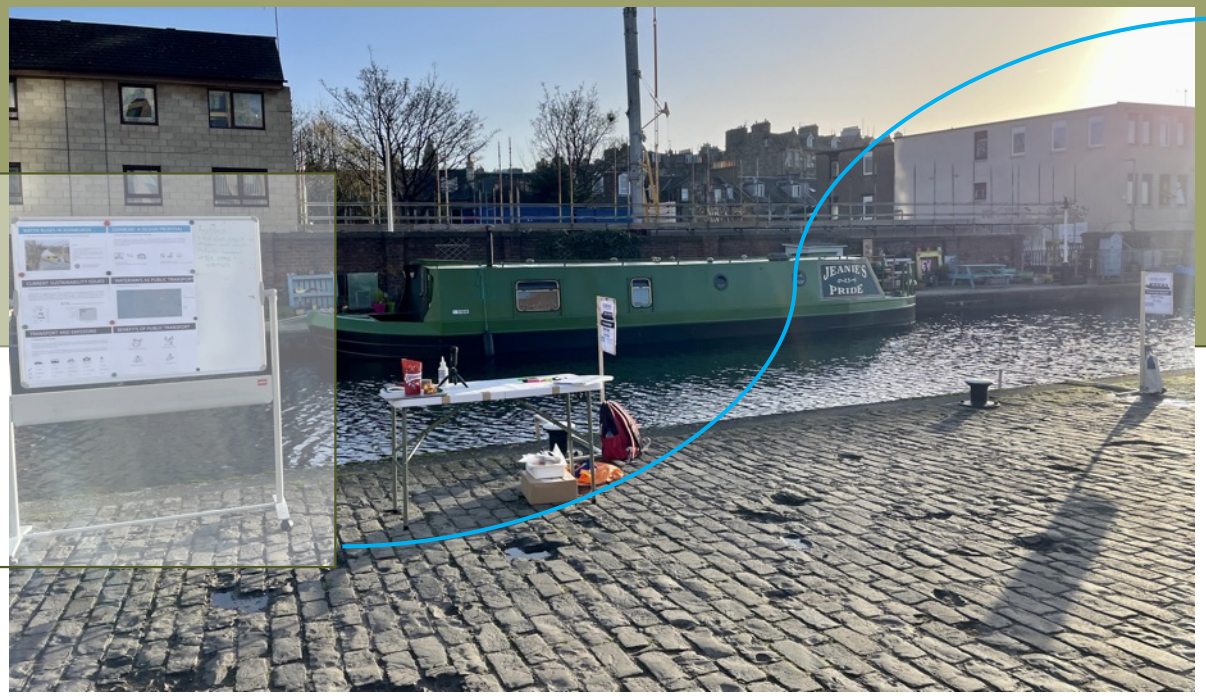
Our main goal was to raise awareness of the new system and gauge the possibility of using the Edinburgh's waterways for public transport. We also wanted to get feedback, suggestions, and ideas from people on effective ways to build the transport system.

The actual testing process began by introducing people to the project, followed by demonstrating the system, setting up boat stops, and getting feedback.




Location of our test

# Prototype Experiment – Setup 1 : Project Description & Feedback





This section contained an overview of the project proposal. The right half of the board was used to collect feedback from passers-by.

# Prototype Experiment – Setup 2 : Boat stops set-up


This section contained the canal route map where participants marked the site settings.

# Prototype Experiment – Setup 3 : Edinboat system demonstration



This section contained the main system of the experimental prototype, which controlled the movement of the model boat via ropes.

# Prototype Experiment – Step 1 : Introducing the Project


In this step, we introduced the background and concept of our project to the residents.

At the same time, the operation process of the canal boat system was explained to the residents.

# Prototype Experiment – Step 2 : Demonstrating the system

Step 2: Demonstrating the system


After the introduction of the system in step 1, we invited passers-by to experience the experimental prototype.

Participants were given "boat tickets" and asked to move slowly on foot following the position of the model boat in the water. This expressed the idea of slow travel in the process.

# Prototype Experiment – Step 3 : Setting up boat stops


After the experience session, we invited passers-by to set up their own stations on the canal route map.

Each participant was given a sheet of clear plastic and asked to mark the location of the site with a marker.

# Prototype Experiment – Step 4 : Getting feedback


Step 4: Getting feedback

At the end of the process, we asked participants for their feedback on the project itself and the prototype process and invited them to write down their ideas and suggestions on a whiteboard.

# 5. Feedback

Data, suggestions, enhancements

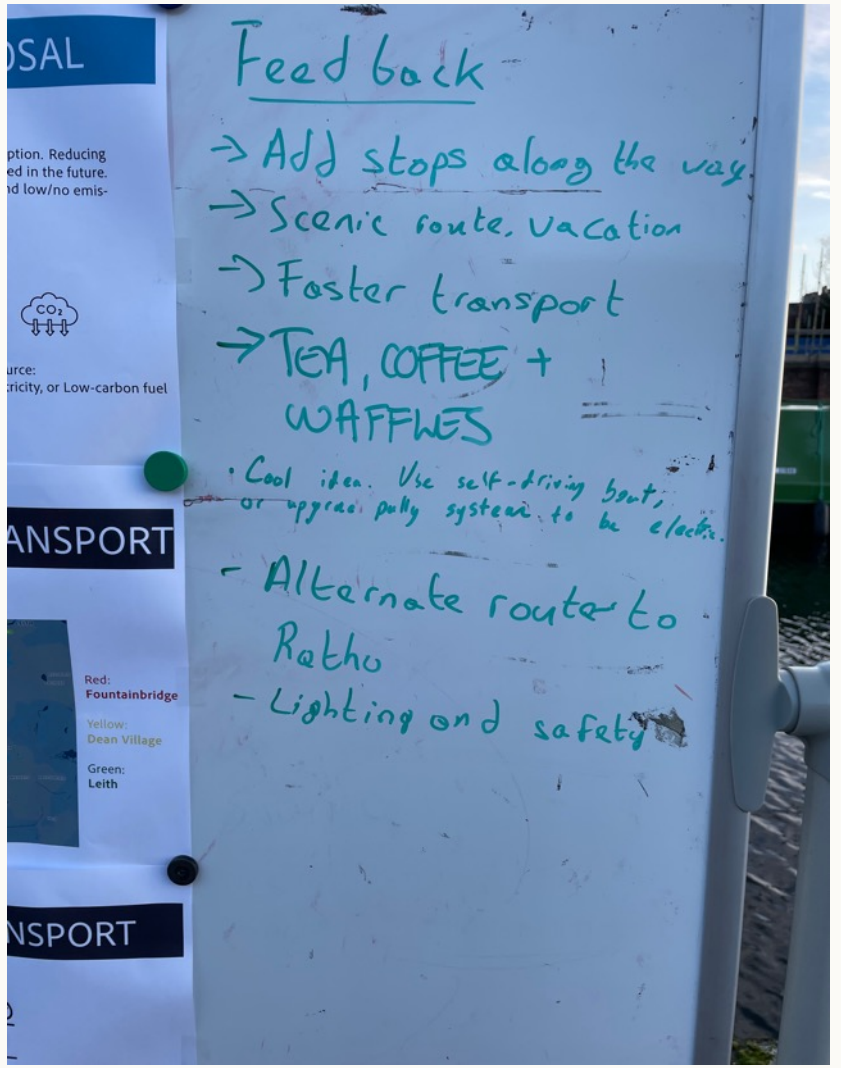
# Feedback

The general feedback from our testing was quite positive with many people liking the idea of using the canal as a waterway.

Some people thought it would be too slow to take a water bus from the airport to the city. They felt like the public could be better served by mapping out an alternate route with stops near the city.

We met with people of different backgrounds and age groups. Some people enquired about how feasible the project was and if this was something that could be maintained well enough over the long run.

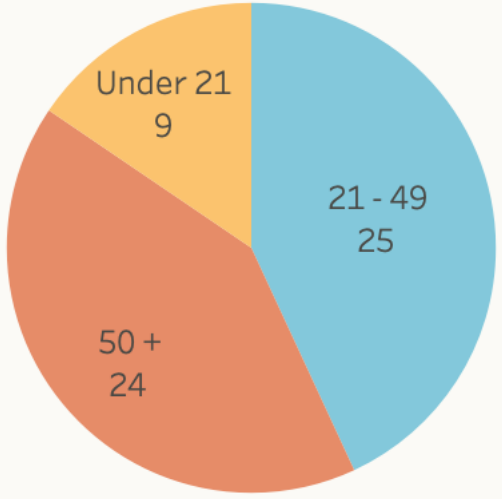
Overall, we got some great feedback, and it helped us design the next iteration of our proposal.



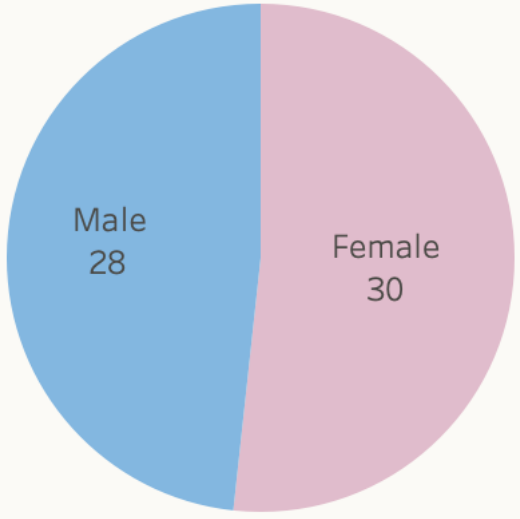
# Participant Demographics

**58** participants in **31** groups (the contact points we had).

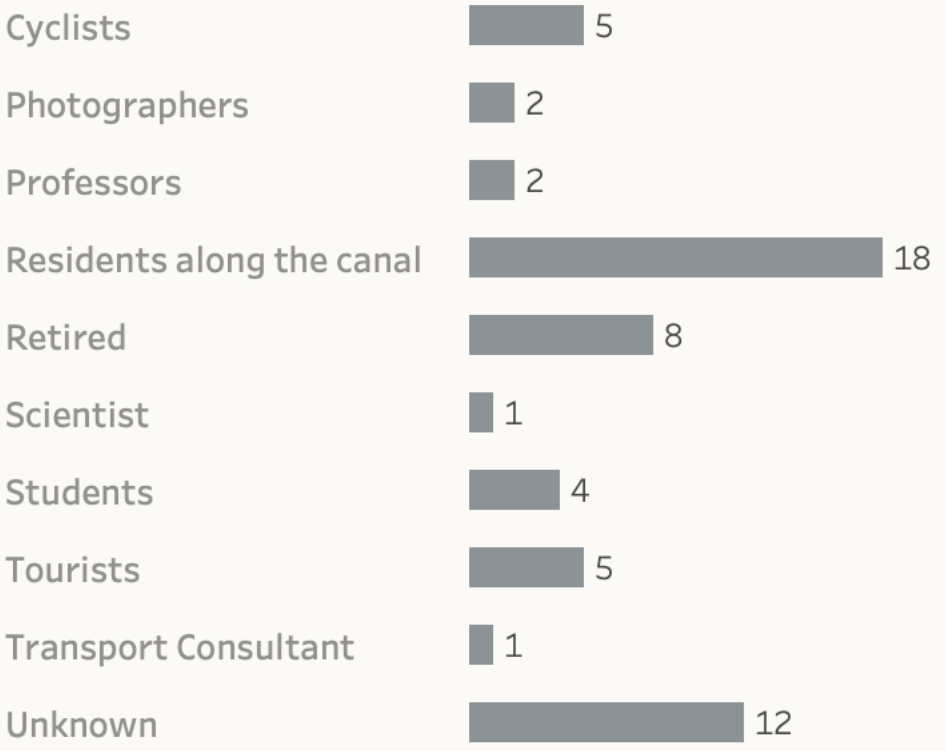
## Age Distribution



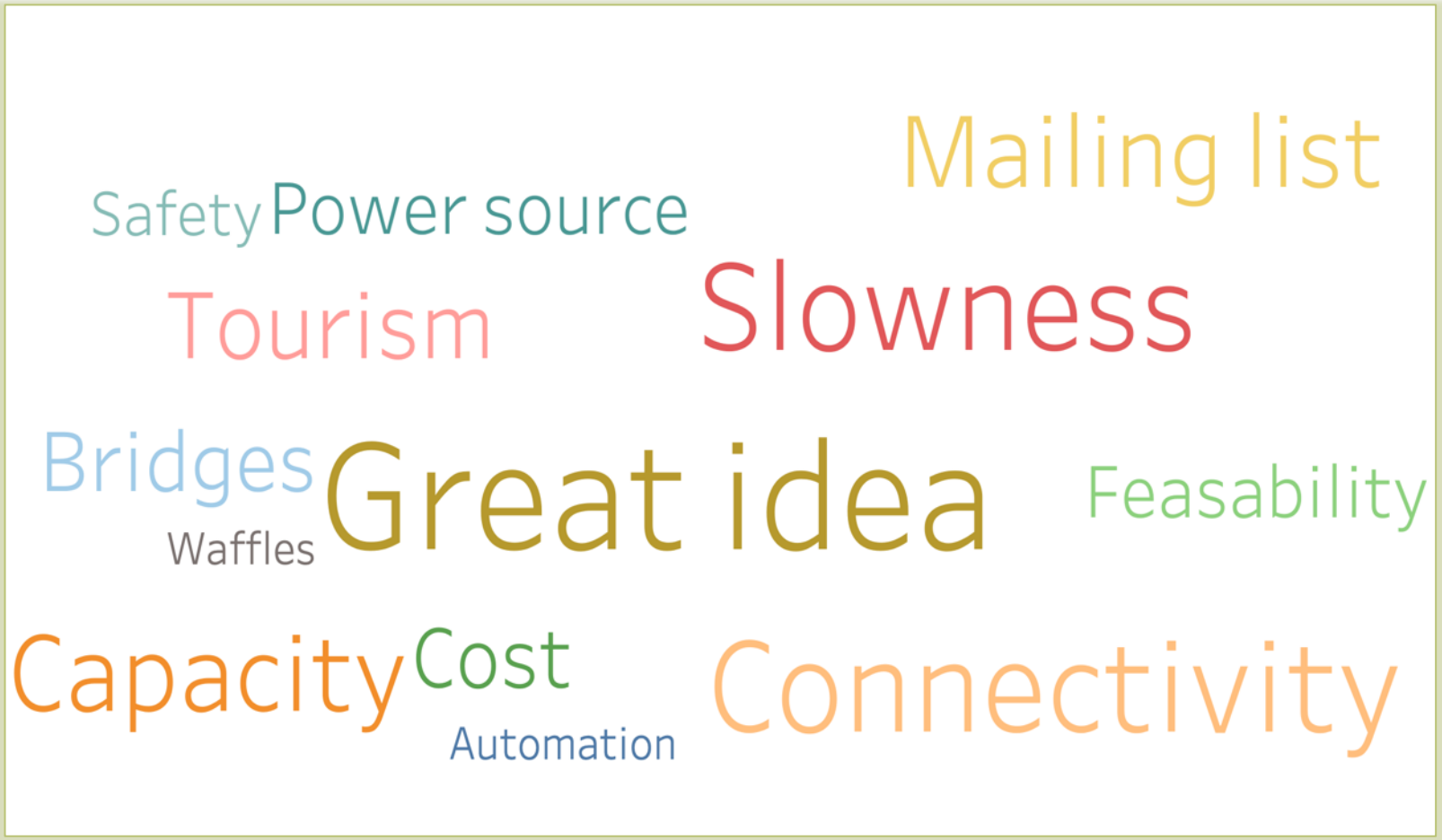

## Gender Distribution




## Profiles



# Keyword Analysis : Page 1

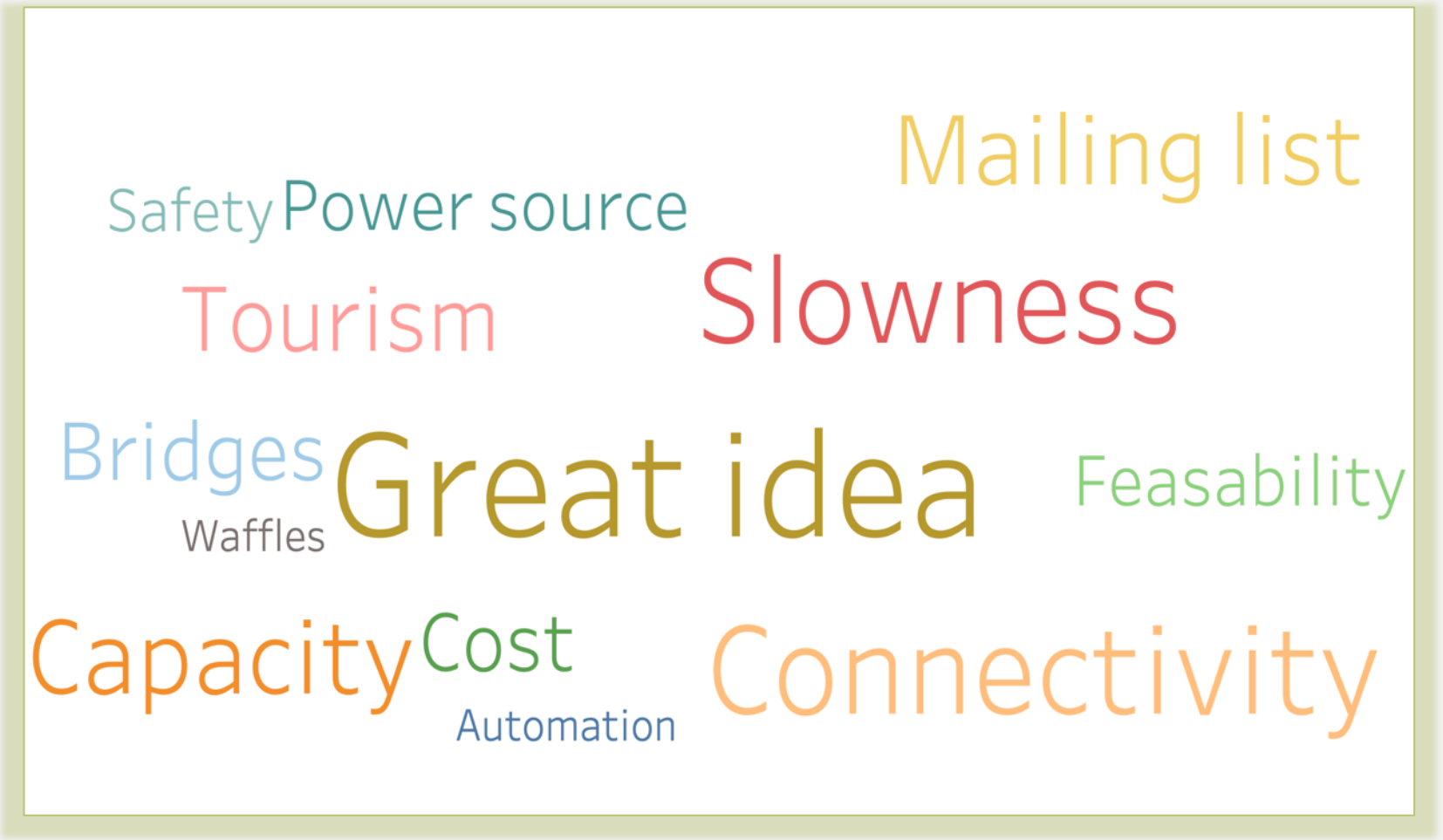



One question that popped up often was about the speed of travel. Not many people were willing to travel slowly.

Using water buses for tourism was suggested by quite a few people.

Some people were curious about the connectivity and wanted to know how the Union Canal connected with other waterways.

# Keyword Analysis : Page 2

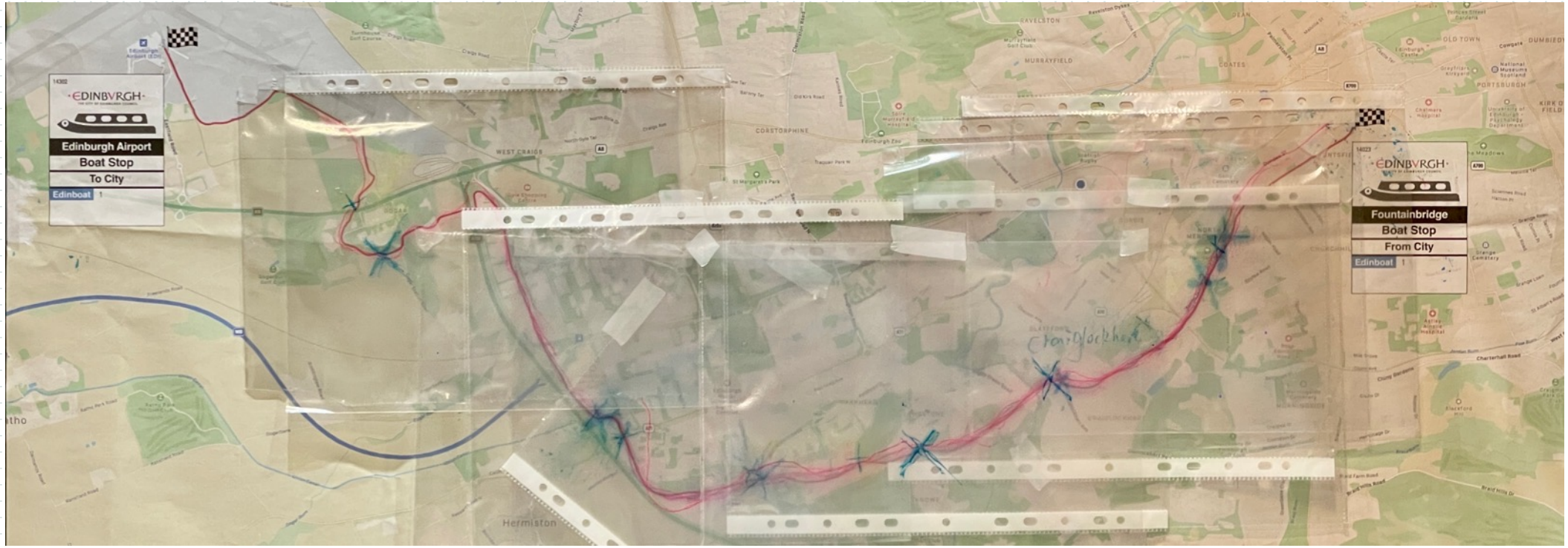



Touching on the theme of sustainability, there were questions and ideas on using human powered power sources and using electricity.

Some people were very interested in the concept and wanted to know if they could sign up for a mailing list to keep track of any project updates.

One-off opinions included using self-driving boats, serving waffles on boats, and focusing on safety and lighting along the canal.

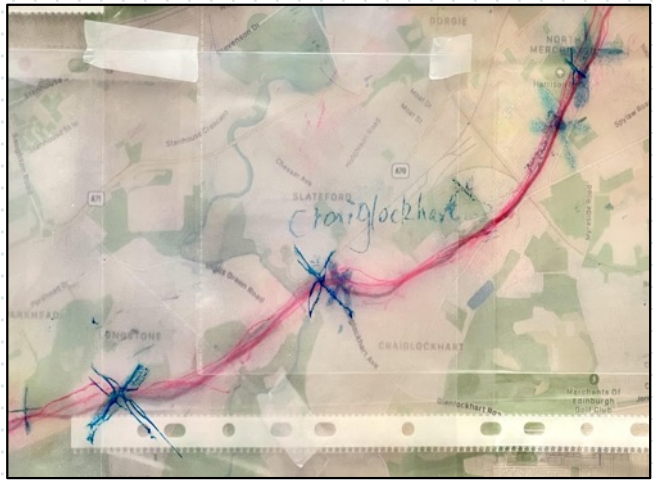
# Route Map Feedback : Page 1



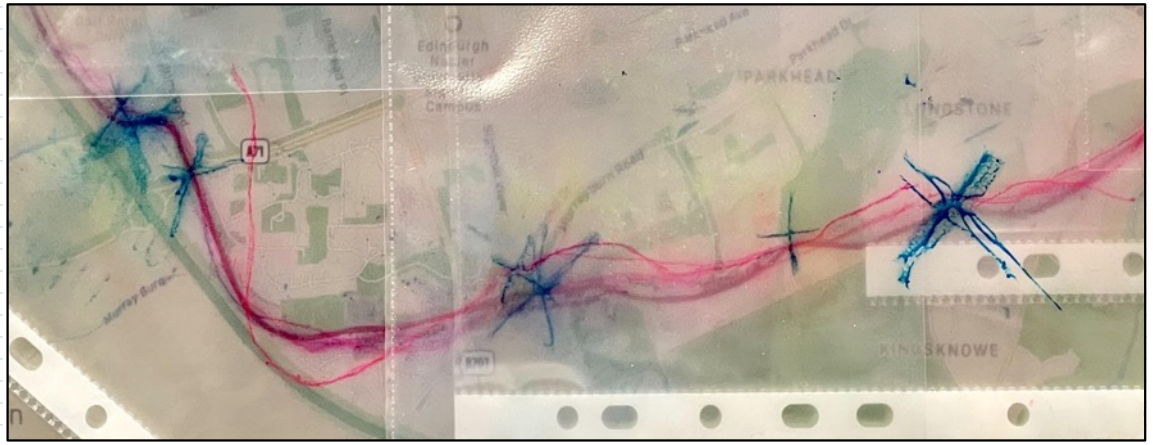

We collected the plastic sheets of residents' suggestions for the location of the site obtained in step 3 of the prototype experiment, pasted them in place, and overlapped them on the map. The travel preferences of residents was obtained through the overall distribution of the stations.

# Route Map Feedback : Page 2


Area1




Area2




Area3

Area 1: Located near the airport, people chose to set up boat stops here due to the presence of large green areas and parks, which are suitable for staying and sightseeing.

Area 2: It is in the suburbs of Edinburgh. The reason why people set up boat stops here is that it is convenient for them to travel from the city to the suburbs and then start out from the suburbs for cycling, hiking and other activities.

Area 3: Close to the city center. People chose to set up their boat stops here because of the proximity of their residence and frequent hangouts, such as schools and workplaces.

## Enhancements and Considerations

- Shorten the route, begin with stops near the city.
- Build an alternate public network which would serve people living along the canal. Don’t compete with existing public transport.
- How can we go past closed bridges?
- Involve people in every phase of the design.
- Consider group pedalling to power the boat.
- Improve lighting and safety along the canal.
- Canals have speed limits of 4 miles per hour.

# 6. Design Proposal : Edinboat

Modified version after testing and feedback

# Edinboat: A waterbus transport system in Edinburgh

Edinboat proposes a public transport system along the Union Canal, extending from Fountainbridge to Hermiston initially. An extension to the airport via the Gogar burn would be considered for the next phase of the project. The waterway system will make use of existing longboats and rent them out to test the pilot project. The systems consists of 4 main parts-

Boats to be used in operation with a few enhancements to improve the passenger's experience.

A route map of the system.

Infrastructure setup along the canal's banks.


A ticketing system to collect usage information and assess demand.

# Boats

Edinboat will rent out existing long and narrow boats to test out the system. This is based on the idea of optimal usage of existing resources. Slight modifications and enhancements will be made to accommodate bike users. Refreshments will also be provided on board. The boats will be able to accommodate between 20 – 25 passengers at a time.

Image 9: Boats along the Union Canal

Image 10: Bike stand attached to boat

Image 11: Tea and coffee cups on board

# Infrastructure

Type1

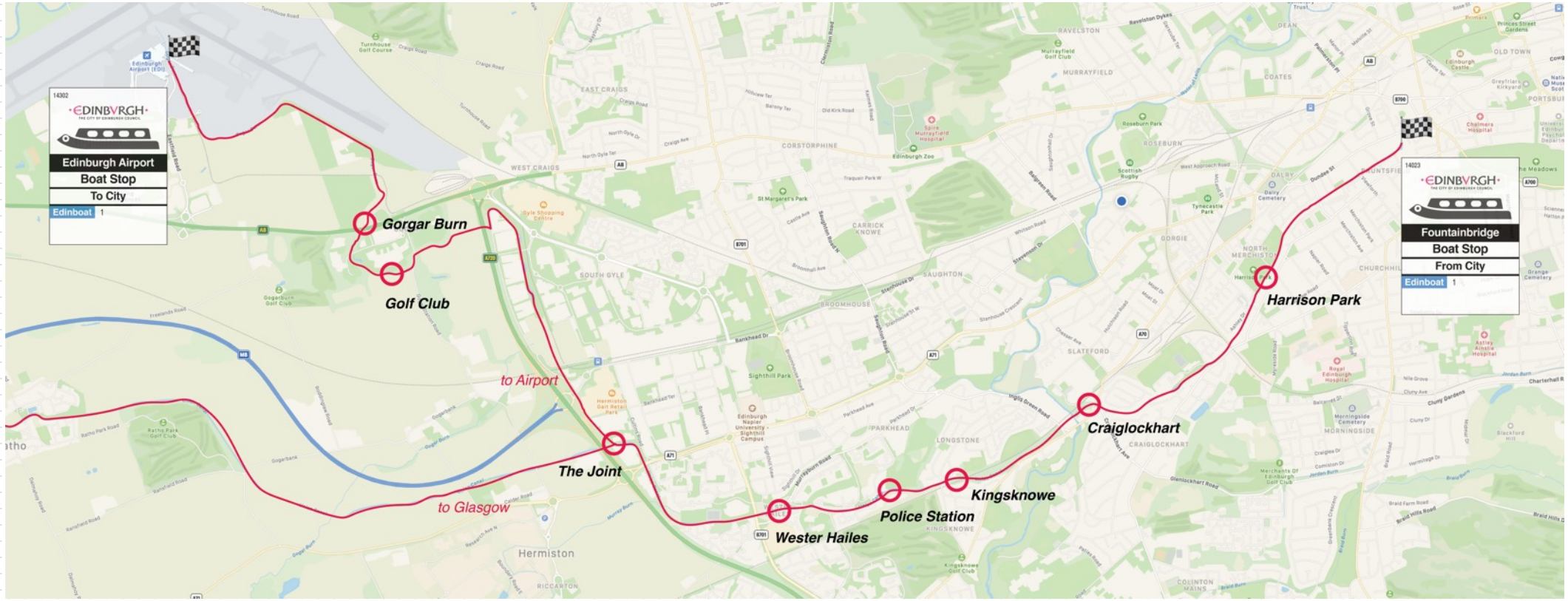
Type2

The figures show two types of platform facilities for Edinboat systems. We think it would be easier for people to access the system by having boat stops like the bus stops.

The Type 1 facility is suitable for the narrower parts of the canal and occupies less space.

The Type 2 facility is suitable for the spacious parts of the canal and has semi-enclosed station kiosks that can display information about the system, such as route maps.

# Route map

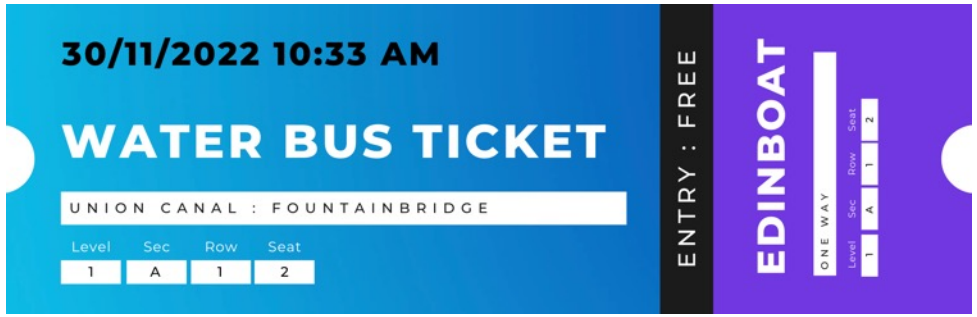



The updated route map has stops based on participants' feedback. The station names came from the suggestions of the participants. In addition, the canal route to Glasgow was added to cater to more users.

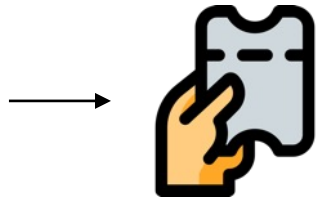
# Ticketing system

Edinboat will kick-off with free ticketing to begin with to encourage users to try out the system and provide feedback and suggestions. The initial setup will serve as a pilot project to gauge demand and validate the proposal.

Tickets will be issued to passengers on entry and passengers will return the ticket at their exit point. The tickets will serve as a mechanism to collect data on frequently used stops and points. Information about peak usage times and low demand times can also be collected from this. This will help plan out an efficient waterway route in the next phase.




Edinboat ticket with timestamp



Collect ticket at entry point

Drop off ticket at exit point

Optimise service based on data

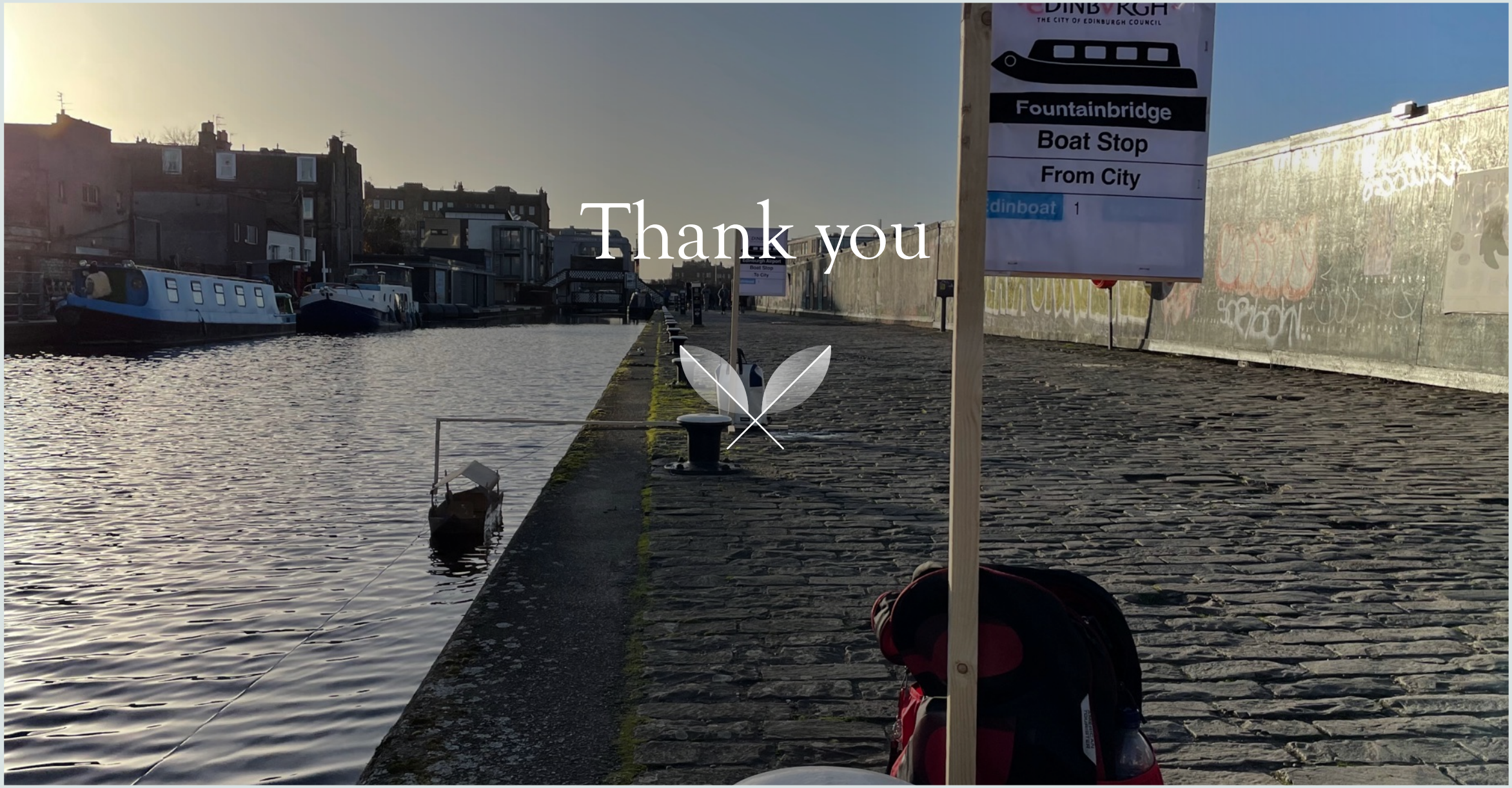
# 7. Summary

# Summary

The Edinboat transport system can serve as a good initiative towards developing an alternate mode of travel and changing people's behaviour towards private car usage and dependency. With Edinboat, there are opportunities to design a new form of public transport and test out ideas and concepts. The focus will be on building a sustainable mode of shared transport and avoiding past mistakes of other forms of public transport. The important thing to consider is to avoid making the waterway as another mode of private travel. While many people suggested developing the waterway for tourism, that isn't the primary goal of this project. We hope to change people's behaviour by changing their attitude towards public transport, involving them in every phase of the design, and considering people's needs and experiences.

There are a few challenges that need to be overcome in order to ensure the smooth operation of Edinboat. The infrastructure along the canal needs to be developed sustainably to provide easy access to passengers. We need to work with Scottish Canals to open or pass bridges along the way. Another point to consider is the width of the canal at different places. Boats need to be designed to suit different types of passengers.

Finally, we would like to conclude by saying that Edinboat can act as a stimulus for behviour change if designed well. The stakeholders- the people of Edinbugh, the local councils, transport consultants, and waterway experts will play an important part in the success of this project.


THE CITY OF EDINBURGH COUNCIL
Fountainbridge
Boat Stop
From City
1

# Thank you

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