



What are you
breathing?

DECO3200
**High-Fidelity Prototype
and Documentation**

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Introduction

Scientific research reveals that "the health damages of anthropogenic air pollution is experienced disproportionately by all countries" (Jones and Olken, 2012). What are you Breathing? aims to bring an acute awareness to individuals about how both outdoor and indoor air pollution affects not only all countries across the globe, but also pervades every aspect of society. However, a certain section in some countries, particularly those with lower social-economic status, are far more vulnerable to the impacts of air pollution (Cooper, 2019).

What are you Breathing? (WAYB?) encourages users to initially consider how the air quality around them will impact their own personal health. It raises a personal awareness that easily takes them on a journey, to click and visually compare what their city's pollution looks like to another socio-economic city of their choice, to click and discover additional pollution details.

By establishing the omnipresent nature of air pollution, users compare 'emerging', 'developing' and 'developed', creating a memorable experience by making at least one 'city type' relatable to the user and taps into a users' curiosity. It highlights the importance of moving away from major air pollution producers, such as coal-fired power plants, and towards renewable technologies which drastically reduce air pollution and its consequential effects on our health and the environment.

It is a persuasive technology that has an advantage over traditional media in that it is more interactive than statistical air pollution websites. It's a webapp that has several advantages over human persuaders; while both are characteristically interactive, WAYB? is more persistent, available in places a human persuader may not be welcome (Nelson, 2007, pg 4).

The visual imagery of (WAYB?) has been equated with pathos because of its strong emotional appeal. Balancing visual design principles helped us harness the emotional power and immediacy of visual perception to create a positive first impression that spreads air pollution awareness more favourably than current basic statistical websites.

WAYB? strengthens the underlying message that air pollution is an urgent global issue. It's a concept which is designed to focus more on creating a personal impact by evoking emotional responses. In this way, environmental consciousness is raised individually. Collectively, this leads to a significant group of environmental voices aware of the air they breathe. The result of this awareness across the globe cannot be underestimated in terms of how powerfully change is able to occur

Prototype link:

<https://what-are-you-breathing.netlify.app/>

Video link:

https://youtu.be/_1w4GYDAz4k

Research

To begin designing our interactive prototype to combat air pollution misinformation, we required a comprehensive understanding on both air pollution and the public's understanding on the issue. This was achieved through a combination of extensive background research, user research and market analysis.

Background Research

Our background research revealed that air pollution accounts for an estimated 7 million premature deaths around the world each year (IQair, 2020), and that long-term exposure is capable of increasing heart disease and asthma, along with being a significant cause of lung cancer (Mansouri, 2016). Air pollution resulting from anthropogenic causes specifically impacts both the geographical distribution of diseases as well as natural disasters (such as heat waves, melting glaciers), posing as a significant threat to humanity if not properly addressed through public awareness (Manosalidis, 2020). However, a deeper probe into the attitudes surrounding this matter also revealed that society is constantly being misinformed by those in political power as well as by large corporations whom individuals have a tendency to trust.

Rather than being sufficiently and fully informed so as to be proactive in helping to reduce air pollution, instead we regularly read of cases of large companies looking for ways to increase their emissions.

This is strongly evident with one of the world's biggest automakers, Volkswagen, exposed in 2015 for creating software to cheat in emissions tests and falsely market their cars as "clean diesel" when actually emitting up to 40 times more toxic fumes into the atmosphere than permitted. It's not that difficult to see an allegory between Volkswagen's deceitfulness in their use of cheating software, and the ways in which society as a whole is being manipulated and misinformed by a variety of everyday digital platforms.

User Research

This understanding of misinformation was clearly evident and supported by our user research. From our two questionnaires, we analysed both qualitative and quantitative data using an affinity diagram and discovered four key insights:

1. *Most participants understand that air pollution is a serious issue but because it is **omnipresent** and invisible they do not think it exists*
2. *Participants only were impacted by air pollution when **directly** affected*
3. *Many participants **deflect** the responsibility of air pollution to bodies in power (ie. the Government)*
4. *Participants were more exposed to air pollution facts **visually** through social media*

IQair (2020). <https://www.iqair.com/us/>

Mansouri, N., 2016. A Case Study Of Volkswagen Unethical Practice In Diesel Emission Test. https://www.researchgate.net/publication/303797234_A_Case_Study_of_Volkswagen_Unethical_Practice_in_Diesel_Emission_Test [Accessed 12 June 2020].

Manosalidis, I. (2020). Environmental and Health Impacts of Air Pollution: A Review. Retrieved from: <https://www.frontiersin.org/articles/10.3389/fpubh.2020.00014/full>

Market Analysis

Further market analysis on air pollution applications was conducted to understand what currently works and doesn't work. Covering reviews from varying apps that provided AQI (Air Quality Index) data, such as AirVisual and Weatherbug, it was found that these apps focused purely on providing statistical data, with little done to educate its users beyond that. Although they fulfil their purpose as data-providing apps, their incredibly basic interface created a severe lack of emotion and air pollution was totally omitted as an urgent matter.

Criteria of success

Based on these insights we created a criterion of success that we wanted our final prototype to fulfil:

- Creatively demonstrate that air pollution is experienced disproportionately by all countries no matter their economic status
- Concisely inform users about the effects, potential health risks and climate impact of air pollution
- Establish the omnipresent invisible nature of air pollution that covertly threatens everyone's health globally
- Provoke an emotional impact, making the content memorable for users
- Navigation must be straightforward
- Technical approach is feasible

Early Iterations

Following the research process, WAYB? originally was inspired by two contrasting concepts, I Spy Air Pollution filter and the AQI What are you Breathing app. By testing these two concepts we wanted to discover whether users preferred a quick immersive experience using filters or a more in depth illustrative approach through story-telling. However, both these concepts lacked in evoking the necessary emotional responses that would create an impact and shift people's perspectives about air pollution awareness.

Concept 1: I Spy Air Pollution



Concept 2: WYAB? (original)

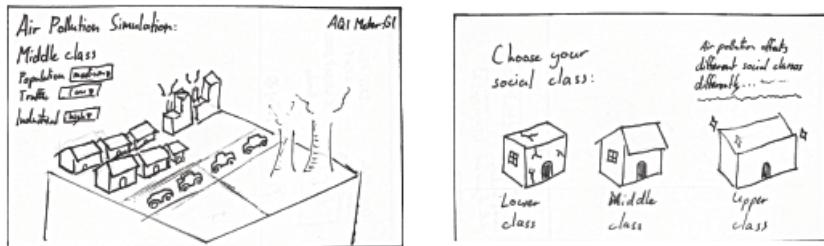


We then constructed a decision matrix, took aspects we liked the most from each concept and amalgamated the two ideas which evolved into the beginning of our Final Concept What are you Breathing? Rather than providing real-time visualisations of ones surroundings, this concept aims to simulate an environment in

which users can control variables related to air pollution, and understand how these factors worsen surrounding air quality.

Initial sketches were created to first have a grasp on the scope and nature of the design, before proceeding with creating low and mid-fidelity prototypes on Figma. We iterated this new concept four times and conducted a total of ten user tests. After each iteration we user tested two to three times, using a range of qualitative methods and collated the findings into an affinity diagram on Miro to properly analyse the changes that needed to be made. These changes/improvements were then applied to the next iteration, where the cycle would then repeat.

Early concept sketches



Our key insights during this stage of iterating evolved around accessibility, interactivity, affordances, communication, recognition over recall, iconic representation and the aesthetic usability effect.

Iteration 1



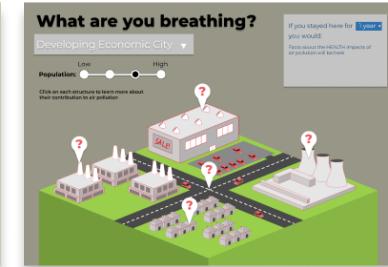
Iteration 2



Iteration 3



Iteration 4



As each iteration was improved upon, accessibility and navigation became more understandable and user-friendly

Main changes

Due to feasibility as well as accuracy issues the initial concept allowed users to change population density, economic growth and traffic, however the amount of separate scenes, as well as research required for these variables to be properly portrayed was deemed too much for the scale of the project. The main interactable variables decided upon for this iteration process were city type, determining the city's socio-economic status, and population density.

There were limitations in the nature of low/mid-fidelity prototypes and users were slightly confused about several affordances and needed direction and sometimes support during testing. Many users found early iterations of the prototype to be ambiguous and confusing, stating that they "did not know that [certain buttons were] clickable", as well as their effects, showing that the affordance of the interface did not correspond with the intended psychological function that visually depicted air pollution awareness. The aesthetics of earlier iterations were also heavily underdeveloped, resulting in the need to flesh out the designs for later iterations to avoid more confusion for users. Consequent iterations featured more salient buttons indicators of interactive elements, and a title screen with instructions was also added to aid users in their use.

Aside from these changes, the core idea and layout of the simulation were largely maintained through this process, with many users commenting positively on its novelty and engaging interactivity.

Final Prototype Iterations

From the low-fidelity prototypes created on Figma, we immediately began building the three different cities in Unity. The scenes for each city type were constructed and assembled using a range of free and purchased assets from the Unity Asset Store. Instead of creating a variety of different assets from scratch, which would have been extremely time consuming, we set a maximum budget of \$100.

An aspect of the design that was carefully contemplated over were the number of interactions available for users to interact with within the scene. The initial concept included a zoom-in interaction feature for each of the four quadrants, which gave the opportunity for users to explore further statistics and information. However, we decided to remove this feature as all information on the screen should be made immediately present to the user, rather than being buried (Cowan, 2001). The drop down/overlay menu that allowed users to alternate between the three city types was changed to three visible buttons. The previous drop-down menu took too long and we noticed from our user testing that this made it harder for users to compare the visual impacts quickly. Buttons allowed clear accessibility, and a quick scan of options is a much more appropriate option for users of all ages to comprehend (Norman, 1990).

The next four iterations evolved around the four characteristics of accessibility: operability, simplicity, perceptibility and forgiveness (W3C, 1999).

Cowan, Nelson. (2001). The Magical Number Four in Short-Term Memory: A Reconsideration of Mental Storage Capacity. *Behavioural Brain Sciences*, 2001, vol. 21, p 87-114

Norman, D. (1990). *The Design of Everyday Things*.

W3C. (1999). Web Content Accessibility Guidelines 1.0. Retrieved from: <https://www.w3.org/TR/WAI-WEBCONTENT/>

Iteration 1 – Operability

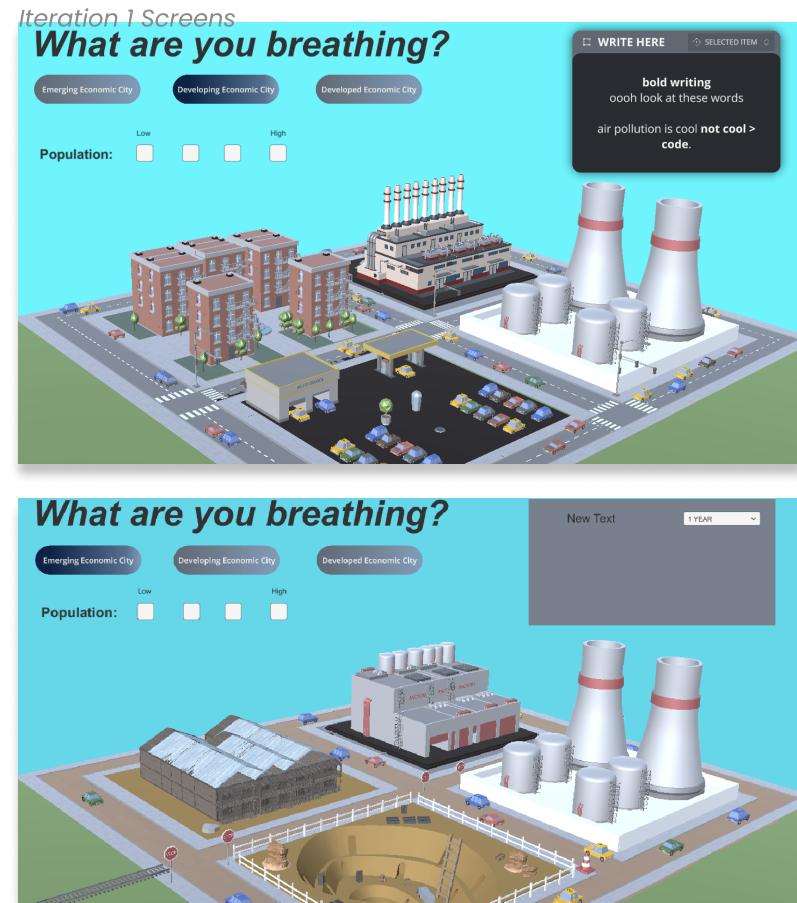
In this iteration, even though we concentrated on assembling models from a variety of different asset packs to create our scenes, we primarily focused on guaranteeing that users could interact and make full use of the prototype's interactions. All quadrants used assets that represented the economic status of each city type. This added value and depth of the simulation and diversified each scene.

Emerging, developing and developed cities were created in three separate scenes in Unity. Using the principle of ***operability***, we coded three separate scripts that managed the scene changes and population levels within each scene.

We also used the principle of ***progressive disclosure*** as it involved separating the assets into multiple layers using the three city type buttons and four population buttons - only presenting them when they are relevant (Lidwell, 2010, pg 188).

As the user pressed the buttons, more assets within the selected city increased. All buttons were extremely visible and acted as reminders for what was and was not operable. This ensured that people of all ages could enjoy full use of the web application (Mace, 1996).

The coal mine was created in Blender.



Iteration 2 – Perceptibility

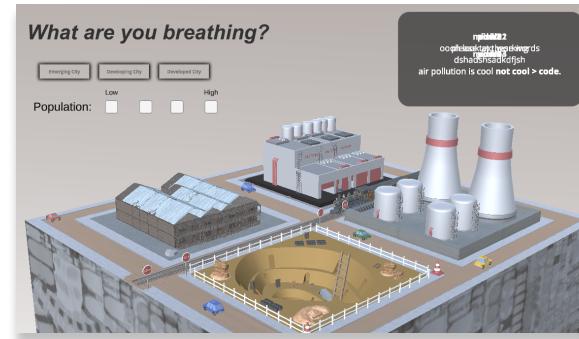
Although Iteration 1 predominantly focused on operability, it was extremely static, aesthetically unappealing and did not visually demonstrate how population density contributed to air pollution.

To solve this, we made each scene much more aesthetically appealing by using the principle of perceptibility to clearly communicate necessary air pollution visual information effectively to the user:

- Emphasised the isometric perspective of each scene by placing it on top of a ‘cube’, enhancing the three dimensional aspect of all the scenes helping users to focus on the issue of air pollution.
- Changed the buttons to Ghost buttons – giving the overall scene an elegant feeling without being intrusive. As there are four different backgrounds, the ghost buttons help keep the UI clean.
- Research suggests that using rounded rectangle corners take less cognitive effort to visually process, look more organic and blending cohesively with the scene (Movement, 2011).

Using the principle of perceptibility we were able to maximise **“legibility”** of essential visual information and provide adequate contrast between essential air pollution contributors within each scene.

Iteration 2 Screens



Iteration 3 – Simplicity

Iteration 3 focused largely on achieving simplicity. This was done by exploring the **picture superiority effect** phenomenon, allowing us to see what users thought the prototype was about and see whether our underlying message was conveyed visually before we added text (Defeyter, 2009).

We added different levels of air pollution (created from the particle system in Unity) as each population density increased to demonstrate quickly to users the omnipresent nature of air pollution (Bornstein, 1987). The air pollution addition allowed us to explore the **exposure effect** principle to help users learn from the prototype visually and help transform the impact and way users think about air pollution (Bornstein, 1989).

To enhance the usability of our buttons, we added a hover and selected button feature. The hover effect informed users what they could interact with by providing instant visual feedback. The selected buttons helped inform users which city type they were looking at. Even though we incorporated the selected button feature for the population buttons, we did not want to add a hover feature to the population buttons because we wanted to emphasise visual hierarchy and help users follow a sequential order.

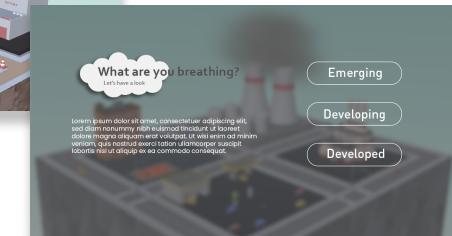
A logo was added to provide the prototype with a “**brand identity**” and aid its overall visual presentation. The cloud imagery was chosen due to its common representation of atmosphere, air etc. This was also incorporated into a newly-made title screen.

The most notable usability improvement was the functional and internal consistency between the population buttons and the city type buttons. When the previous iteration population buttons were clicked and a user decided to change city types, the scene would force the user to start from the ‘low’ end of the population buttons. To fix this consistency issue, our coding significantly changed. All of our three city type scenes were merged into one scene and one C# script, and using the SetActive() function, we were now able to compare the population levels with the city types seamlessly.

Iteration 3 scene



Early title screen



Button when hovered



Button when selected



Iteration 4 - Forgiveness

Iteration 4 predominantly concentrated on improving good **affordances** and enhancing **readability**. Information on air pollution effects, health risks and climate impact were added to the information box and changed as the population increased. These facts were very concise, coming from the World Health Organisation (WHO, 2020). We added icons next to the text 'Effect' to visually indicate that the information was changing.

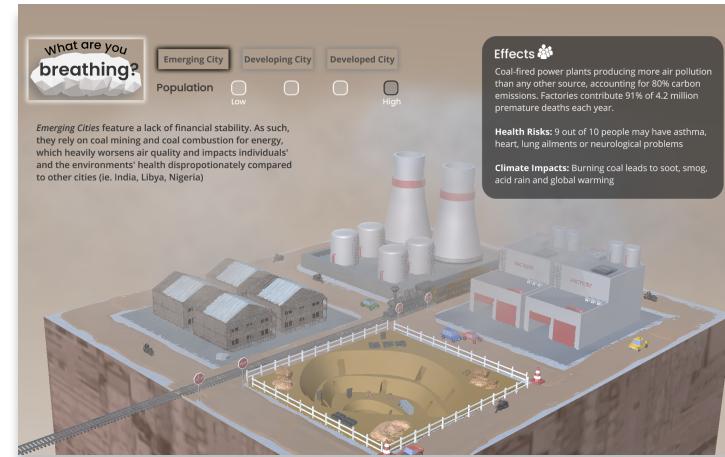
Iteration 4 also used the Gestault principles of contrast, alignment, similarity, and proximity to differentiate between the concise content and navigation areas. The logo switched to a 3D, low-poly graphic to suit the visual theme of the scene, reinforcing and establishing the WAYB? identity.

The UI layout was changed, the city type buttons were now placed on the right side of the logo. This created more space to include the city type descriptions and also allowed users to more quickly discover that the logo was also hoverable. Users were more aware of how to undo an action without getting lost.

The population buttons were also aesthetically improved upon and instead of being solid we made them more radio-button like and transparent so as to not be intrusive to the rest of the scene. Scooters and buses were added in emerging and the developing cities to distinguish more visual disparity between scenes. Each city type's cube texture changed to make the scene change more obvious to the user.

Finally, the title screen layout was adjusted to incorporate better text **hierarchy** and readability. The original unity loading icon was replaced with an edited WAYB? logo, and a hyperlink to the World Health Organization website, our information source, was included.

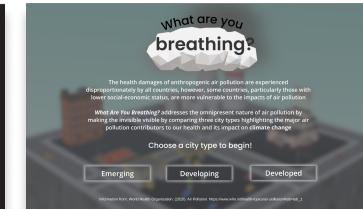
Iteration 4 Screens



Loading screen



Title screen



User Testing

After exporting our Unity Project using WebGL and uploading it onto netlify, we conducted 6 user tests. Our goal was to explore the usability and also the overall impact of WAYB?.

Two main user testing methods [Appendix C] were conducted per user. The **System Usability Scale** provided us with a 'quick and efficient' tool for measuring how successfully users interacted and understood the interface. We used Andrew Chak's (2002) notion of "**persuasion testing**", a method that shares similar characteristics with usability testing but has the goal of evaluating the impact of WAYB? and how it influences users' attitudes. Users were asked to think aloud during testing. We also '**interviewed**' our participants to assess how effective WAYB? was to help spread awareness. We wanted to see how confident users were after interacting with the webapp. We collated these findings into an affinity diagram [Appendix A].

Three important questions were asked to determine the perceived persuasiveness of the webapp:

1. *How does WAYB? make you feel now towards air pollution?*
2. *Do you feel more aware about the impacts of air pollution?*
3. *What have you taken away from the WAYB? experience?*

Since the majority of our user comments were qualitative, we created an 'affinity diagram' on Miro to identify main themes and helped us drive to deeper levels of understanding the success of WAYB?.

Usability

Affordance: All participants stated that the buttons corresponded with its intended function and that users were never lost. One user stated: "*I was never lost, it was very consistent, the glow hover on the buttons really directed me*".

Accessibility: All participants stated that WAYB? was extremely straightforward to use because the interface was modern and sleek. Participants of all ages were able to operate the interface without assistance. A few participants stated: "*The UI elements were intuitive, all buttons were in the right spot, my eye always knew where to go*".

Visibility and Hierarchy: All participants noticed that the button controls and information served as constant reminders for what city type and population level they were on. This reduced kinematic load and made the usability more understandable. One participant remarked on the logical sequential order which helped them to cohesively combine the visuals and information together. Another participant expressed that the icons changing in the side panel helped draw attention to the different text that changed per population and city.

Summary: Visual communication helped convey the overall message of WAYB? by optimising user experience. WAYB? does this by establishing a mood through the use of colour, assets and using Gestalt principles to organize the UI in a way that increases readability and coherency (Wroblewski, 2002). From our system usability scale no user had difficulty interacting with any part of the prototype.

Impact

From our user findings, we discovered that the visual persuasiveness significantly impacted users' emotional responses. Chak (2002) claims that comparison is the best way to test for persuasiveness.

Comparing

We gave users the task to explore WAYB? and compare the different levels of air pollution in the different socio-economic cities. One user revealed "I didn't know that other countries affected another country's air quality, the graphics helped me understand that".

An interesting insight discovered from a user who only looked at the visuals of WAYB? stated that "Without reading the text I can tell that the website is about how air pollution increases when populations increase by comparing it to other cities".

Emotional responses

The highly salient air pollution attracts the eye and holds users' attention as they interpret what is happening in the scene. Three users stated "It makes me kind of sad when I see the air pollution because the world isn't doing anything about it".

Another user stated that "the background colours created a sense of sadness". This demonstrates how WAYB? can create empathy between users. This is further exemplified with some users saying "I did not know there was disproportionate air pollution across the world, it makes me upset and I feel lucky".

Awareness

A lot of users expressed that the impact of WAYB? made them more aware of air pollution and the impacts on their health and the environment. One participant stated: "I didn't really know much about the impacts of air pollution, I am quite shocked at the statistics".

All users appreciated that each city type had example cities and that they could relate to the countries they knew about.

All users enjoyed clicking and comparing the air pollution in each city. One user stated "I like comparing the differernt smog in each city, I visually understood that emerging cities don't have the best technologies to combat air pollution".

Users expressed that their knowledge of air pollution increased after exploring WAYB?, one user stated "I don't have any pollution prejudice so I feel like I've learnt something new and it helped deepen my understanding".

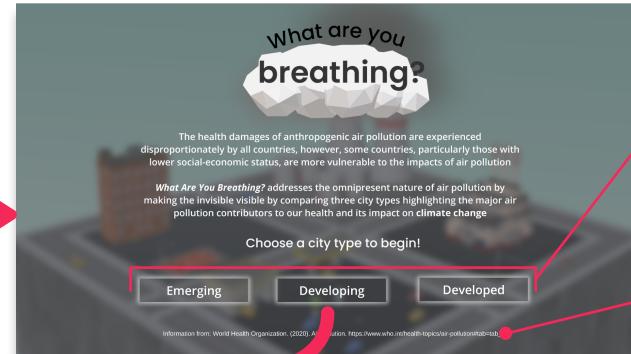
After all users completed WAYB?, we asked what they took from the experience. The majority said words similar to the effect of "It's about climate change and it has impacted my perspective on air pollution...I am more aware about how it can affect climate change and what cities globally should be doing".

Summary: Overall, the words in WAYB? are strongly defined by the visual imagery. It balances the layering principles, harnessing the emotional power and immediacy of visual perception to create a positive impression that spreads air pollution awareness

Core Functionality

Title screen

The first screen users will see. Provides context on the webapp and prompts the user to enter the main scene

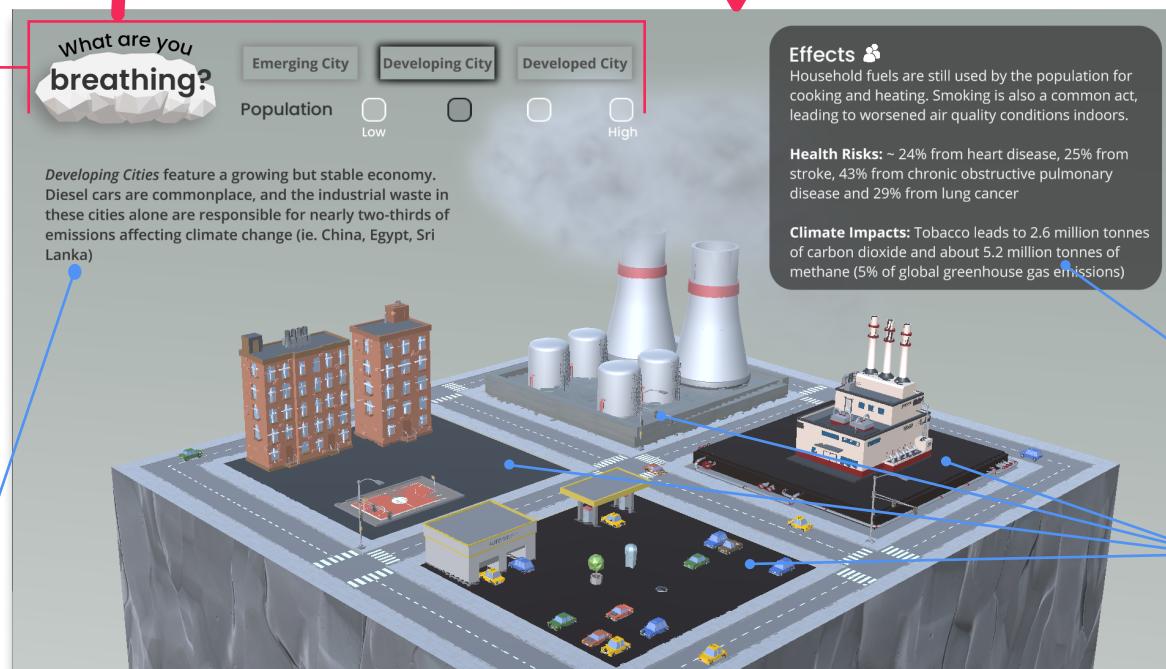


INTERACTABLE
User enters the main scene by choosing a city type

INTERACTABLE
Linked to the World Health Organization website when clicked

INTERACTABLE
All interactable elements of the screen are placed in here. Users can change the population and city type through the buttons. The logo acts as a button and returns to the title screen, a convention supported by Jakob Nielsen. Both the logo and buttons light up on hover to indicate action

INFORMATION
Each city type is given a description to help users understand its context, as well as similar cities in the world



Main Scene
The main scene users interact with. Allows to change city type and population level to see its effects on the city

INFORMATION
Contains information on air pollution sources, health risks and climate impacts. Changes with population and city type

INFORMATION
Each city contains four quadrants, housing, factories, power source and a quadrant unique to their context, for visual consistency.

C# Script

In the 'Game Scene' in Unity, instead of having three scenes we had one scene with all of the GameObjects. We did this because we wanted the population button to stay selected when changing between scenes for confirmation purposes. We used the `SetActive()` function to hide and unhide each city type and each population level.

We created a public function called `SetCity` which determined which city is active when it is being called through the public function called `SetPopulationLevel`. The number that is being passed in the `SetCity` function activates the city. It includes three different 'if statements', representing 'emerging, developing and developed cities'. The `SetPopulationLevel` function includes an integer stating which level from the `SetCity` function is set to true or false when the button is clicked on. 12 different 'If statements' were used to `SetActive` each level and text information.

The title screen has a separate script called `StartManager.cs`. It has a function called `CallButton` and uses an int parameter to set the value of the `currentCity` and load it into the 'Game Scene'. We had to make the `currentCity` static in `PopulationLevels.cs`, so that the variable could be accessed from `StartManager.cs` in the other script `PopulationLevels.cs`.

The `OpenLink.cs` script opens the URL specified on the 'Start' Screen.

User Flow [Appendix B]

The functionality of WAYB? remains fairly simple, as most information is gained through the extensively decorated and animated scenes.

As users firstly open up the webapp, they are initially greeted with a title screen providing context, as well as a prompt to choose a city type. After selecting a city type, they are immediately thrust into the world of WAYB?, where they can see how air pollution affects cities of different statuses and populations. The only interactable elements on the screen are buttons which change the city type, radio buttons which change the population levels, and the logo which allows users to return to the title screen.

As the population and city type is altered, information on the right side also changes, allowing users to learn as they interact with the scene. Users are expected to go through all population level and city type combinations and read the information, though they may simply choose to immerse themselves in the different scenes of WAYB? and absorb the information visually.

Hardware/software Requirements

Download Unity version 2019.4.14f1 or later with WebGL.

Setup Instructions

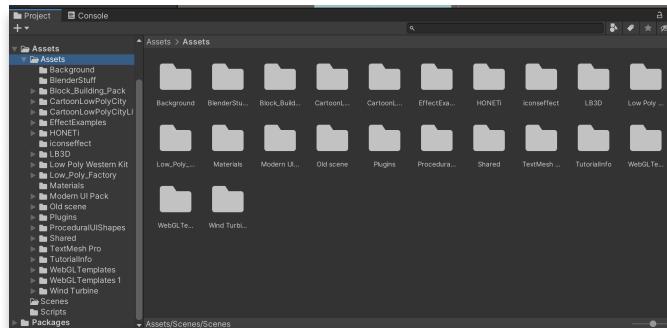
When our prototype was exported from Unity using WebGL, even though our prototype worked on most web browsers, we did notice that with the latest version of Chrome, that the WebGL Draft Extension had to be activated in the chrome://flags settings. Enabling this option allows web applications to access the prototype link.

If the prototype is being opened in Unity, all assets, materials and textures need to first be downloaded within the Unity project.

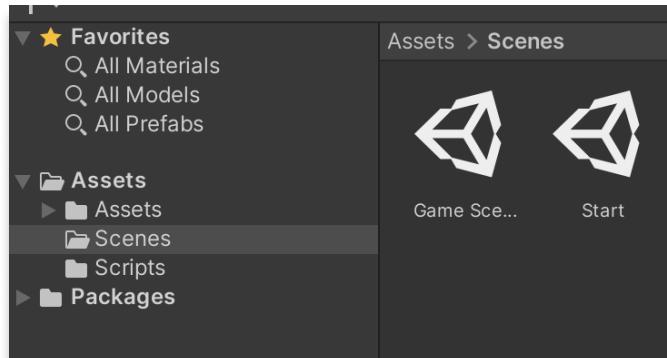
To do this, drag the Assets folder provided into Unity, go into scenes and open the 'Game Scene' to see the city type scene. Click on 'Start' to open the start screen.

To change or view coding click the 'Script' folder and click, 'PopulationLevels.cs' to view the code for the 'Game Scene' Scene. Click 'StartManager.cs' to see the code for the 'Start' Scene. Click 'OpenLink.cs' to see the code for the link on the 'Start' Scene.

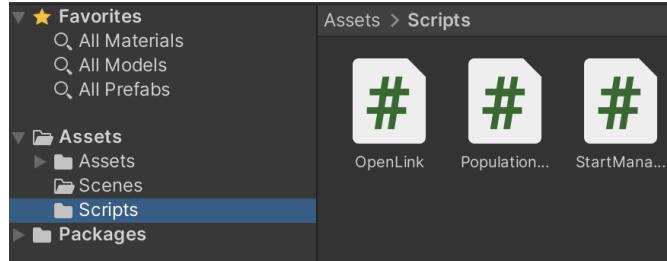
Asset Folder



Scene Folder



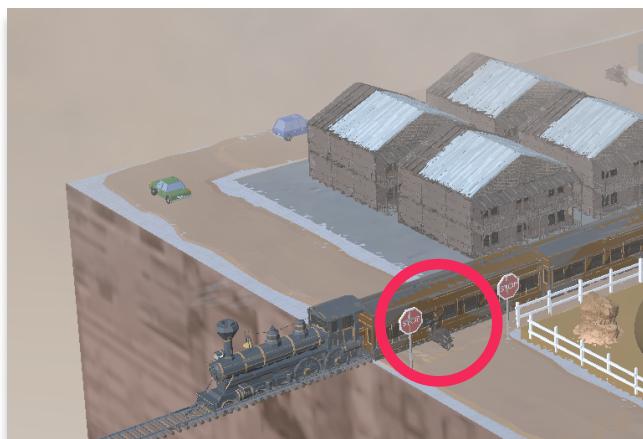
Script Folder



Known Issues

In terms of technological design, all of the prototypes button transitions and interactions work seamlessly. However, we noticed that in the Emerging city the vehicles go straight through the train, causing users to become easily distracted. The hyperlink on the start screen does not open as a new tab which is frustrating. When opening the netlify link the loading time is very unpredictable, sometimes taking too long and other times having a pause between the start screen and the next scene. Even though the WebGL template Unity provided us with work, it is not responsive and there are display inconsistencies across a variety of mobile devices.

Vehicles may occasionally pass through other objects



Future Versions

Imagine walking in the city, and breathing in deeply. Maybe you are lucky to be able to look up to a beautiful clear blue sky, and breathe in a smell of freshness; but most likely you look up to a hazy blue sky and breathe in and ask yourself what am I breathing? This all depends on where in the world you are.

With future versions of WAYB?, we want users to be able to go onto either their mobile or desktop and type up any city, see what type of city type it is and see the major air pollution contributors and compare.

With climate change being the prime topic of our generation, what each country does and intends to keep on doing to reduce carbon emissions is being monitored. We also want to add a graphical sharing feature that makes it more fascinating to look at and keep 'tabs' on other countries. What Are You Breathing? will allow people all over the world to follow and track the pollution levels of cities all around the globe, keeping everyone informed and on track to reduce anthropogenic pollution.

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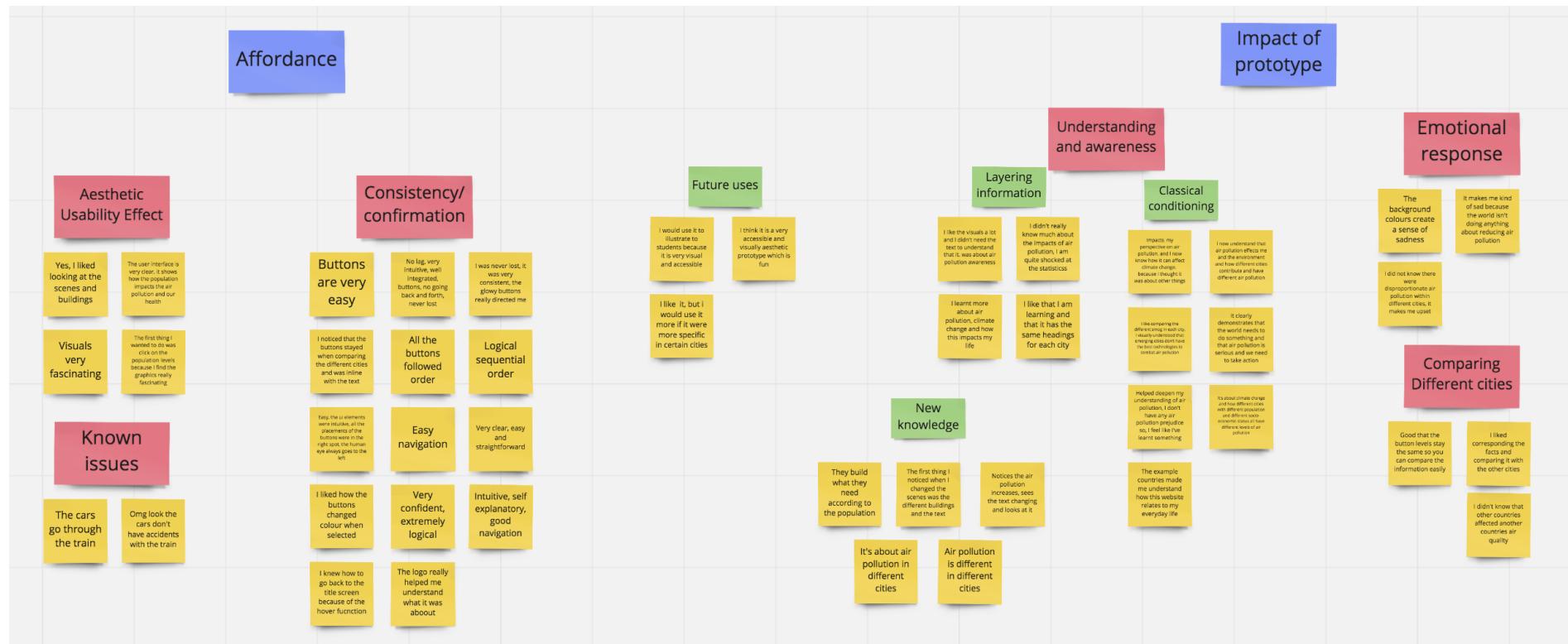
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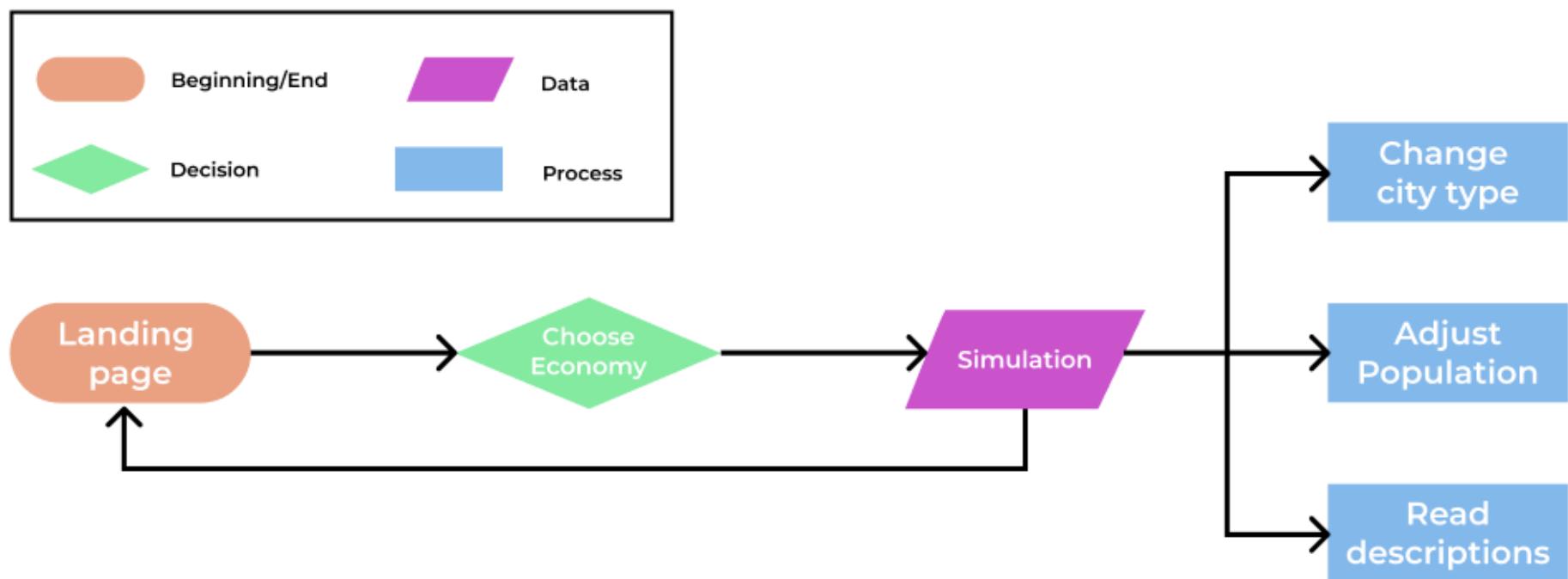
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Appendix A



Appendix B



Appendix B

User test 1

Denise

User Test - Part 1

Task	Success	Time to Complete	Number of errors	Notes/ observation
Choose a city	check	fast	none	I did not know there were disproportionate air pollution with different cities
Change the population to high	check	fast	none	
What is happening on the screen				More vehicles, more cars, hazy
Go to home screen	check	normal	none	Likes glow border
What is the website about				I learn about air pollution, climate change and how this impacts my life
What do you see on the screen				The trains crash

User Test - Part 2: System Usability Scale

	Statement	Disagree					Agree		User Comments
		1	2	3	4	5			
1	I think I would like to use this system frequently				x				Yes, I liked looking at the screens buildings
2	I found the system unnecessarily complex	x							easy
3	I thought the system was easy to use				x				yes
4	I think that I would need the support of a technical person to be able to use this system	x							no
5	I found the various functions in this system were well integrated					x			Yes, I liked how the buttons changed colour when selected
6	I thought there was too much inconsistency in this system	x							no
7	I would imagine that most people would learn to use this system very quickly					x			Yes
8	I found the system very awkward to use	x							no
9	I felt very confident using this system					x			Yes
10	I needed to learn a lot of things before I could get going with this system	x							no

User test 2

Photini - User Test - Part 1 -

Task	Success	Time to Complete	Number of errors	Notes/ observation
Choose a city	check	check	none	Chooses emerging because they want to start from the beginning It's about air pollution in different cities
Increase the population to high	check	check	none	Very easy
What is happening on the screen	check	check	none	More cars, likes the text on the screen
Go to home screen	check	check	fast	Liked text
What is the website about				Air pollution is different in different cities → understood underlying message
Change scenes when on a level				They build what they need according to the population
Compare scenes				Likes to correspond the facts and compare with the other cities

User Test - Part 2: System Usability Scale

	Statement	Disagree					User Comments
		1	2	3	4	5	
1	I think I would like to use this system frequently				x		I like it, but I would like it to be more specific and key in certain cities and get these sort of information
2	I found the system unnecessarily complex	x					Visuals very fascinating
3	I thought the system was easy to use					x	Buttons are very easy
4	I think that I would need the support of a technical person to be able to use this system	x					no
5	I found the various functions in this system were well integrated					x	Logical sequential order
6	I thought there was too much inconsistency in this system	x					no
7	I would imagine that most people would learn to use this system very quickly					x	yes
8	I found the system very awkward to use	x					no
9	I felt very confident using this system					x	yes
10	I needed to learn a lot of things before I could get going with this system	x					No, it was intuitive

User test 3

DominiqueUser Test - Part 1 -

Task	Success	Time to Complete	Number of errors	Notes/ observation
Choose a city	Check	Check	Check	It's about what are you breathing. I like the title
Increase the population to high				Notices the air pollution increases, sees the text changing and looks at it
What is happening on the screen				Notices everything we want
Go to home screen	check	check	fast	Thinks emerging is about cities that have no buildings. Likes the example countries
What is the website about				I like that I am learning
Change scenes when on a level				Very easy to do
Compare scenes				Good that it stays the same, so you can compare the info

User Test - Part 2: System Usability Scale

	Statement	Disagree					Agree	User Comments
		1	2	3	4	5		
1	I think I would like to use this system frequently		x					If it was more specific and updated
2	I found the system unnecessarily complex	x						It was <u>gooood</u>
3	I thought the system was easy to use					x		Very clear, easy, straightforward
4	I think that I would need the support of a technical person to be able to use this system	x						No
5	I found the various functions in this system were well integrated					x		Yes, sequential order
6	I thought there was too much inconsistency in this system	x						No, because I clicked the buttons in each level, I was never lost, very consistent
7	I would imagine that most people would learn to use this system very quickly					x		Yes
8	I found the system very awkward to use	x						No
9	I felt very confident using this system					x		
10	I needed to learn a lot of things before I could get going with this system	x						No

User test 4

Panos

User Test - Part 1 -

Task	Success	Time to Complete	Number of errors	Notes/ observation
Choose a city	check	check	none	Impact: emerging needs help and can't sustain their population levels
Increase the population to high				The user interface is very clear, it shows how the population impacts the air pollution and health impacts
What is happening on the screen				Changes the later of pollution
Go to home screen	check	check	fast	Emotional: makes me kind of sad because the world is unfair and corrupt and people's priorities are wrong
What is the website about				Clearly demonstrates that the world needs to do something and that air pollution is serious and we need to take action
Change scenes when on a level				
Compare scenes				Likes to compare and correspond

User Test - Part 2: System Usability Scale

	Statement	Disagree			Agree	User Comments	
		1	2	3	4	5	
1	I think I would like to use this system frequently			x			I would use it to illustrate to students because it is accessible
2	I found the system unnecessarily complex	x					No
3	I thought the system was easy to use					x	Easy, the ui elements were intuitive, all the placements of the buttons were in right spot, the human eye always goes to the left (goldilock zone)
4	I think that I would need the support of a technical person to be able to use this system	x					No
5	I found the various functions in this system were well integrated					x	No lag, very intuitive, well integrated, buttons, no going back and forth
6	I thought there was too much inconsistency in this system	x					No
7	I would imagine that most people would learn to use this system very quickly					x	Yes
8	I found the system very awkward to use	x					No
9	I felt very confident using this system					x	Yes, always, because it is logical
10	I needed to learn a lot of things before I could get going with this system	x					Was great

User test 5

Leo

User Test - Part 1 -

Task	Success	Time to Complete	Number of errors	Notes/ observation
Choose a city	quick	quick	none	What's the first thing you want to do ? Click on the population levels More peoples more changing
Increase the population	quick	quick	none	The cities increased
The screens				Noticed buildings, air pollution, underlying message
Go to home screen				Hover function
What is the website about				How air pollution affects me and the environment and how different cities contribute differently to air pollution
Change scenes				Easy
Compare scenes	check	check	Wonderfully	Helped <u>deepened</u> my understanding of air pollution, I don't have any air pollution prejudice, I feel like <u>i've</u> learnt something. Noticed that the buttons stayed when comparing :)

User Test - Part 2: System Usability Scale

	Statement	Disagree Agree					User Comments
		1	2	3	4	5	
1	I think I would like to use this system frequently					x	If i was looking at air pollution, this would be very useful for me
2	I found the system unnecessarily complex	x					Very straightforward
3	I thought the system was easy to use					x	Good navigation
4	I think that I would need the support of a technical person to be able to use this system	x					No
5	I found the various functions in this system were well integrated					x	Intuitive and self-explanatory navigation
6	I thought there was too much inconsistency in this system	x					No, all the buttons followed order
7	I would imagine that most people would learn to use this system very quickly	x					No
8	I found the system very awkward to use	x					No
9	I felt very confident using this system					x	Yes
10	I needed to learn a lot of things before I could get going with this system	x					No

User test 6

Jamie

User Test - Part 1 -

Task	Success	Time to Complete	Number of errors	Notes/ observation
Choose a city				<p>It's about Climate Change and how different cities with different population and different socio-economic status all have different levels of air pollution</p> <p>Chose emerging because you want to go through an order and it's the first one</p>
Increase the population to high				<p>Likes the train a lot</p> <p>The first thing I want to do is click on high</p> <p>When I read the effects in emerging i feel lucky that I am not in the example city</p>
What is happening on the screen				The colours are creating an emotional response, the high colours makes me feel sad
Go to home screen				Hovered over it
What is the website about				Impacts my perspective on air pollution and I now know how it can affect climate change because i thought it was only because of plastic pollution

User Test - Part 2: System Usability Scale

	Statement	Disagree	2	3	4	5	User Comments
		1					
1	I think I would like to use this system frequently					x	I think it is a very accessible and visually aesthetic prototype and it's fun
2	I found the system unnecessarily complex	x					No
3	I thought the system was easy to use					x	yes
4	I think that I would need the support of a technical person to be able to use this system	x					no
5	I found the various functions in this system were well integrated					x	Likes the visuals a lot and would still understand the underlying message without the text
6	I thought there was too much inconsistency in this system	x					no
7	I would imagine that most people would learn to use this system very quickly					x	no
8	I found the system very awkward to use	x					no
9	I felt very confident using this system					x	yes
10	I needed to learn a lot of things before I could get going with this system	x					no