

Weather Shift Reflective Report Society and Technology: Digital Civics and Digital Commons

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submitted 11/04/2018

Prototype: https://panel.uwe.ac.uk/~arrontp/weather_shift/

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1 Introduction

Named Weather Shift, our online platform fits both parameters of digital civics and digital commons. The proof-of-concept website allows citizens to upload a photograph of the weather on that day, in their location. This photo is merged with local weather data and plotted on an interactive timeline where the user can compare the weather visually over time. Furthermore, the system aims to educate people on the effects of climate change by framing the issue at a local level (Center for Research on Environmental Decisions, 2009), while also concurrently building an archive of localised climate data.

In this report I will outline key points during our design process that has led to our final deliverable. Reflection will be delivered throughout in accordance with entries from my weekly journal regarding research, development and testing of the final prototype.

2 Research

At the beginning of the project we decided rather than selecting an organisation and suggest a design solution we did the opposite and chose an issue within society to marry with an organisation later. We conducted ideation through the process of brainstorming, where each member of the group suggested possible areas for our project to inhabit (see appendix A). This in hindsight delayed proceedings and made the process more difficult, as we had to fit the topic to civics or commons after. I'm not sure why we made this decision, I think as a group we found it difficult to decide on an organisation straight off the bat without considering various possibilities. We could have perhaps researched organisations rather than social problems and contacted them to engage interest. This would have been more efficient and would have allowed us to find an organisation quicker for feedback.

2.1 Interview: The Agency

The core grounding for our platform was creating a sense of collective belonging, where members of a community have a common motive which brings them together and provides the rationale for the community's existence (Lehane, 2010).

In our meeting with Yoke (see appendix B), a sustainable design agency based in Bristol, they stated that before starting any project they would spend up to three months researching. At the very beginning of this they would address the market to see if people would use this platform and why. This was a key issue for us as we were basing our platform on the fact that British people like to talk about the weather and secondary research that suggested citizens globally lack the understanding of the changes they are currently experiencing (Lee *et al.*, 2015). I feel we lacked understanding of our audience. Our target audience is fairly broad to encourage different types of users (see appendix C). Although this decision was made because it was too late to go back on our work, I still felt we could have researched concurrently to build mental models (see appendix D) of our audience. This would be something I would do if we had the chance to start again.

2.2 Interview: The Expert

We attained much useful information from our interview with climate expert DR. Wendy Woodland (see appendix E). The focus was for us to understand the current situation, future impacts, if our platform would indeed show change and how people are currently educated. The interview was semi-structured which allowed the

conversation to take a more natural path while using planned questions to remain on topic. I learnt a lot from this meeting, for instance, the difference between weather and climate, how the term ‘global warming’ is misleading and how quickly the global temperature is rising. These educational points were informative and suggested that we can’t assume that people know these crucial details. It’s important to consider that proceeding this interview, decisions were based on opinion, but I believe that this allowed us to refine our scope further.

3 Wire Framing

Initially we had planned to display the photo comparison, weather data and climate data on the same screen (see fig.1). This instantly limited us, due to the lack of space we would have to play with. The idea is further discussed and explained in Appendix F. We wanted to show the sense of time and visually engage the user with interactive graphs. But what became apparent was that we should have designed Weather Shift with the mobile-first approach (Mullins, 2015). The mobile-market for this platform makes more sense as the user process would be a lot more instant. By taking a photo on your phone and uploading it to the platform straight away. I imagine it unlikely for a user to load a picture on to their desktop computer and then upload this to the site. This is a long process which after a while would garner a loss of interest. I think as a proof of concept; our desktop version works to convey our idea well at the very least. But as an improvement, this platform could be made into a mobile application which would help increase contributions and engagement.

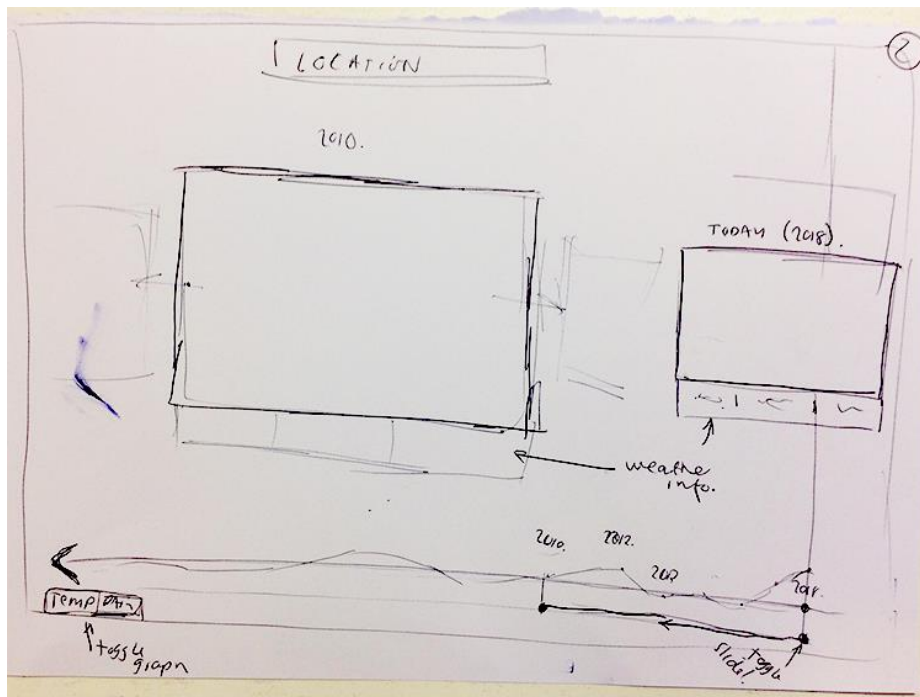


Fig. 1. Initial sketched wireframes.

4 Development

As we developed the idea and implemented the photo upload functionality, I felt like the project started to come together. We strongly drew upon comments made by Yoke “People won’t learn more just by clicking on things, they need it layered in to the experience” (see appendix B). We wanted to take the user on a journey where they can inform their own learning. By personalising the experience and framing locally but also addressing the wider global context at the same time was a challenging design problem.

To help build the final prototype I looked back at competitor analysis (see appendix G) and considered some persuasive design techniques. Due to our broad audience I wanted to utilise UX principles such as Fitt’s Law (Interaction Design Foundation, 2016) and Jakob’s Law (Nielson Norman Group, 2017) to simplify the design so that it’s accessible to all ages and understanding. A strength held by Weather Watchers was its simple use of language and ease of navigation which was something we wanted to employ. This is something I believe we achieved as user testing (see appendix I) and evaluation suggests (see appendix J).

5 User Testing

At the time of writing, we have run out of time to iterate on the user feedback received and will be unable to follow the full steps of the Deming Cycle (Deming, 1950). But I still remain positive that our usability testing has given us a real insight into both strengths and weaknesses of our concept. Appendix I presents the outcomes and scenarios provided in our testing sessions. We used the phenomenological approach (Dennett, 1991) to gain an insight into experiences that appear in consciousness through the method of concurrent think aloud (Giles, 2002).

The process went well, considering I was concerned that the think aloud method would distract users. Instead of probing the users as they conducted tasks, we reserved asking questions to the end to avoid flustering the participants.

A major design floor highlighted by each user was that they didn’t realise that you could compare the uploaded image to others by sliding the toggle on the timeline (see fig.2). Users were concentrating on following photo upload steps and didn’t comprehend the functionality available. Potentially this is because there is no descriptive guide for the user to indicate what to do, which they have experienced during the process up to that point. In our next iteration, this would be a priority to amend as it’s the hook that encourages learning and a community-based contribution.

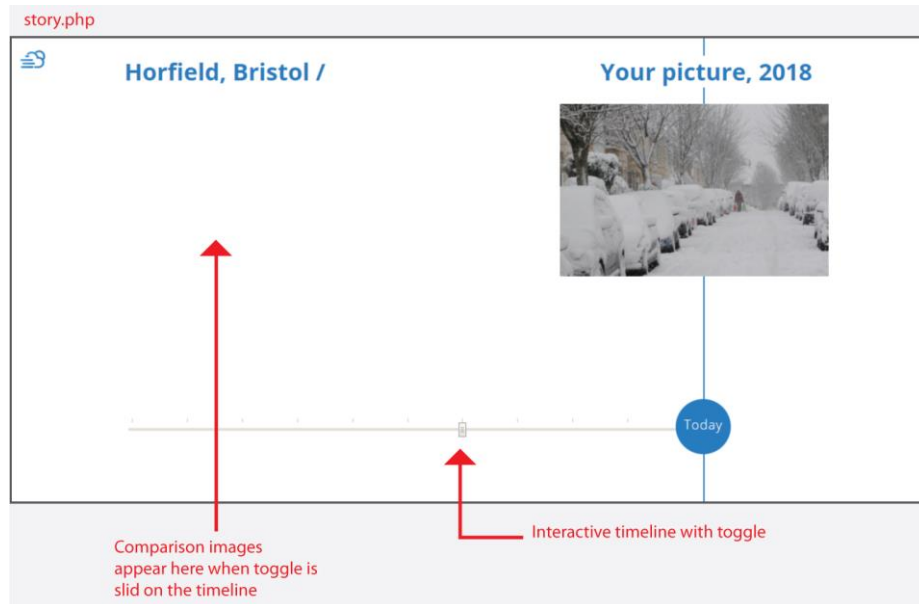


Fig. 2. Image showing comparison timeline in Google Chrome.

6 Evaluation

We asked Dr. Wendy Woodland to evaluate our platform from an expert's perspective. Our process was fairly structured by asking her to scroll through the site and provide feedback (see full responses in Appendix J). This was then followed by planned questions that are key to understanding the extent of potential success of Weather Shift.

Dr. Woodland suggested that we could improve the localised framing aspect more throughout the sections but understood why data was difficult to attain. I agree in our final iteration we have included local statistics far less than we had planned (see appendix H). We planned to compare global temperature rise and global CO₂ emissions to that of a localised position. We didn't achieve this due to two main reasons. Firstly, accessing data for local areas was difficult, especially for showing change over time. Secondly, we found that UK based levels of CO₂ showed an improved trajectory over time (see fig.3). Thus, we had to be careful to not send a confusing message to the user.

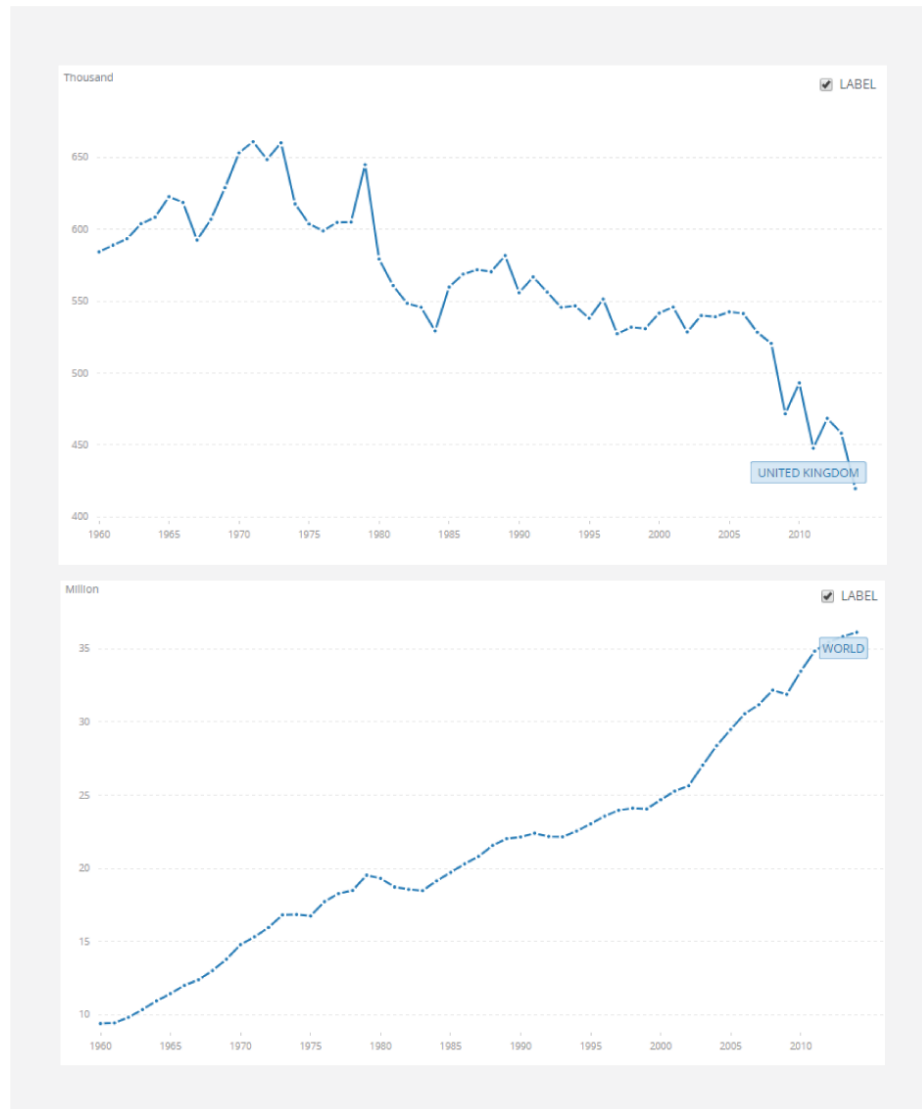


Fig. 3. Global Co2 emissions Graph compared to UK emissions Graph since 1960. Data from the World Bank.

But more positively Dr. Woodland found the experience, engaging, concise with a clear linear story that allows the user to stop and explore sections further. There are further technical improvements outlined in appendix J, but overall the response was positive with the belief that a user would have learnt something by the end.

A final suggestion that I would be very interested to implement would be to stream people's photos to Twitter to keep the public engaged and remind them to return to the platform.

7 Conclusion

To conclude, I believe we have designed a proof-of-concept community platform that allows citizens to learn, encourage learning amongst others, while also contributing to a local visual archive of the changing weather and climate conditions. I have enjoyed developing this project and have gained valuable knowledge of UX principles that

helped strengthen our prototype. Although Weather Shift needs further improvements, and it would take years of contributions to build up a strong archive, it is my belief that we have created something unique that has a grounding in digital civics but also an engaging education resource.

8 References

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9 Appendices

Appendix A - Journal 1 (Individual vs Collective and our Initial Ideation)

Submitted: Friday 2nd February 2018

This week's session looked at the individual versus the collective by comparing the difference in needs and requirements for a successful user experience in both situations. The individual experience is a much more personal and tailored experience aimed at championing *you* as a distinct person. Individual applications for example tackle common personal problems in daily life. A fitness app for instance or a time management planner. These examples can be utilised by the individual user to best suit their lifestyle, needs and problems. These systems may be designed for a more general audience with the added flexibility built in to personalise the user's own experience.

This differs from designing for a collective or community. The demographic of a target group could be wide ranging, therefore more differences between users can be a difficult problem to solve. How do you design for a collective with different abilities, opinions and knowledge? Or how do you tackle differences in cultures (*Extract from Book on 'Mind Change' by Susan Greenfield*)? Collective UX must be able to adapt,

be accessible and understand the shared goals/motives, the reasons for belonging and its importance to the users within the group.

In the second half of the session our group started ideation. We first had to decide whether to choose an organisation first and find a problem – or – to identify an issue within society and marry it with an organisation later. We decided to go around the group and each suggest an idea or problem they would like to investigate. These were then each expanded upon through a quick group brainstorming session. The four areas are each very different, they are as follows:

- Closures of independent businesses**
 This idea started with music venues but was later expanded to businesses to include pubs, restaurants and indie shops.
- Re-using waste**
 The irony of recycling is that energy is used to do it. How about a process by simply re-using items without melting them down again? Have an empty bottle? Simply give it a wash, somebody else may want it.
- Sea levels rising**
 This is a global problem under the umbrella of climate change that will directly affect the UK and specifically low-lying coastal cities such as London and Bristol.
- Knowledge of mass surveillance**
 How the majority of the population are unaware of issues regarding personal data, surveillance and privacy. Younger people born into the digital age don't seem to care, is this true?

Attached below are photographs of our quick ideation sessions. Next, we will each go away and research our ideas, find compatible organisations and present our findings to the rest of the group before choosing our final area before the next session.

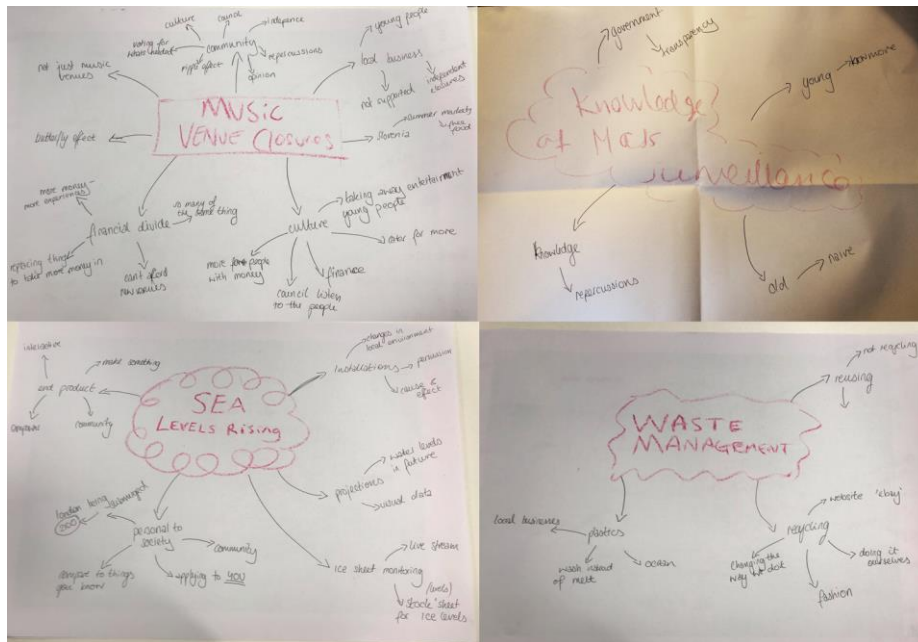


Fig.1 Ideation spider diagrams showing the four potential areas to research.

Appendix B - Journal 8 (Prototypes and Yoke)

Submitted: Sunday 22nd March 2018

From the wireframes last week, I have mocked up how the website would potentially look. Using *Adobe Illustrator* and *inVision* has allowed us to assess the user flow and consider the aesthetics for our platform.

View inVision mock-up: <https://invis.io/PFGAHA986NE>

We have also prototyped a second version with the functionality of the photo-upload included. A few points we picked up on was that we need to build in error prevention. Take for instance, if the user selects the option to upload a photo and then decides later that they would rather view the archive instead. There would need to be the flexibility to go back on choices and return to the initial start point. By simply providing a home or back button will prevent user drop-offs.

But our main dilemma at this point is how to display the data that will support the imagery and timeline. We don't want to clutter the screen with a lot of data which would influence with user in an overwhelming way. The layout will need to be clean with an effective use of white space to help guide the user to concentrate on the essential elements.

This is a big problem that we were struggling to solve. Next, we had planned to carry out a round of user testing in our iterative process to gain an insight into how users would complete tasks and to evaluate how they felt about it.

We raised these issues with Jay Bigford, the creative director at Yoke, an ethical design company based in Bristol.

As a critique, Yoke suggested that although we know as a nation – we actively talk about the weather, we haven't actively determined whether people would actively engage with this platform. They also thought that this platform would be best suited for the mobile market, as the user process would be a lot more instant. By taking a photo on your phone and uploading it to the platform straight away.

In response to this point, I agree that mobile-first would make it easier for citizens to contribute this would make it challenging to design the experience and show the image comparison. For this proof of concept, we chose desktop as it provides a better space to present our idea.

On a more positive note, they liked the fundamental idea that seeks to bring what seems like a far-flung problem to localised people. This links with the 'local framing' method mentioned in *The Psychology of Climate Change Communication*.

We asked for advice on visualising the data we wanted to show, which is where we have become stuck in our development. Yoke, like Wendy stated that they agreed that visual communication was important as "people seem to switch off when too much data is presented". They suggested that to make the platform meaningful, there would be a few areas that we need to be considered.

It isn't enough to assume people want to learn. We need to consider what we want the user to do and what we want them to take away. Yoke mentioned that it was difficult to measure the success of 'awareness'. To measure the impact, we should consider a call to action that might lead users to sign a petition for example. Another suggestion by Yoke was to look at peer motivation. This is "when other people are doing something, it makes you want to do it too".

In terms of the user experience and education, it's become clear that we need to take the user on an informed narrative. Maybe allow the user to explore and inform their own learning and personalise the experience. "People won't learn more just by clicking on things, they need it layered in to the experience".

We want to provide context so that people can learn and be made to feel like they can make a difference. "You're not just clicking something that simply says: I want to learn about climate change."

Yoke said that we were clearly "pulled by the marketing aspect. you want the older weather geeks but also the younger audience, who are more actively out there taking photos." An interesting suggestion that we hadn't considered was utilizing existing technologies. Could the system tie in with *Instagram* or *Flickr* somehow? By using hash-tags we could pull in photos, but privacy and rights to store that photo on our servers could be problematic.

To summarise, our visit to a design agency who work on similar projects was informative and refreshing. It has allowed us to re-evaluate our idea and to try and craft something that has a grounded connection within the community. Moving forward I believe that taking the user on a little journey with an informative narrative is quite a playful and self-exploratory experience for the user.

Appendix C – Personas

Patricia

Age: 59

Gender: Female

Qualification: Master's Degree in Meteorology

Occupation: Head of climate sciences at Surrey University

Location: Surrey

Interest: Environment and the outdoors

Character: Active, caring person

Patricia is an active person who likes spending her spare time walking her dogs and spending time with family. Patricia has always had a big interest in UK weather and has decided to pursue a career in analysing weather change at the met office. Throughout her career she has seen a significant change in UK weather patterns as well as changes in weather locally in her home town, which worries her. To help pursue her interests further, Patricia is interested in most websites that she can interact with and share her experiences of the weather. She thinks online and social media campaigns to raise awareness about climate change locally could be key in fighting climate change as a global issue.

Gary

Age: 35

Gender: Male

Qualification: O level qualifications

Occupation: Mail carrier

Location: Basingstoke

Interest: Interest in sports, football, Wildlife.

Character: Very outgoing, people person

Gary enjoys his job as a mail carrier as he likes spending time with the local community. He also participates in community social events and is a supporter of his town football team. The weather is something that affects Gary at work every day as he is outside for most of it. He often checks the weather forecast before the start of his shift. He is curious about climate change and accepts it is a problem, however does not feel there is much point in changing his ways and in his opinion, will not make a difference to the global problem. Therefore, he doesn't think about it in day-to-day life. He does however take an interest in wildlife and takes pictures of animals with the camera on his phone when he gets the chance.

April

Age: 16

Gender: Female

Qualification: N/A

Occupation: Secondary school student

Location: Newport

Interest: Spending time with friends, Fashion

Character: Shy, spends a lot of time indoors

April is a secondary school student about to start her GCSE's. She does not have much of an interest in weather or climate change, so does not usually think about it. However, she is currently being taught about climate change in Geography at school and has been set homework on this subject. She is looking for ways to show how climate change is affecting the UK.

Appendix D – Journal 7 (The Psychology of Climate Change Communication)

Submitted: Sunday 18th March 2018

This diary entry covers my thoughts and interesting points on a piece of literature we discovered this week. The booklet named *The Psychology of Climate Change Communication* (2009) addresses the subject through the lens of Social-Science and was published by Center for Research on Environmental Decisions (CRED) at Columbia University.

Know Your Audience/Get Attention

Within this document, CRED outline different framing models to best communicate climate issues. Before framing, it's important to understand the audience and their 'mental model'. This term refers to "a person's thought process for how something works." But sometimes a mental model can result in selective knowledge uptake. This results in a confirmation bias.

"A confirmation bias makes people look for information that is consistent with what they already think, want, or feel, leading them to avoid, dismiss, or forget information that will require them to change their minds and, quite possibly, their behaviour."

Framing, applies the established mental model of your perceived audience to help communicate climate change in a way that's bespoke to that audience. The idea is to correct misinformation and promote awareness and change. There are more than one frames that could be useful for us to consider for Weather Shift.

The 'Local Frame' best suits our project as research suggests people see climate change as a distant issue. "By framing climate change as a local issue, communicators not only increase their audience's sense of connection to and understanding of climate change, but also promote the development of local and regional solutions that could transfer well to the national and global arenas and, further, inspire future action everywhere."

Also, elements from other frames should be kept in mind whilst developing our design. For example, the 'Future Frame' which taps into people's desires to avoid future losses. Another, 'Promotion Vs. Prevention Frame' considers either viewing goals as making something good happening or preventing something bad from happening.

Looking critically at our project so far, the fact that we don't know the mental model(s) of our audience is a problem. We have a very broad reach and are attempting to encourage as many citizens as possible.

Scientific Data into Concrete Evidence

The Keeling Curve (see reference 2) alone doesn't motivate behaviour change. This links heavily with what Wendy told us during our interview. Not only does this provide a design challenge - how do we best make an impact? – but it allows us to question how emotional we want to design our impact. "Distant risks do not set off the same alarms that immediate risks do."

Overuse of Emotional Appeals

There's a fine line that needs to be walked between appealing to people's emotions and emotional numbing which makes the user feel worthless.

Address Uncertainties

“Put uncertainty into context and help an audience understand what scientists know with a high degree of confidence and what they have a relatively poor understanding of.”

Commons and Group Participation

Why would someone engage with Weather Shift? This is the dilemma of commons platforms.

“An individual’s benefit may or may not be the same as what benefits society. In other words, deciding to engage in behaviours that help mitigate climate change, a benefit for society, may seem more of a cost than a benefit to the individuals.”

How do we make the experience worthwhile? How do we measure it’s success?

Behaviour Change

Giving people an immediate incentive makes behaviour change easier. -
Gameification?

Conclusion

There are a lot of challenges presented in this document, but what seems important is to create a personal connection with climate change without overwhelming or confusing the end user. Weather Shift needs to have a clear goal and framing to deliver a narrative that is simple to follow and raise the potential for behaviour change.

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Appendix E – Transcript of expert interview

Conducted: Wednesday 28th March 2018 with DR. Wendy Woodland.

Q: What's the difference between climate and weather?

A: Weather is something that happens day to day. So, the cold snap that we are having at the moment is weather. And then climate is normally the average conditions, that a location experiences over 30 years or more. That's usually around our cut off.

Q: Did our project make sense, or did it muddle?

A: Not too badly I don't think. When you're looking at - if you are looking at climate change - certainly in our lifetimes, we'll see weather changes more than anything else. And probably the public will be experiencing that as well. And one of the biggest challenges we've got is to say to people that this is weather, which will come about as a result of climate change.

Q: And in general, looking back sort of 50 years, has there been any sort of UK based differences. Say for example has a month become wetter over time?

A: I think what they've found in the UK is that the winter storms that we have seem to be getting more intense. And were getting a higher number of wetter days during winter. And then those days that are wet have a heavier rainfall. So, there are some studies that have shown that.

It's a bit more difficult in the summer, as the thing we would look at is heat waves. And we have had some quite significant heatwaves. But whether that's a long-term trend is difficult.

Q: So, a lot more extreme weather changes? I know globally there are extremes, like hurricanes and things like that.

A: Yeah, the recent hurricane season in the Atlantic Ocean is a really good example of where a lot of people can latch onto climate change. But as your friends will tell you, they'll know that it's very difficult to put the blame fair and square at the door of climate change. Because there are so many things that control a hurricane.

Q: So, when we do our weather change platform, we can say that climate change is a contributing factor, rather than the sole reason.

A: Yeah that's right it's a contributing factor because we know that the earth's climate system varies naturally.

Q: But it's at the highest point isn't it now? That's why everyone's a bit worried.

A: Yeah, that's right so the temperature, the global mean surface temperature as we call it, because it's an average of all the temperatures in the ocean and land, that is increasing. You can find lots of graphs that will record that. But it is difficult, because people will want to know whether the storms that we had, over Christmas, the named storms that the Met Office do, whether that's a symptom of climate change. But again, there's variability in the systems.

Q: When you talk about the graphs to show people what's going on with the weather, what data visualisation techniques do you use?

A: Right, we normally use, well there's two. Either the Met Office or another one from the University of East Anglia. It's quite tricky but that's what we normally use. It's called the global average temperature anomaly. So, what that means is, the average is taken from 1961 to 1990 - that's your 30-year climate. And then what they do is show whether the individual years were warmer or colder than that long-term average. What its showing is about 1955/1960.

Q: That's quite surprising.

A: We use that one because that's when weather readings started

Q: 1950s onwards that's not even long.

A: No, it's not. Well within human lifespan. And what we might be seeing is either some variability as in somebody coming back in 200 years' time may say oh that was just a blip. Or we might be seeing there the cumulative effects of the warming that's been taking place, the enhanced greenhouse effect.

Q: So, if we were showing change - because we're bringing it to a local level. Our whole idea is that the current global issue is far removed from us. In terms of general society, we want to bring it to a local level, closer to home. So what sort of things would you focus on would it be temperature?

A: Yeah temperature is the main thing, because that's what most people get a handle on, it's what most people can understand. That's the best one to use. And that's the definitive data set as well from the Met Office.

It's very difficult to show people how temperatures have changed right sort of on their doorstep. Regionally within the UK. So, we normally use this one - and the data that are available regionally are out of date. They're not worth using.

If someone had a weather station in place for this period of time in Bristol, then of course you could use it. But we don't tend to have access to that kind of information. But most people will understand that. And then what normally happens is if you have a cold snap like this then people say how come that's happening? And what we're experiencing now could happen in the future.

Q: It feels like the seasons are shifting.

A: Yeah that the autumn is being delayed and the spring is coming earlier. There are some scientists that will look at how early blossom arrives on trees. And use that to work out whether spring is moving forward.

Q: That's quite interesting especially because our idea was for people to take photos. Every day and then add it to and build up an archive. In 20 years' time someone could sift through that. And we wanted to fade through on the website, so a user could. It was also a bit of not a gimmick, but people could look through the environment too.

A: Yeah, I mean are you aware of BBC weather watchers.

Q: Theirs is slightly different as they are not comparing over time. Everyone becomes a weather reporter across the UK. Ours is heavily based on photos, so when you talk about temperature change, we want to show that as well. So, we need to find a way of showing maybe a visualisation underneath the photos.

A: That would be good. Are they photos that would be from the UK?

Q: Yeah

A: Even though the global surface area is increasing on average, there are still some parts of the world that are warming more quickly and others that are warming more slowly. That's why we don't say global warming. Because global implies the whole earth is warming at the same rate. And that's not the case. It's about climate change rather than global warming.

Q: How is climate change currently educated? To evaluate our work, we need to know that. Quite an open question. Do different age groups care more?

A: There's been work undertaken to see whether your educational standard affects how you perceive climate change. Or your access to the media. So, students in the past for their dissertations have done that. Sometimes people will say you're a guardian reader so you're 'gonna' be really environmentally conscious. Then you will be either more aware or more worried. It's so difficult to find impartial information -

the Met Office is good and their public outreach stuff is good. The BBC is good, it still remains to be impartial.

Q: Weather seems to be one of those things British people in particular always talk about.

A: Yeah and BBC have latched onto that.

Q: It's taught at schools isn't it now?

A: It is taught yeah. It's in geography it's in integrated science as well. At A-Level now they teach it as an environmental challenge - they teach it through the carbon cycle. So, a lot of students will come into university now aware that this is a topical environmental issue.

Q: How do you think people learn best? Do you focus more on visuals or stats?

A: Visual definitely visual. Because it's so complex it can scramble you really really quickly. And some of the most effective ways to teach it are through case studies of events. To make those events meaningful to somebody as well.

Every week we go through a particular case study. Or a particular hazard that might be associated with climate. And we try and use the data and the real examples and case studies and impacts on people just to make it more tangible.

Q: That's what we're trying to do - we're trying to bring it to people. Which is quite hard I find. People have to want to take part.

A: Yeah that's right I think they have to want to take part, and then they have to be shown how what they've experienced - what they've photographed - relates to what's happening out there in the wider climate system.

Q: It's complex

We imagined it over time we build up so much information that it could be useful. A lot of people just like to take pictures of the weather and outside and talk about it. My grandparents always talk about how the weather's changed.

A: It's a common thing it kind of unifies us in the UK I think. So, and you think about at the moment with the obsession over the snow and the weather warnings. And on Twitter when you follow some of the strands it's incredible to see. The Met Office puts out an alert and almost instantaneously there's people commenting. Why can't you get this right? Why are you worrying its winter - what do you expect? So, it's quite a powerful thing.

Q: Snow always seems to miss Bristol.

A: It's definitely going to hit us this time.

Q: Wonder if everything will grind to a halt.

A: It's quite significant because we're on a red warning at the moment.

Q: Scotland have always had it more than anyone else

A: Yeah absolutely. Its significant for us tomorrow because the weathermen are watching a low-pressure system that's coming up from the South. They've been watching it for about a week now and the first concerns about what may happen came out about a week ago. Now they are much more confident because the radar will pick it up now and they'll be able to model how quickly it will arrive with us.

Q: At least it will look beautiful outside - perfect for pictures.

A: It will look amazing actually. But for your site, it might be that you're giving people sort of incremental steps, along which they can improve the detail of their knowledge. You can start them off with something fairly basic - and then if you want to find out more click here.

Q: Yeah, I think we need to lead people elsewhere from our site. Rather than keeping them there. We don't people to just look back and say oh it rained on this day and then they make a judgement from that, that's not what we want. We have to back it up I think.

A: Yeah that's right. This year would be a great example if our site was up and running because obviously it would be snowing this year and then next year it'll be the start of spring or something. Yeah there's nothing to say that our summer won't see a heatwave.

Q: Do you know of any other citizen-based projects?

A: There's another one called the UK Climate Impacts Program. It's about adaptation to climate change. But it is quite handy because they do publish what's been in the media recently. And sometimes that's quite good because that will lead out into interesting articles that talk about the climate and recent weather. So, this is definitely aimed at non-climate specialists. And definitely those that will have to react and adapt to climate change. It's worth having a look at. UKCIP

Q: Who's that run by is that an independent body?

A: Yeah that's independent.

And the other one is climatechange.net this is quite good. This one is run by Oxford University. That was the first sort of public program that harnessed unused processing power in the public's computers to run climate models. And part of it was the education side of things, so in here there's quite a lot of educational materials. What's really useful is science for public understanding. And that will probably help you I think. There's lots of things in here. They seize on the film the day after tomorrow and what's correct about and what's not. Climateprediction.net It really sparked people's interest because they could contribute to the big climate models that were predicting future climate.

Q: I remember when the inconvenient truth came out, everyone was talking about it. I was at school at the time.

A: The follow up has come out now as well.

Q: That's more to do with the aftermath and reaction. Like trump pulling out of the climate agreement.

A: We love Donald on that module.

You have to be careful because climate change is so emotive. Most of the time once you start to dig down in the site you'll see it sits on one side or the other. And if it's the states it will be either Democrat or Republican. So, you have to be a little bit careful.

There are lots of commentators it's quite tricky. Somebody like Marshall Shepherd is good because he is part of the weather channel in the states. It's a good example of an academic, he's a geography professor but he's on a public weather show - so he's quite quick to dispel myths etc. So that's another example of outreaching to the public.

Q: Do you think our idea should be refined anymore? What do you think about what we've come up with?

A: I think it's nice I think it's a good starting point to have the photos. Because the person themselves has made that decision themselves to take that photo because it's of interest. So, there's a motivation in there. You might want to ask them why they took that particular photo? What is it that sparked them to take the photo? If you were looking out now you think I'd take that photo because it kind of looks like a snowy cloud. And we're waiting for the next snow. Because then you start to see what's initiated their interest and if you know that then you can start tailoring the content to help them.

But I think if you guide someone through the climate science. Explanations step by step.

Q: The idea we had like Weather Watchers was to have a map then you can go around the UK and see for example Bristol and click on it. And then you'll bring up a picture and fade through, then we'd have the graphs and extra links.

A: And then you could be showing how the temperature has fluctuated over those years. There is weather station data you can get hold of.

Q: I wasn't sure if much would change over ten years, but it does seem to be.

A: Yeah it will show the variability of our weather.

You might see a little bit in terms of the overall temperature trend. But in terms of the weather you will see quite a lot of variability. Partly because of our location because we are so strongly controlled by the Atlantic Ocean the English Channel and then whatever comes across like it's doing at the moment. Yeah, we will always be quite variable, but underneath that you will always be able to pick up the long-term trend.

Q: Exciting. At the end we'll bring it back to you to evaluate and see what you think.

A: It's really helpful for me as well because I can see how non-climate specialists - media specialists are doing it as well. Because I have a hell of a time trying to put my lectures together even at third year level. Into something that will be engaging but also easy to start from and 'ratch' it up as we go through the lecture. It's quite tricky.

Q: I think it takes for something big to happen before people think oh this is a bit of an issue. We were discussing whether our platform would try and cause change as well. On an individual level. People think oh I'm just one person I can't do anything. There are different angles you can take.

A: Yeah there are lots there's the whole education for sustainable development area. You've got Georgie Gough. Who is our associate professor in education for sustainable development, so it might be worth talking to her about it. Perhaps a bit further down the line if that's the kind of questions you're 'gonna' need to answer.

Q: We sent a few emails out to organisations because we thought it would be interesting to get an alignment with someone. Met Office didn't reply. Environment Agency replied but then pushed us off to the flood prevention people. We got one from Yoke, they're a design agency that take ethical projects really. They do branding videos and websites, so they did reply to us but they're a bit busy.

A: Another one to look at is the Cabot Institute. They're at the University of Bristol. They have quite a strong interest in climate change. So, they're local they do quite a lot of events and public engagement.

Some of the carbon focused groups may be interested because its making that link from the fossil fuel use through to climate change.

Q: In terms of the next 50 to 100 years, what will UK see change. What's predicted?

A: Overall there's about probably a 2 degree warming. So, we'll probably keep pace with that, but some of it will be fluctuating. We will have the extreme events superimposed on that trend as well. We haven't got yet - there was a set of maps that would show the warming that we expect. Its published by UKCIP they haven't released them yet but they are due in 2018. They've done it in America, it's a really powerful visualisation tool.

Q: Other things will be affected like crops.

A: Yeah food security, water security as well.

Q: We saw a sea level rise map for the UK and Bristol was pretty much gone.

A: Yeah that's right if we don't maintain the flood defences.

Q: London was gone and Bristol.

A: There are lots of flood maps and the Environment Agency produces them too. They'll usually show you the worst case scenario if we carry on as we are. But if we can get greenhouse gas emissions down then we shouldn't follow that scenario. They are trying to push towards 1.5 degrees instead of two.

There's certainly some good visualisation tools out there.

Q: Do you think trying to scare people like that is a good tactic to educate them?

A: Picking up on what the media are doing these days.

On the one hand it can galvanise people to make change. On the other hand, it can make people feel helpless. And if you make somebody feel helpless then they will think well there's no point recycling or there's no point turning the thermostat down. I'm not going to make a difference.

Q: And that's the opposite of what we're trying to achieve.

A: So, you're about empowering people and showing them that they can make a difference. And that could be through a carbon footprint calculator or something like that. If you make these changes to your lifestyle this is the effect, you will have. That's a really powerful way to show somebody the effect of their actions.

Q: And if we have lots of users we could show that if everyone made the change we could accumulate that and show the change.

A: Definitely. You could have a total couldn't you on the site saying since 12 o'clock our total carbon savings have climbed this much. It makes people feel that they are making a difference. Otherwise it's a global issue - people defer to the global leaders to make decisions. Whereas it's in all of our power to make those changes. We might not necessarily see many of the cumulative benefits in our lifetime but it's about what we call Intergenerational justice. It's about children, grandchildren and the like in the future.

Appendix F – Journal 6 (Wire framing)

Submitted: Sunday 11th March 2018

Although the audience for our platform will remain very broad across all ages and understanding, our prime scope will be on education and inducing awareness of climate change. Our platform has been simplified to visually engage people through the comparison of photographs. But importantly, these pictures will be supported by climate and weather data that is paramount in making an impact and creating a useful experience. After all, the purpose is to make a change and as discussed in our interview with Wendy Woodland – ‘you don’t want to make people feel helpless,.. you want to empower them to make a difference.’

We have abandoned the idea of using a map of the UK to navigate, which the user could explore and find pictures in their location. This would be something we would introduce in a future development. But initially, our primary focus is on the comparison and visualising the sense of time and the change that has gone with it. We have developed our first prototype to test the user functionality. The user can upload a picture which is added to a database. This remains on the page while the user can select different years that will display a different photo alongside the user’s upload for that day. Originally, I hadn’t thought of displaying both together, but it makes sense as a user can’t be expected to remember information (Heuristic evaluation (Nielsen, 1994) and Miller’s Law (Miller, 1994)). By displaying both images it reduces the user’s memory load and provides a visual comparison instantly. During this week’s session our design challenge was exploring how we will display the sense of time, along with the change in climate over this time. An interactive timeline made the most sense, but how will it be used and designed to best function and visually convey in an impactful way?

A key influence for our timeline was *Who Old Are You?* by *Information Is Beautiful* (2018). This example places circles over an interactive timeline in which the user can move around, zoom in/out and hover over circles for more information. This certainly broadened our ideas to think of more engaging displays. The sense of time is quite strong on this example, by placing ‘you’ (your age) at the centre of the screen and in contrast with the rest of the data it becomes quite a personal experience – as you visually compare yourself to others. A slight weakness in this example was how the dates were not very visible along the bottom of the graph. This I feel would need to stand out much more on our platform.



Fig.1 Screen captures of Who old are you? Interactive timeline.

To help guide our decisions we also made a list of standards so that there was no confusion about the system amongst the group. The points were...

- User can not change day, system works from current day.
- User can only adjust by year (past years).
- User photo upload should always be visible/available to view.
- System must show weather data in that location when photo was taken.

- Must have climate data over time for that area.

One of the ideas we liked was merging the timeline with climate data. So, the timeline will have spikes of temperature above the line and rainfall below the line. This was a neat visual idea that combines the sense of time and the change in climate.

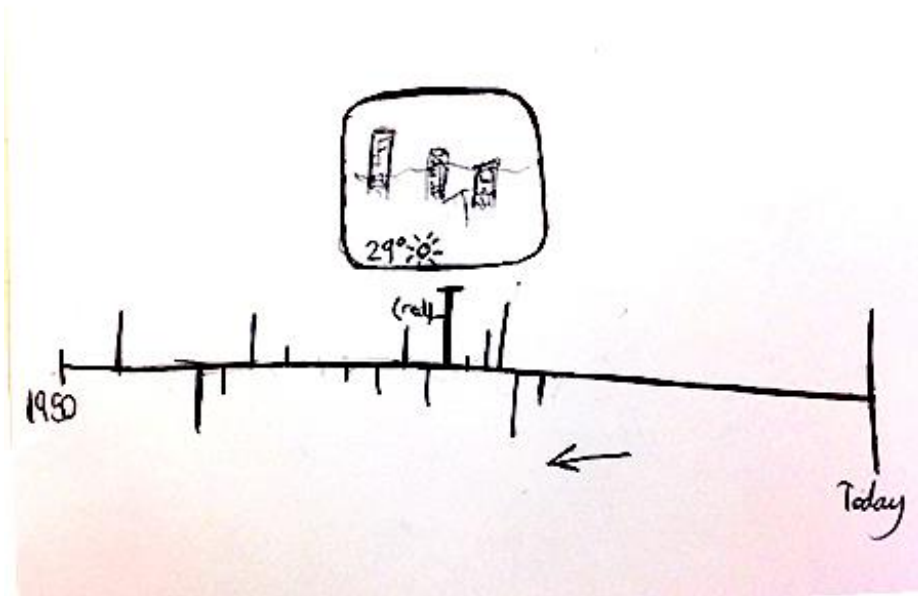


Fig.2 Timeline idea showing 'spikes' as temperature and rainfall.

We also considered a 'card' style layout similar to Instagram, where the user can scroll through images from different years. This would take place to the left of the screen, while the photo uploaded by the user would always be visible on the right.

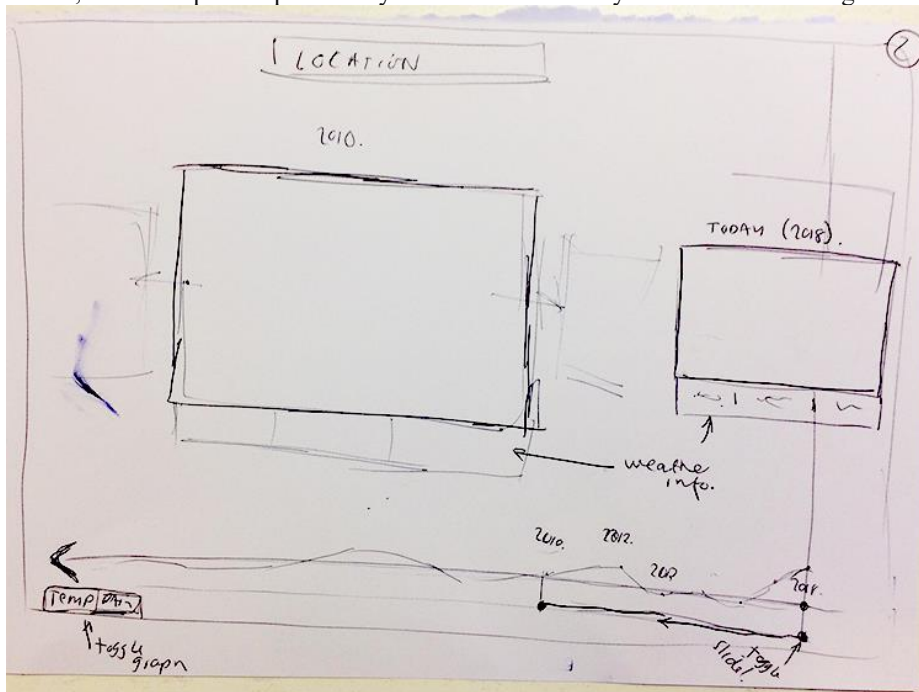


Fig.3 Wireframe of data screen with photo comparison and timeline.

Our current wire frame iteration combines a couple of ideas and takes inspiration from iTunes accordion navigation and BBC Weather Watchers temperature slider. At

first, the user will be presented with an upload image button or the option to enter the site without your own photo (this still allows the user to educate). Assuming the user uploads a photo taken on that day, a page will load placing the user's photo to the right of the screen. Along the top of the window a timeline provides the user with options to select a year in the past. When the user selects a year, a photo taken in the local area of that year will be displayed to the left of the uploaded image. This would be supported with a comparison of weather data including the change in temperature and rainfall. Furthermore, we would like to overlay the timeline with a graph showing temperature change in correlation with the timespan of the timeline. We still have further design considerations to evaluate and we plan to do user testing on these wireframes next.

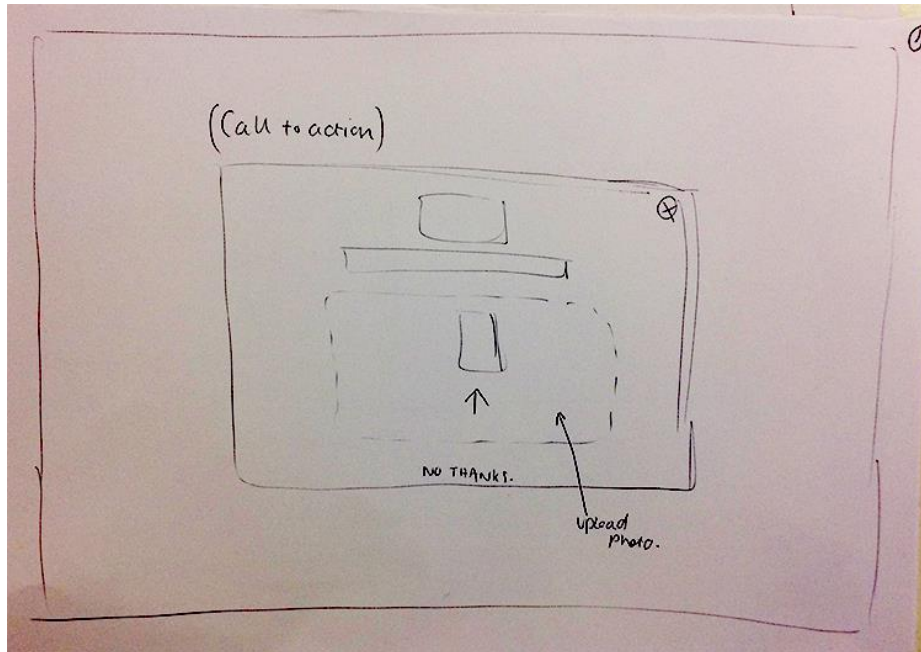


Fig.4 Call to action as the first screen – prompting user to photo upload.

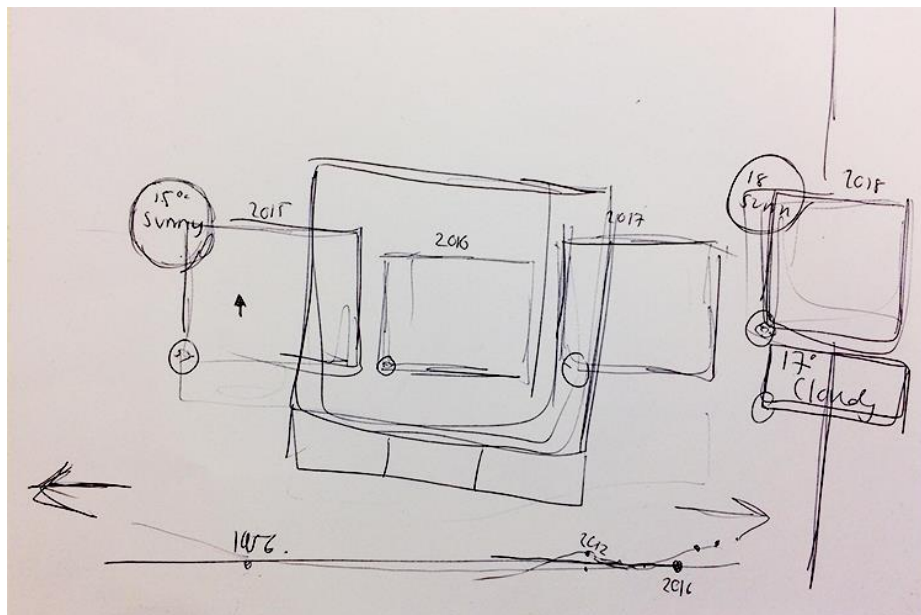


Fig.5 Accordion style Timeline sketch.

References

1. Nielsen, J. (1994). Heuristic evaluation. In Nielsen, J., and Mack, R.L. (Eds.), *Usability Inspection Methods*, John Wiley & Sons, New York, NY.
2. Miller, G.A. 1994, "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information", *Psychological Review*, vol. 101, no. 2, pp. 343-352.
3. Information Is Beautiful *Who old are you?* Available from: <http://informationisbeautiful.net/visualizations/who-old-are-you/> [Accessed 11 March 2018].

Appendix G – Competitor Analysis

Conducted: Tuesday 6th March 2018

BBC Weather Watchers is a responsive site that allows users to report the weather in their location around the UK. Users become ‘reporters’ by taking a photo of their location, filling out a form about the weather conditions and mapping it to their general location. *See supporting images below.*

Homepage

The homepage is split into three principal areas. The first provides a summary of the user’s recent reports, by displaying a ‘card’ based design layout of the latest photos. As well as this a summary of conditions the user has experience is shown, such as highest, lowest and average temperatures.

The second section displays a map (Google Maps API) with weather icons pinned to locations. By selecting areas, you can scroll through images taken within half a square mile of that location. These photos appear overlaid and to the right of where you selected.

The third section showcases some reports and bulletins in a blog style that are related to the current weather.

Creating a weather report

A report can only be uploaded for that calendar day; the user needs to specify the time the picture was taken as an image can be uploaded at any point during the day. User’s must select a weather icon to visually identify the conditions and state the temperature by using a slider. Further optional data can be manually added to support the report including rainfall (mm/hour), pressure (hPa), windspeed (mph, direction) and humidity (%).

Photographs must not include people and should focus on the weather.

Strengths

- The user experience is very straight forward with large affordances making functions clear. The design is simplistic and straight forward to navigate.
- A photo can be uploaded at any time during that day, even hours after taking it.
- Can use current location button if you’re not at your pre-defined home location.
- Privacy for home location – mapped to half a square mile of your actual location.
- Builds a community.
- Your photo could be used on the weather after the news.
- Ability to report inappropriate images.

Weaknesses

- Dependant on people knowing the correct weather icon and temperature to select. Not accurate.
- Photo could be from any day – should use photo meta data?
- Based on trust.
- Can’t edit mistakes or delete posts.
- Manually enter conditions that you probably won’t know (e.g pressure, wind speed).
- Can report the weather condition without a photo.
- Can’t change your home default location.

- Must have a BBC website account.

Design questions we need to consider

Will our platform be web based or a mobile app? If an app, will the user be able to take a photograph directly within the app?

Will weather data be added automatically? Or will the option of user input be available?

Will users need an account?

What will the age range be? Currently you must be 16 to use BBC Weather Watchers.

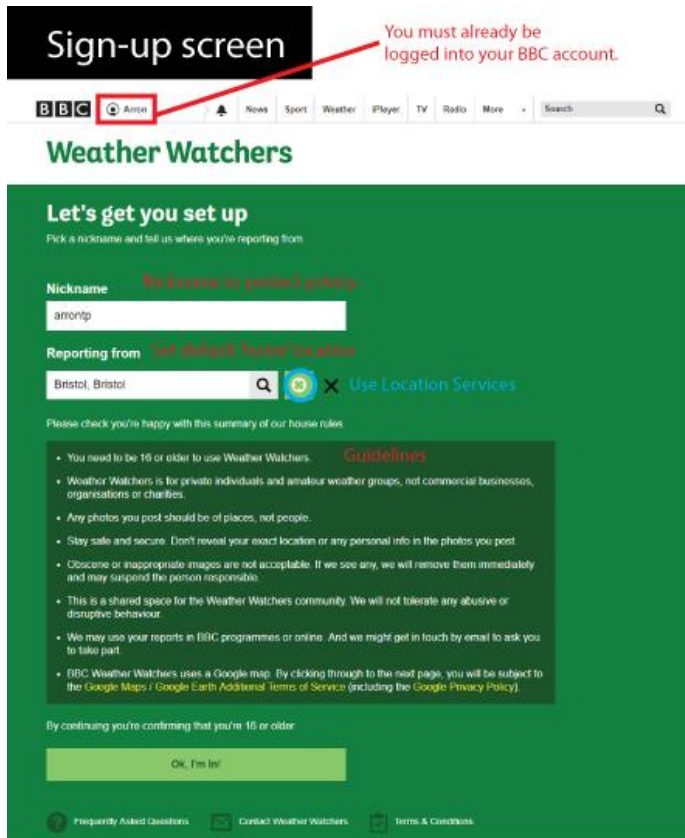


Fig.1 Weather Watchers sign-up screen.

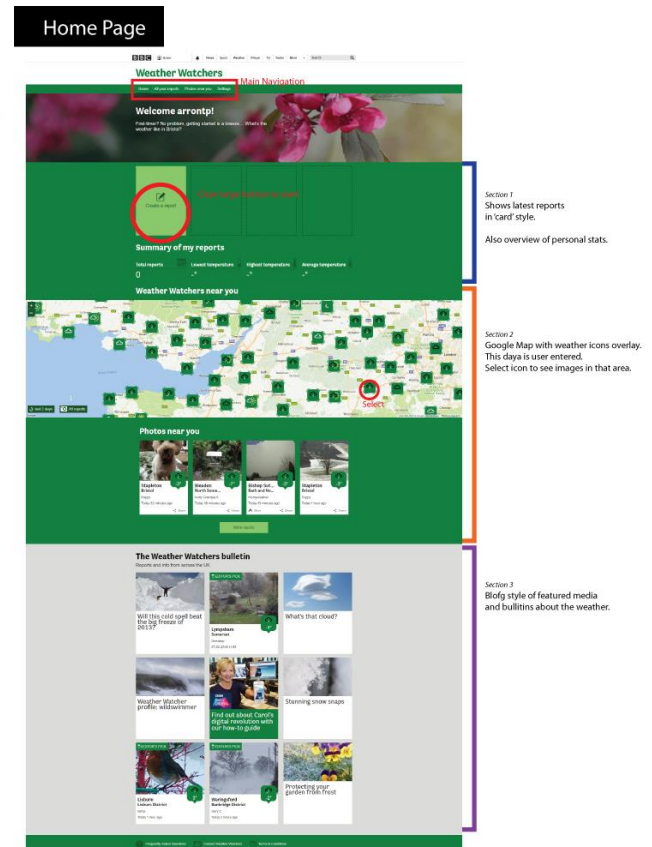


Fig.2 Weather Watchers home page.

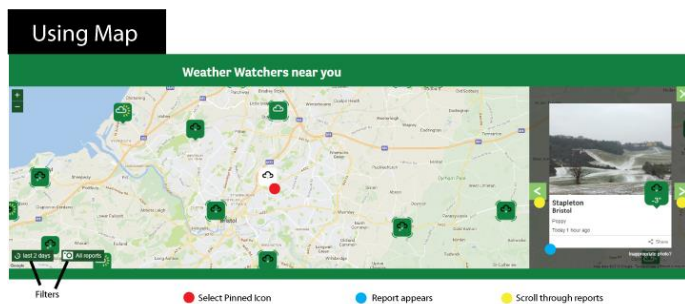


Fig.3 WW map.

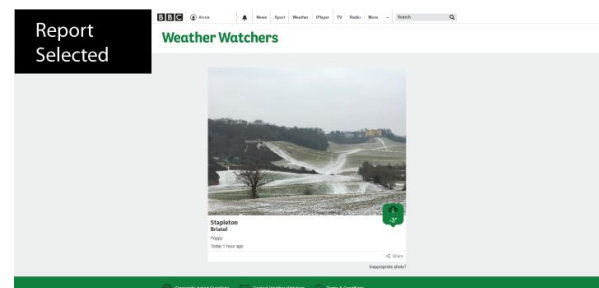


Fig.4 WW report card selected.



Fig.5 WW user stats.



Fig.6 WW user settings

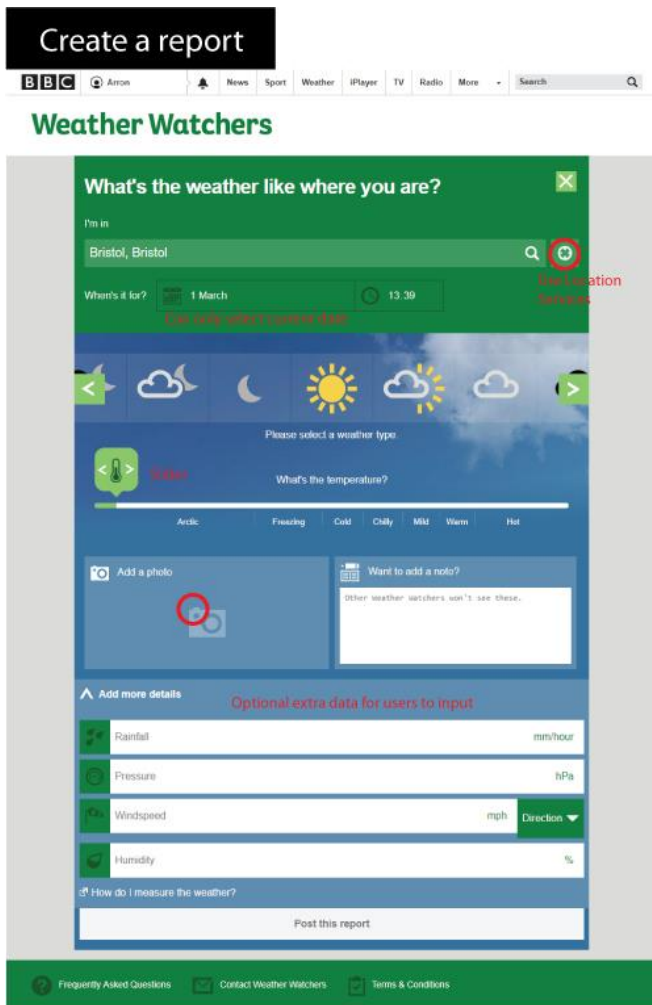


Fig.7 WW creating a weather report.

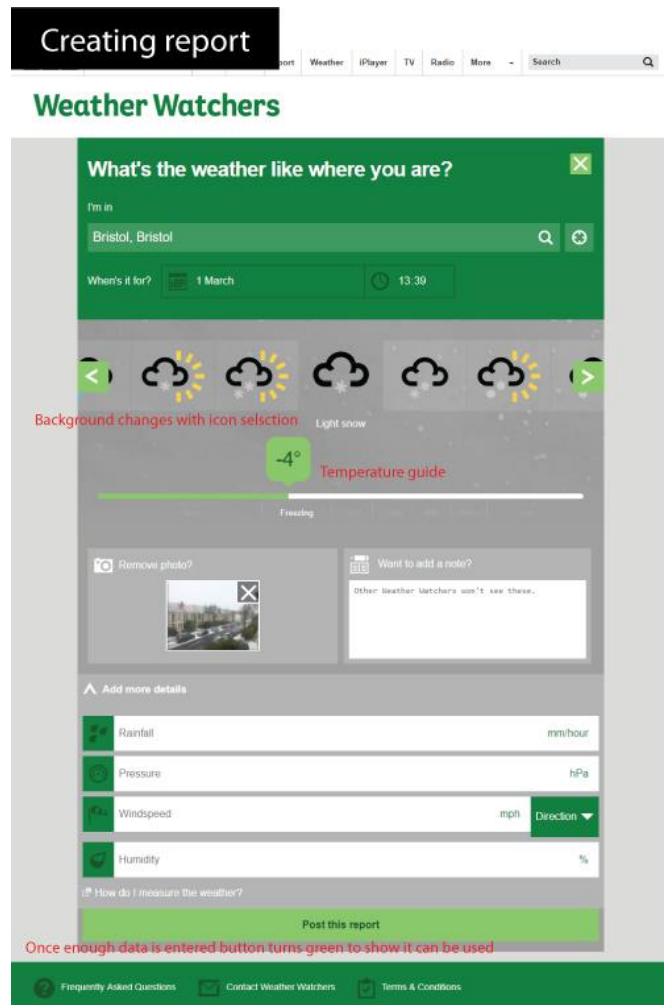


Fig.8 WW filling out a report.

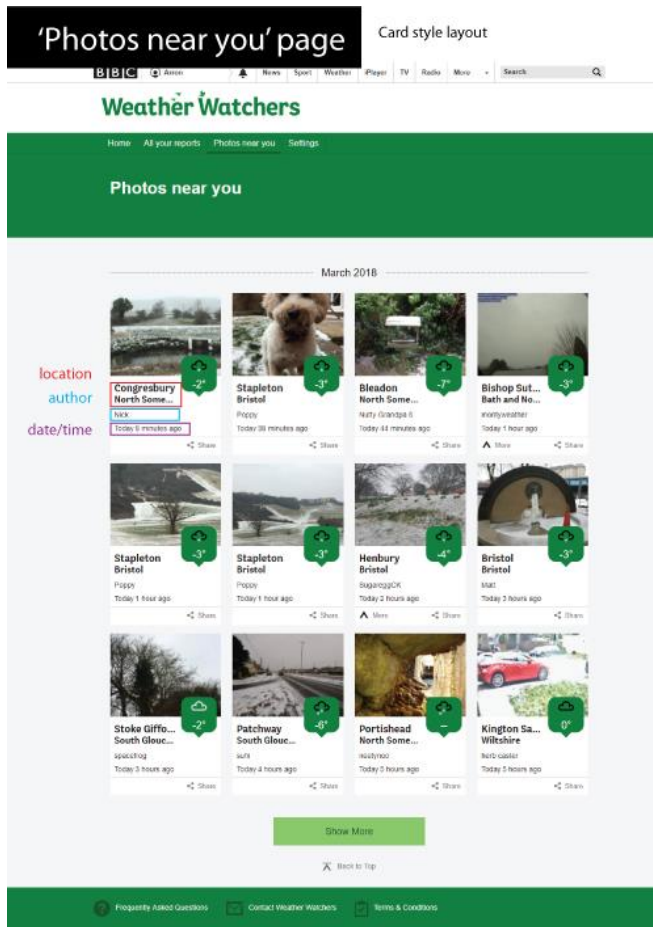


Fig.9 WW List of localized location based reports.

Appendix H – Journal 9 (Planning the build)

Submitted: Thursday 22nd March 2018

Our wire frames have developed in response to the comments made by Yoke. Our platform will retain the comparison of data visually as it's main USP, but how the user experiences this has changed. We want to take the user on a narrative about the causes, the current situation and future impacts of climate change on the weather. Constantly we will make the process of discovery personal and more urgent by addressing local changes through comparison visualisations. These will include weather change facts (perhaps a particular month has become wetter), percent change over time of CO₂, change of temperatures and rainfall over time.

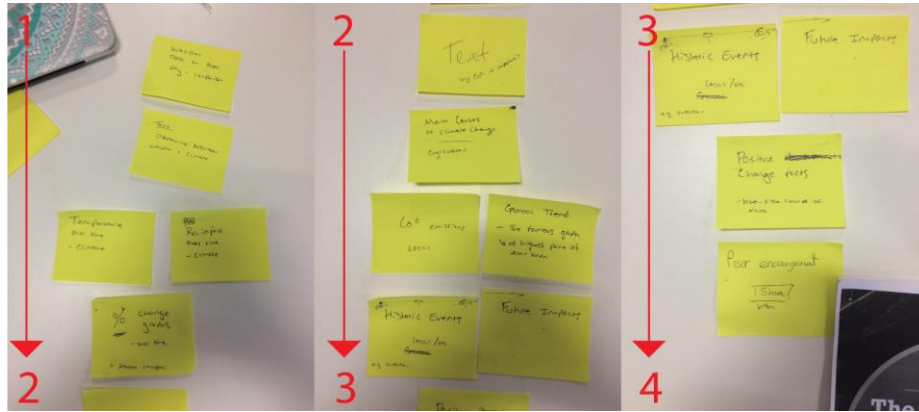


Fig.1 Planned Narrative Structure.

The site would ideally be dynamic with the comparisons taken place between the current day and the year selected on the timeline/slider.

To help evaluate the success of our platform we have implemented a call to action. Which will be presented at the end. The user could share their experience on social media which will hopefully attract more people. Secondly, there will be an option to sign up to an online petition to for a local environment problem.

I have created new wire frames that also show the user process from uploading an image to the final 'story' screen which will host the main experience.

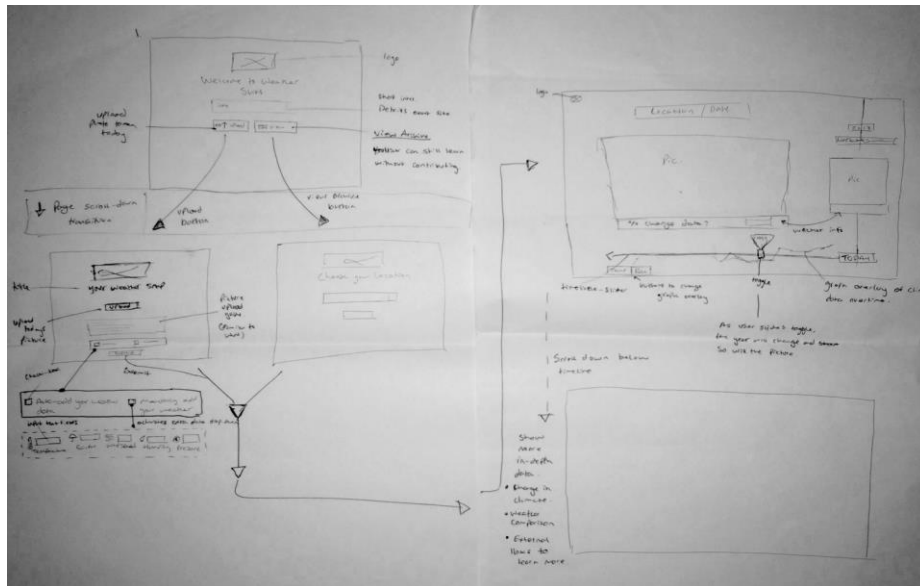


Fig.2 User processes and wireframed layout.

Appendix I – Journal 10 (User testing)

Submitted: Wednesday 11th April 2018

We used task-based scenarios in our usability testing. The aim was to identify how the participant accomplished a task and showed us whether the interface facilitates provided any problems or fall-offs. We didn't include any information about how to accomplish a task.

The 3 scenarios were as follows...

1. You have taken a photo of the weather to upload. Use the website and follow the steps to achieve this.
2. You haven't taken photo today but want to compare the weather over time. You have an interest in learning more about climate change.
3. You've accidentally selected the photo upload, but you have no photo. Navigate to start again without uploading.

We conducted our testing with three different users, we have categorised these users into three main groups in Table.1.

User Type	Name	Age	Education	Occupation	Where they're from
Expert	Wendy Woodland	40+	PhD	Senior Lecturer	Based in Bristol
Intermediate	Tom M	21	Undergraduate (first year)	Building and Planning Student	Surrey
Novice	Jade	20	College	Nursery Assistant	Carmarthen

Table.1 User Classification

The results are presented below in Table.2.

What surprised us was that the unique feature of our site was missed initially by all three users. Our expert suggested she was too focused on getting the picture to upload and didn't realise there was meant to be a comparison on the right. This is a major design flaw.

Question	Expert	Intermediate	Novice
BEFORE USING WEBSITE			
What would you consider yourself as; expert, an intermediate or a novice.	Expert	A Building and Planning student, member of the target group	Novice. Not at University.
What would you expect from a website focused on climate change awareness?	Clear navigation informing the user of climate change facts. User interface that encourages users to learn more.	Information about climate change and what they could do to make a difference	Teaches you about climate change. Makes it less confusing

Do you know of any other websites that raise awareness of climate change locally?	UK Climate Impacts Program	Not really.	No
Are you interested in the weather?	Yes	No more than anyone else.	Not really but they do for clothing and activity reasons
AFTER USING WEBSITE			
How easy was it to navigate?	Scenario 1: Found navigation quite easy, because she was computer literate. Maybe put subheading at beginning to introduce platform Missed slider for comparing images. Was distracted by uploading image and the section below so carried on scrolling. Only realised what it was for when we pointed it out. Scenario 2: Easy up until after I uploaded the picture, although after this point there is no guidance on where to go from there. User needs to be invited to view the timeline. Maybe a pop up on main page which indicates to user what they should do next (or a pull slider that selects the year). Scenario 3: Yes	Scenario 1: Pretty easy, said that they were computer savvy. All the guidelines were clear, the choose file could be a bit bigger. Slider bar is a bit small and questioned what it was for? Scenario 2: The archive was easy to navigate too, wasn't sure whether to put e.g. Bristol or Filton? Scenario 3: Used the logo to go back to the home page and then went to archive.	Scenario 1: Did it really quickly without any comments. Did not manually enter weather. Did not notice slider bar to choose images and scrolled straight past it. Scenario 2: Same, completed it quick Scenario 3: Couldn't find the logo so used the back button
Was the language easy to understand?	Scenario 1: Largely clear, In terms of technicalities there were a few errors. Scenario 2: Short paragraphs easy to understand. Change phrases of public sentence Scenario 3: Yes	Scenario 1: Yes very. Scenario 2: Yes again except wasn't sure about what city to write as said above. Scenario 3: Maybe have a 'Home' when you hover over the logo	Scenario 1: A lot of text straight away Scenario 2: Yes Scenario 3: Yes
How was the functionality?	Scenario 1: Works very well	Scenario 1: Good, all works well.	Overall thought it was good

	Scenario 2: Good Scenario 3: Yes, works well	Scenario 2: Again, all flows smoothly. Scenario 3: Good	Scenario 3: Couldn't find button for home but other than that okay
Would you use this platform? And how often?	Might forget it was there. Maybe if you had users. Link a twitter feed to this, to encourage people to visit.	Probably if they had a reason to e.g. wanted to know about climate change and weather more. Would recommend to someone if they wanted to learn too.	They liked uploading the picture and looking at others, like "being in a time machine".

Table.2 User Testing Results

Also, here are my notes from user testing with Dr. Wendy Woodland that I made during the session..

Scenario 1

'Publicly visible' or 'made public' could be a clearer guideline

Upload successful – reassuring message

Navigation was simple, straight forward. Easy to follow, 'I'm fairly computer literate'.

Language largely – few technicalities to clarify. But to the general public would be fine.

Our user testing took place in chrome. User didn't realise you can scroll through years and compare pictures. Guide is needed as the comparison screen is blank on the left.

Because..

'Up until that point so focused on making sure the photo is uploaded successfully'.

Because there was guides up until that point – so need a short description telling the user what to do next.

Reflection: was this our fault not explaining it in the scenario?

Scenario 2

Very clear, straight forward.

Scenario 3

Click on the logo in the top left corner – assumed it took you back to home page (similar to other sites).

Appendix J – Journal 11 (Expert Evaluation)

Submitted: Wednesday 11th April 2018

Evaluation was a semi structured interview with a concurrent speak-aloud process for technical improvements.

Evaluation

Q: Were the website aims clear (to empower people by providing information through a collective archive)?

"I think the website could have a sentence at the start showing the clear aim and then the guide description underneath. There was definitely a linear story line but also the site has the possibility to stop and explore and link out to other sites. Climate change is complex, this is done well to keep the focus and an interactive way to get the user involved."

Q: Do you feel a user would have learnt something new by the end?

"Yes, they would have learnt how the weather has change over time and emissions and actions they can personally take themselves."

Q: Do you think that this information is directed at a local level enough?

"History section could have an increased local identity of those points, particularly naming places. Should be done through impacts rather than stats, as they're difficult to find."

Q: Do you think this website creates an impact?

"Yes, it's concise, you can go through it in a comfortable time. Doesn't tie them up for too long, peaks their interest."

Q: Do you think people would feel encouraged to Re-visit?

"Site could have a user sign up but that's a lot of extra privacy data to handle. Could stream uploads out to a twitter feed to maintain the link with the public. Twitter might prompt users so they don't forget."

Q: Final comments, positives of the overall experience?

Straight forward, clear, engaging. If they want to learn more they can by clicking on the source.

Like the symbols and the interactive nature – once I realised graphs were interactive. Use of colour is good, simple and attractive to look at.

Technical Improvements:

Compare the weather section

Mph vs km/h – they are different so difficult to compare.

Maybe icons should have labels – would people know the droplet with percent icon means humidity.

Climate vs. weather section

'long period of time' – could say 30 years minimum.

Global Temperature Rise section

Technically 'mean temp rise'

Explain what an anomaly is

Didn't realise you can hover over the graph – so perhaps short descriptive guide

Also reference a source link for a user to know that it's credible

Why is CO2 important section

CO2 – '2' should be subscript

'Naturally' is underlined – thought it was a link – usability (what they're use to)

Instead of 'added to natural processes' – 'added to greenhouse gases'

Not all time high – not true. It's the highest since records began. – wording

Main causes section

2010 – could say 'in 2010 _ contributed to' – figures have moved on

'Campaigner' change to 'literature'

Maybe 'read more' link under each of the 3 main causes.

History timeline section

Navigation is clear, can't go back but can navigate forward.

Need a heading to identify that the user has moved on to something new in this section

You are significant section

Maybe change the heading to something that suggests 'these are the small steps you could make'

Navigation circles don't work – so you have to wait for text to come around again.

Replace 'double paned' to 'glazing' might be an Americanism