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**Supervised Project Report
(ANTA604)**

An eBook entitled “Breaking the Ice – Climate change in Antarctica” and accompanying justification, “How to most effectively communicate climate change in Antarctica through an eBook”.

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Abstract/executive summary (ca. 200 words):

This eBook is aimed at a non-expert audience, with the aim of communicating recent findings in climate science that have taken place in Antarctica. It is both about the effects of climate change that are taking place in Antarctica, but also about research projects with much wider applications.

The justification accompanies the eBook in order to support decisions that were made in the creation of the eBook – not just the writing, but the piecing together as well. The justification takes into account: Choice of audience; Choice of topics written about; Framing of topics; Language used; Choice of visual elements; Psychology of climate change communication.

How to most effectively communicate climate change in Antarctica through an eBook.

One of the greatest challenges faced by climate researchers is how to communicate their findings to those who have the power to make a change. Antarctica is a place where climate research is particularly important. A large amount of our current climate knowledge comes from projects based there – ice core drilling projects such as ANDRILL have given scientists insight into the composition of the atmosphere over the past 800,000 years. Ozone, ocean circulation and ice-sheet stability are also important climate-related topics which are studied in Antarctica.

In addition to the projects that have taken place in Antarctica, it is also a place which has already been affected by climate change, and is particularly vulnerable to future climate change. Through creating an understanding of how Antarctica is being affected, scientific literacy as to what is happening with regards to climate change in the far south can be increased. With understanding comes action, which is the ultimate aim of this eBook.

A huge amount of research has been conducted into the communication of climate change. In this review, I will briefly assess peer-reviewed literature on the following topics, in order to best inform the choices made in the creation of this eBook:

- Choice of audience
- Choice of topics written about
- Framing of topics
- Language used
- Choice of visual elements
- Psychology of climate change communication

This review is unfortunately not comprehensive, but aims to identify aspects of the eBook which need to be taken into account in order to ensure effective communication. The aim of the eBook is to raise awareness about climate change, as well as climate science that is happening in Antarctica. It aims to dispel myths and misinformation regarding climate change in Antarctica, while informing readers accurately on what is happening on the ice, and how that affects us at home. Through providing accurate information, and taking into account framing, visual persuasion and the psychology of climate change, the aim is to inspire a behaviour change in readers towards reducing their carbon emissions.

Choice of audience

Climate change is a problem which has no easy and obvious solution, and therefore different people/organisations have differing opinions and levels of concern about what should be done.

A study by Maibach et al. (2011) found that the American public can be divided into six categories, depending on their attitudes towards climate change. Each category represents a relatively homogenous group of people, in terms of beliefs, behaviours and political ideology. The researchers noted that each group needs to be targeted differently. Using a 'one size fits all' approach towards informing the general public about climate change has thus far been largely unsuccessful because each group of people responds differently to different frames and methods of communication.

The six categories they identified are:

1. Alarmed
2. Concerned
3. Cautious
4. Disengaged
5. Doubtful
6. Dismissive

Those in the 'alarmed' category are the most worried about climate change. They are relatively well informed, and already taking action to minimise their personal and societal impacts.

Those in the 'concerned' category acknowledge the threat of climate change, and support policy to reduce its effects, however they are slightly more reluctant to change their than the 'alarmed' group. One in three American adults would identify with this group, making it the most prevalent of the six groups.

The cautious group believe that climate change is a problem, but they don't feel personally threatened by it, and are therefore unlikely to change their actions. The authors of the study state that narrative-based communication and reframing of the issue in human health based terms would be a good approach for this group.

The disengaged, doubtful and dismissive groups are tough groups to communicate to through writing, because they either don't want to hear about climate change, are sceptical about the science, or they are actively against any actions to prevent climate change.

I chose to target this eBook mostly towards the concerned group, because they make up a significant proportion of the population (30%) and relatively open to hearing about climate change, even if they are slightly more reluctant to change their actions than the alarmed group.

The cautious group are the secondary target audience, because they are receptive to hearing about climate change through narrative. Because they are not necessarily well informed about climate science, I feel that they would make an attentive audience, without preaching to the choir (- the 'choir' would be the alarmed group).

Why an eBook?

I chose to write an eBook to communicate climate change and climate science in Antarctica because this is an inexpensive and effective way to make this information available to the target audience. Those that read eBooks are those that have access to iPads. The assumption can be made that most of these people are relatively wealthy and come from western countries. These are also the people who (in general) have large individual carbon footprints, and are also the people who have the power to change their actions.

The book does not necessarily need to be produced electronically. The majority of the book consists of words and pictures that would also be printable.

Choice of topics

The Scientific Committee on Antarctic Research (SCAR) is a committee of the International Council for Science (ICSU). SCAR is a well-reputed organisation of scientists which initiates, develops and coordinates high level research in the Antarctic region. One of SCAR's most important publications is the Antarctic Climate Change and the Environment (ACCE) report, which was first published in 2009, and reviewed in 2013.

Within the report there were ten points, which were decided to be most urgently in need of communication. These were:

1. Hole in ozone layer has shielded most of Antarctica from global warming.
2. Warming of the Southern Ocean will cause changes in the Antarctic ecosystem.
3. Rapid increase in plant communities across Antarctica.
4. Rapid ice loss in parts of Antarctica.
5. 10% increase in sea ice around Antarctica.
6. CO₂ levels increasing at fastest rate in 800,000 years.
7. Sea ice loss directly affecting krill levels and penguin colonisation.
8. Antarctica predicted to warm by about 3°C over this century.
9. West Antarctic ice loss could contribute to about 1.4m sea level rise by 2100.

10. Improved modelling of Antarctic processes needed for accurate prediction.

Because a panel of experts at SCAR decided upon these topics, I decided they could be used as a guideline for the topics I would discuss in the eBook. I discussed some of these topics more than others, due to constraints regarding the length of the eBook.

Framing

There are a range of potential frames that can be used to communicate climate change, but the challenge is in identifying which one is appropriate for the audience. An interdisciplinary research group from Columbia University identified a range of frames which are useful in communicating climate change (Marx et al., 2007). They include some of the following:

I decided to use an 'interconnected' frame, which creates the idea that climate change and Antarctica are part of a much larger global system, which people are also a part of. By using this frame, I hope to bring Antarctica a bit closer to home, and remove any ideas that it is remote, and therefore unimportant.

I also chose to use a mixture of 'promotion' and 'prevention' frames. A promotion frame says that we want to advance towards a goal – a stable climate – while a prevention frame says we want to avoid change, and maintain the status quo. Different people naturally gravitate towards either promotion or prevention, and the Columbia University research group recommend using a bit of both frames, in order to get the message to both groups.

According to the research group, people feel more strongly about losses than gains (eg. Negative feelings about losing \$100 outweigh positive feelings of finding \$100). Thus if a frame of potential future losses is used to highlight what may happen if we do nothing about climate change, it is more effective than framing future gains if we were to act and have a positive outcome. In order to encourage immediate action, the group recommends framing actions against climate change as 'lose less now, or make big losses in the future'.

Language used

Following on from framing, the choice of language is also an important consideration to make in writing an eBook. I chose to write this book in a mix of personal anecdotes and scientific information, in a style reflective of popular science writers such as Bill Bryson or Bill McKibben. By adding personal anecdotes, it takes away any feelings of being fed scientific

information from a superior, informed person. I tried to frame myself as a non-expert, but also someone who is capable of collecting and reporting credible scientific information. The line between credibility and personal anecdote is blurred, but I attempted to cover both.

Visual elements

In order to communicate a place that is far away, isolated, and unlikely to be visited by most readers, it was important to include visual elements into the eBook to create a sense of place of Antarctica. The idea was to show the audience what is under threat, rather than telling them. This is not just through the use of photographs, but also illustrations and infographics.

A study by Summerson and Bishop (Summerson & Bishop, 2012) involved showing people images of Antarctica – either people who had lived/worked in Antarctica, or those that had a particular interest in the place. It was found that participants had a preference for images which showed snow/ice-covered natural scenes, with no sign of human presence, rather than scenes with people or huts/machinery in them. Similar results were found in a survey (not based on Antarctic images) by Kaplan and Kaplan in 1995.

Because of these findings, I endeavoured to include images which show the natural state of Antarctica, except where this was not appropriate (such as photographs of the Scott Base sign).

Interestingly, it has been found that photographs are effective in inspiring similar reactions in people as their *in situ* reactions would be in the environment they are shown (Kaplan and Kaplan 1995). However it is not clear whether this finding applies to photographs of landscapes which people are not familiar with. This remains to be studied.

Photographs used in this eBook were limited to those that were publicly available, and those that I had personally taken. Thus, some areas were difficult to illustrate – there were no publically available images of the ANDRILL drilling rig, for example.

Psychology of climate change communication

The psychology behind the communication is complex, and the goes far beyond the scope of this review, however I thought I would look at a few key concepts which are most crucial to take into account when writing an eBook for the chosen audience.

1. *Existing mental models and confirmation bias.* People have preconceived ideas about climate change, whether they are correct or

not. This causes them to pick out bits of science which fit their existing model and ignore things which don't fit. It is important to identify existing mental models, and correctly replace incorrect/missing information with correct information. A particularly problematic example is the oft-cited view that climate change is not happening in the Antarctic because the ice is growing, when this is actually only part of the story.

2. *Analytic vs experiential processing systems.* People process uncertain information using two processing systems. The analytic system processes logic and numbers while the experiential system processes stories and experiences. Climate change communicators need to take both systems into account in order to credibly communicate climate science (Marx et al., 2007). This study also found that people are more likely to change their behaviour if their experiential processing system is appealed to. This means that people are more likely to respond to narratives and stories than simply being given facts. This is the reason I decided to include personal stories amongst the science in this eBook.
3. *Avoiding a tragedy of the commons.* A tragedy of the commons is a situation in which many parties scramble for finite resources before they are gone. In order to avoid such a situation with regards to the use of finite fuel sources, a group atmosphere needs to be created. If people are in a situation where they are concerned about the wellbeing of others as well as themselves, then a tragedy is less likely to take place. In this book, I have attempted to praise initiatives which involve international cooperation (such as the signing of the Antarctic treaty for peace and science).

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