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Master's Thesis
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Towards Sustainability Awareness: Developing an Online Course and Frame Analysis for Climate Change Communication

Keio University
Graduate School of Media Design

Lawrence Quest

A Master's Thesis
submitted to Keio University Graduate School of Media Design
in partial fulfillment of the requirements for the degree of
Master of Media Design

Lawrence Quest

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Abstract of Master's Thesis of Academic Year 2021

Towards Sustainability Awareness: Developing an Online Course and Frame Analysis for Climate Change Communication

Category: Design

Summary

In recent years, globalisation and increased data accessibility have allowed tremendous growth in the field of climate change communication. Now more than ever, it is necessary for people to be able to have access to trusted, reliable and understandable information surrounding sustainability and climate change.

This work contributes to this growing field through a user study of 50 residents of Japan combined with statistical modeling. The results suggest that the use of self-confidence measurements can improve knowledge acquisition and recall of information. Moreover, a framing analysis on types of communication calls for further exploration of the influence of context and design modalities for improving efficacy of statistical and climate change related data.

Alongside, an online course on climate change communication was developed and drafted for the SIAP (Statistical Institute for Asia and the Pacific), a branch of the United Nations responsible for statistical training. Together with the aforementioned work, this body of research aims towards raising awareness on climate change and improving existing communication strategies and frameworks.

Keywords:

climate change, communication, sustainability, policy, design, statistics, framing, education

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Chapter 1
Introduction

1.1. Background

In the past decades, the growing interest and global conversations surrounding climate change have evolved into the idea of a collective societal and human effort to prevent the earth from warming past 1.5 degrees Celsius. The ongoing discordance between our growing economy and consumption and the existing limitations of our natural resources is deeply rooted in the ways in which we communicate, interact and absorb information.

Communication of the climate crisis covers a vast array of audiences with varying needs and levels of understanding, cultures and backgrounds. At a surface level, climate change communication is about education, awareness, persuasion, mobilization and the search for solutions to this critical problem. However, at a deeper level, it is shaped by our different personal and collective experiences, mental and cultural models, and underlying values and worldviews. The field of climate change communication is highly complex and dynamic - opinions are formed by individuals, organizations and institutions with widely diverging knowledge, politics and cultures. And it is through these dynamic and evolving processes that our global society develops climate change awareness.

As an academic field of research, climate change communication scientists seek to better understand these processes, but also identify more effective strategies and frameworks to address this crisis. More specifically, this field can be categorized into two areas to explore:

- The efficacy and effects of existing communication strategies
- The development of recommendations, frameworks and modalities for new or improved communication

In recent years, many major research institutes have delved into improving climate change communication, including the Yale Program on Climate Change Communication, Climate Outreach, and global organizations and NGOs such as the IPPC and the UN Climate Change Secretariat [1–4].

Part of this research and body of work was conducted in collaboration with the SIAP (Statistical Institute for Asia Pacific) [5] at the United Nations in Tokyo. This institution has worked on increasing communication about climate change statistics, and my goal is to further develop this with a focus on indicators that can be derived from the System of Environmental Economic Accounting (SEEA) [6].

1.2. Motivation

With the opportunity of studying and living in Japan for 2 years came the chance to research and experience some of the development and current level of awareness of climate change and sustainability within the country. Like many other developed countries, there is a lack of progress and awareness of certain climate related issues and subjects, ultimately inspiring and influencing the direction of this research [7, 8].

As a member of the Paris Agreement, Japan was the first nation to release a new national climate plan by 2020 as required in the 2015 agreement. However, this new plan included no major changes from their 2013 national climate plan [9], which aimed to reduce emissions by 26% from 2013 rates. This lack of aggressive action as the fifth-largest polluter in the world led the World Resources Institute [10] to describe the plan as "put[ting] the world on a more dangerous trajectory." Similarly, the head of the World Wildlife Fund Japan [11] climate and energy group, Naoyuki Yamagishi, described the plan as "completely the wrong signal".

The Climate Action Tracker [12] has rated Japan's Nationally Determined Contributions (NDC) target under the Paris Agreement as "Highly Insufficient", further stating that "it is not stringent enough to limit warming to 2°C, let alone 1.5°C. If all countries were to follow Japan's approach, warming could reach over 3°C and up to 4°C."

In addition, the COVID-19 crisis continues to have a significant effect on Japan's economy and emissions overall. Japan's energy and industry greenhouse gas emissions for the first six months of 2020 were estimated to have dropped by 7.5% compared to the same period in 2019 [13]. Albeit not necessarily planned or intentional, the efforts toward decarbonisation are expected to accelerate as Prime Minister Yoshihide Suga has recently set an ambitious goal of becoming carbon neutral by 2050 [14].

Even without the ongoing pandemic and heightened sense of emergency, there is a clear need for not only immediate, but long lasting change. Furthermore, KMD strives to represent and explore our globalized society in its research and education, which undeniably requires more socially and environmentally driven projects. Our Dean, Masa Inakage, has been exploring the idea of a "new normal" at Keio University after COVID-19 disrupted the world last year, and one could argue that research with a focus on the climate crisis will inevitably be a part of this conversation.

1.3. Research Goals

The objective of this project is twofold, both of which fall within the field of climate change communication. The first one is to develop an online course for employees of statistical offices within the Asia Pacific region to better understand how to effectively communicate about climate change. The second one is to conduct a frame analysis based on designed communication slides and work towards creating a conceptual framework for more effectively communicating about climate change related issues and statistics.

More generally, this research project aims to go towards raising awareness on climate change, and understanding how to go beyond that. Sustainability and climate change literacy play an important role in the response to climate change on many levels - but what is the role and effectiveness of climate change communication? Starting from the assumption that lay people and experts have important roles in both mitigating and adapting to climate change, the current hypothesis is that using contextualised, data-driven information is an effective way to raise awareness and inform policy adaptations.

1.4. Contributions

This work mainly contributes to the growing field of climate change communication. Firstly, the user study on climate change communication generated some relevant findings, suggesting that the use of confidence measurements have a bearing on improving knowledge acquisition and recall of information. Although not statistically relevant due to limitations, the study also calls attention to the use of framing within climate change communication. Further research on contextualisation and its potential for improving efficacy is needed.

Additionally, an online course on climate change communication was written for the United Nations, which is the largest and most internationally represented intergovernmental organization in the world. The rising demand for accessible online learning has yet to reach the specific niche of statistical office employees, often appointed with the supplementary task to communicate results to multitudes of target users with different needs and literacy levels. The developed modules were informed by surveying employees of national statistical offices, as well as research on the SEEA and expert guidance from within the SIAP institute in Tokyo.

1.5. Thesis Structure

- **Chapter 1** introduces the background and motivation for this research topic, as well as outlining the contributions towards the field of climate change communication.
- **Chapter 2** presents a comprehensive literature review covering climate change and communication science, as well as establishing the field and study of framing. The specific case of Japan is also discussed with relation to the SDGs and the general landscape of climate change communication.
- **Chapter 3** is an in-depth explanation of the design process of both the online course for the SIAP and the user study on climate change communication. It presents an overview of the scope of this research and the methodologies for designing this interlinked body of work.

Additionally, it covers the initial study on pro-environmental behaviours that lead to the development of the framing analysis.

- **Chapter 4** covers the process of identifying the contributions and contents of the online course, as well as the implementation and statistical evaluation of the climate change communication questionnaire. A mixed-effects model is used for the analysis of possible correlations within the data set.
- **Chapter 5** presents a general discussion of the research results and examines the limitations and potential for future works.
- **Chapter 6** concludes and summarises the study.

Chapter 2
Literature Review

This study builds upon research from a multitude of academic fields. The following review begins by covering some of the science and methodology used to assess climate change, including the SEEA framework developed by the United Nations. Next, an overview of communication theory leads to the establishment of the importance of science communication, and with it the recent emergence of climate change communication. These interlinked fields of study often have common roots, but they present distinct scopes and challenges, of which the study of framing and environmental identity are of particular interest for this project.

2.1. Assessing Climate Change

In scholarly works, climate change is often described as an issue characterized by uncertainty, skepticism, controversy and problems with engagement by individuals. This lack of engagement is often attributed to the fact that climate change is distant from us, both in time and space, and seemingly not our immediate concern. In this section, we will look at climate change and attempt to define it according to global consensus, as well as link it to statistical and assessment frameworks, before looking at the specific case of Japan as an example.

2.1.1 Climate Change

"Climate change" is defined by the UNFCCC as: a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods [15]. These changes in the mean and/or variability of its properties can be caused by natural processes or external forcings (this includes the generation of Greenhouse gas (GHG) for production and consumption).

Climate Change is a complex issue with many components. In order to respond to GHG emissions, the response focuses on two main components: mitigation (avoid consequences – reducing the flow of heat-trapping GHG into the atmosphere) and adaptation (adapt to consequences – adapting to life in a changing climate, adjusting to an actual/expected future).

Climate Change is a global phenomenon, which is why response requires international agreements (1992 UNFCCC, 2015 SDGs, 2016 Paris Agreement,...), national plans and individual action. What all of these interventions have in common is the need for high quality data and communication, in order to create effective policy based on indicators and trustworthy information.

Statistical indicators are used to inform Climate Change responses in many ways (tracking, raising awareness of issues, promoting accountability, supporting policy development and integration).

In order to have an integrative approach and to compile all of these indicators and data, one must combine information from economic, social and environmental domains within conceptual or statistical frameworks.

2.1.2 Assessment Frameworks

Conceptual frameworks are logical structures through which indicators are developed, selected, grouped and communicated. Graphically or in narrative, they explain the key factors, concepts or variables shaping the system under study, as well as its boundaries. In some cases they also shed light on the interrelations among such key elements.

Conceptual frameworks might play several key roles in sustainability or climate change assessments: They support and orient steps to reduce complexity in indicator development processes. They can ensure comprehensive coverage of themes and can reveal gaps in preliminary sets of indicators. When indicator selection involves multiple stakeholders, conceptual frameworks might also provide a basis for discussion – i.e., a common ground for their discussions. Conceptual frameworks also put indicators into context, providing to them a coherence without which they unavoidably lose their meaning and become mere ad hoc data [16].

Sustainability assessment frameworks are seeing increased use as a tool for adaptive policy making and effective information communication. The SEEA's Central

Framework is a good example of an agreed upon international standardised way of collecting and disseminating data in the form of accounts and indicators. The natural next step to this process is the ability to comprehensively analyse and put data to use for policy making decisions as well as general communications.

Indeed, evaluation should always offer evidence-based, up-to-date information on policies and programs with deliverable results in order to offer perspective on what needs to be done differently. Using data from accounts like the SEEAs can be used to bridge anthropology, sociology, HCI and science to better understand or contextualize everyday practices and design interventions, as well as create opportunities for collaboration.

2.1.3 Climate Change and the SEEA

The SEEA provides a comprehensive approach to the organization of environmental and economic information, covering both stocks and flows, and conceptualizing the interconnected relationship between the environment and economy in a coherent manner.

It therefore connects the different policy domains associated with environmental and economic data, which is precisely the type of information needed to inform the climate change policy process. The link between the environment and economy in the SEEA is made possible because the SEEA uses the same concepts, definitions, classifications and boundaries as the System of National Accounts (SNA), from which GDP is derived [17].

The SEEA is the agreed upon international statistical standard for understanding the relationship between the environment and the economy, and it uses aligned definitions and classifications as a conceptual framework.

The Central Framework (CF) of the SEEA [18] deals with environmental flows (of materials and energy) and stocks (of natural resources), as well as environmental economic statistics (transactions, taxes, subsidies,...).

As a source of information, the SEEA's accounts and indicators need to be communicated to a multitude of audiences with different needs and levels of understanding. Therefore, using these accounts and data, the challenge is to create and disseminate communications about these climate change statistics effectively, whether it be for policy makers or the general public. In order to illustrate the

importance of such frameworks, the next section explores the current progress towards the SDGs in Japan and highlights some of the pain points and obstacles.

2.1.4 Japan's efforts towards achieving the SDGs

Japan is a member of the Paris Agreement, and as such it was the first nation to release a new national climate plan by 2020 as required by the 2015 agreement. However, this is not necessarily a good thing, as this new plan sees no major changes from the 2013 national Japanese climate plan, which aimed to reduce emissions by 26% from 2013 rates [12]. Japan is currently the world's fifth largest polluter [19], and according to Climate Action Tracker, their commitments are not at all consistent with holding global warming below 2°C, let alone the 1.5°C set by the Paris Agreement in 2015. If all other government targets were within this range, warming would reach 3-4°C . Recent actions by the Japanese Government strongly suggest that it has no intention in the foreseeable future of revising its highly insufficient 2016 Paris Agreement NDC targets to a more ambitious one [20]. Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.

This means that without further policy and implementation work, Japan might fail to meet the requirements of the Paris Agreement without being held accountable, leading to an increase in global temperatures as predicted by the IPCC [3].

According to the Government of Japan, it attaches great importance to implementing measures for the 2030 Agenda, monitoring progress, and conducting follow-up and review activities across agency boundaries and through public-private partnerships [20]; in other words, through Public Private Action for Partnership (PPAP), in order to achieve the SDGs. The SDGs Promotion Headquarters established within the Cabinet was set up to foster close cooperation among relevant governmental agencies and lead the comprehensive and effective implementation of related measures. According to them, the Headquarters focus in particular on the following items, while cooperating closely with the relevant governmental agencies that are individually implementing the related initiatives:

- Monitoring the progress of measures taken in line with the "SDGs Implementation Guiding Principles" and review the Guiding Principles, including adjustments of and additions to the current indicators, based on the monitoring results.
- Promoting exchange of opinions and cooperation/collaboration with stakeholders.
- Conducting awareness raising PR activities for the 2030 Agenda and the "Implementation Guiding Principles".

While progress has been made in some initial planning stages, key gaps remain in terms of methodology and the assessment of interlinkages and synergies between targets, which is also true for many other first world countries [21]. The third point is particularly relevant to this research, as conducting awareness raising activities falls within the realm of communication. A recent study conducted in Japan in 2017 noted a lack of participation by social scientists in climate change communication research, resulting in a very narrow range of communication with the public [7]. This highlights the importance of bridging communication science with climate science in the coming decades, and the need for improved climate change communication globally. The next section introduces an overview of communication theory and its evolution towards climate change communication.

2.2. Communication Theory

2.2.1 An overview of Communication Science

Communication science analyses the ways in which people interact within different contexts, whether interpersonal, grouped or mediated. Communication scientists often aim at developing theories to help increase the effectiveness of certain types of applied communication. This results in the general field of communication science's interdisciplinarity and roots in human and societal behaviours.

In an overview and analysis paper on communication theory published in 2016, Ballantyne [22] goes back in time and separates the study of communication into different eras:

Communication as linear transmission

The earlier days of communication science. In the 1930s, it was mostly thought of as a linear model of information theory - a message is sent out by the sender, the receiver interprets it, and the effect/response is the outcome. This conception of communication is merely thought of as a tool for transmitting information, ideas or knowledge.

Communication as complex interaction

The 1970s were when the first shift started to happen, and researchers began doubting the "naive" linear transmission models. The emerging theories were inspired by cultural and linguistic research. Hall argued that "before a message can have an 'effect', [...] it must first be appropriate as a meaningful discourse and be meaningfully decoded" [23]. This paved the way to new theories where the emphasis was on the complexities of extracting meaning from messages based on social and cultural influences. This is often referred to as the "interaction paradigm", where communication is seen as an ongoing cycle of subjective interpretations, and the receiver is no longer a blank canvas.

Towards a Meta-Perspective

Over the years, many theories were developed in an attempt to distill the essence of communication science. However, it could be argued that this multitude of models and theories accurately reflects how interdisciplinary the field and its global scope is. In the same way as climate change and sustainability are terms that are difficult to define, communication science is almost impossible to condense into a single framework. As such, the multiplicity of communication science can be considered an asset, as long as all of the theories and models go towards building a better understanding of these social processes. Craig outlines the idea of a meta-model to define and help create a common theoretical consensus - the constitutive model [24] . In this model, communication is not only the transmission of information. It is the process by which we constitute a common reality (factual truths, norms, personal and group identities, etc). This entails that communication exists as an element of our common reality.

2.2.2 The importance of Science Communication

Having explored the collective and overarching concepts of communication theory, it is important to recognize the heterogeneity of this discipline. For this reason, academic research on communication often explores subdivisions or specific types of communications. Within the broader field of communication, Science Communication is typically thought of as being the responsibility of professional communicators such as journalists, public information officers and scientists themselves. The most commonly understood idea is that science knowledge enable the public to make effective decisions about science policy and personal behavioural changes related to topics such as energy conservation or waste disposal [25]. Nelkin [26] offered the additional claim that effective reporting can "enhance the public's ability to evaluate science policy issues," as well as contributing towards "the individual's ability to make rational personal choices". Therefore, communication of science could also have the potential to help people make better decisions about their life, health and happiness overall.

In an attempt to define Science Communication in 2003, Burns et al. [27] established the AEIOU vowel analogy: Awareness, Enjoyment, Interest, Opinion-forming, and Understanding. This framework has been widely recognized as representing the personal responses individuals have to scientific communication. Today, there is growing recognition that the relationships and interrelations between science and the public are at a critical phase due to the climate crisis, which exists as another subdivision within the wider landscape of communication theory - Climate Change Communication.

2.3. Climate Change Communication

Climate Change Communication has become a salient and growing topic in society. The field and scope of research surrounding it has grown tremendously in the last 5 to 10 years. At its core, it discusses the importance and difficulties that are inherent to talking about climate change to different audiences, using different tools and strategies. This can range from raising awareness to the difficult relationship between communication and behavioural changes. Since the late 1990s, analysis of climate change communication and its potential impact on the

general public has been discussed [28]. Despite this, we are still facing a climate crisis, with global carbon emissions continuing to increase every year and natural disasters occurring at an alarming rate [29].

In this section, an overview of some of the research that has been done in the field of climate change communication will be introduced, as well as an attempt to better define this field in the context of this research.

2.3.1 The landscape

In the 1990s, Amy E. Chadwick described Climate Change Communication as a new emerging field [30]. At the time, studies were often relating this concept to environmental communication practices and concerns - for example the ozone depletion crisis [31]. Nowadays, a large amount of research has been conducted on Climate Change Communication, mostly in the United States, Australia and Western European countries. However, the Asian Pacific region is still somewhat lagging behind, and this gap in representation does not reflect the globalised nature of this field.

The progression of research on Climate Change Communication has been brought about by a multitude of conflating forces, mostly originating in climate science itself. This landscape is shaped by both incremental changes and extreme ones, some of which are summarized and listed below:

- Climate itself - This includes the understanding of climate change and climate disruption, events such as natural disasters as well incremental changes and tipping points.

- Scientific advancements and climate change assessments - Planetary boundaries have become a public and political debate in the last decade, as well as the science of adaptation and mitigation.

- Climate policies and actions - Over the last five years, the climate crisis, has been subject of increased international attention – from politicians, activists, the media, and the global community.

  For example, Greta Thunberg gained international recognition in a short period of time and went on to become a leading voice in contemporary cli-

mate activism in 2019 [32]. Indeed, her "Fridays for Future" campaigns and demand for intergenerational justice have established her as an inspirational youth figure. In a study on the "Thunberg Effect", researchers found that those who are more familiar with Greta Thunberg have a stronger sense of collective efficacy – "the belief that, through working together with like-minded others, they can reduce global warming" [33]. In turn, these people were measured to have higher intentions of talking collective actions.

- Climate Change Communication Science - Although it is a highly distributed field, it has seen a huge amount of growth and publication over the last decades (see Figure 2.1 [34].)

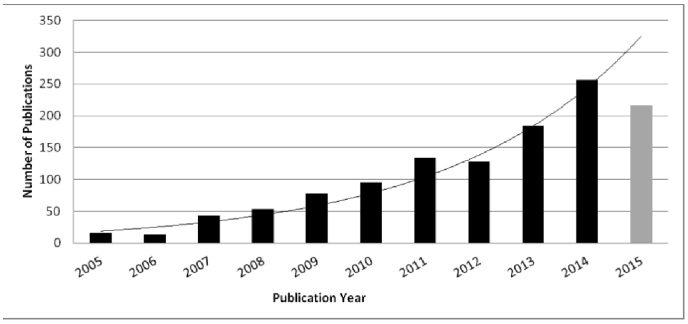


Figure 2.1 Rise in the Number of Publications on Climate Change Communication from 2005 to 2015.

To sum up the central idea, because climate change affects everything, everyone and everywhere, Climate Change Communication should aim to reach across boundaries - whether sectoral, geographical or disciplinary.

2.3.2 Key elements

Communication processes involve understanding one's audience and the role of values, beliefs, identity and other variables. We all hear and perceive information through the filters of culturally and environmentally transmitted values, and no one can escape this. The key is to become conscious of it and further study these types of influences. Not only do these values affect our perceptions, they can also influence our interpretations and acceptability of proposed policies or behavioural

changes. To this effect, much of the research that has been conducted on Climate Change Communication has talked about values frames. Indeed, approaching communication through value frames can theoretically help create more resonant and effective messaging. This includes the study of framing, language, and more recently and prominently the role of visualizations and imagery [35].

Although at first the field seemed to be crippled by many uncertainties, namely knowing whether or not anthropogenic climate change was real or not, there is now mostly scientific consensus among both scientists and policymakers. Communication efforts have therefore shifted - more than persuasion of the existence of climate change as a threat to humanity, we are going towards persuasion and conversation on how to deal with it.

2.3.3 Challenges

Persistent challenges remain - superficial public understanding, transitioning from awareness to action, political and polarizing information, the overwhelming nature of climate change and growing feelings of anxiety or hopelessness. All of these confounding factors call for improving the interaction between climate change communication research and practice.

Based on research from Schäfer [36], another striking finding is the fact that climate scientists and institutions from this field do not seem to be the major players and disseminators in climate communications. Indeed, engaging in conversations and online communication does not seem to be a main occupation for climate scientists or statisticians in this field of research. Although there might be reasonable reasons for explaining this gap (e.g. lack of time and resources), it is worth mentioning that it exists. Some people refer to this phenomenon as the communication "science-practice gap" [34]. It describes how academic work and researchers are typically not rewarded for public outreach, and the time consuming nature of these types of endeavours often acts as another deterrent. The overall landscape of incentives (e.g. research programs, conferences, etc.) and capacity building currently still does not overcome the "fences" that have been erected. Additionally, climate change communication is an increasingly interdisciplinary field, and the fact that research is being presented in a growing number of venues, formats and fields could make it more difficult to narrow down and distill

for public engagement purposes. Non-experts may find it hard to put together recent findings into larger, integrative pictures of communication.

If climate change communicators want to create more impact through their work, they must connect more effectively with those who can use these tools for good: policy-makers, advocates, journalists and public intellectuals. This is why platforms like the SIAP-elearning [37] are important tools for communication. Training statistical experts and employees who work on the science of climate change to communicate their results and findings to a variety of audiences is a crucial step towards creating impact. Simply putting results (whether they be related to climate science or social science) 'out there' and waiting or assuming that they will find their way into some form of practice is not enough.

Today, the United Nations and other NGOs do have a better grasp on communicating about climate and the environment to a variety of audiences, but there are still steps to be taken for many countries.

2.3.4 Scope of Communication

A growing amount of research has delved into the idea that there is a complex interplay between giving out information on climate change - raising awareness - and eliciting behavioural responses from people. Mass media is often cited as the predominant information channel in these studies, whereas climate science and the policy sector are more dynamic and less delved into.

When looking into the history of climate change communication, one can notice that in the 1980s, most scientists referred to the "public understanding of science model" [28]. In this model, the public is seen as being in need of education from "experts", and it is believed that this increase in knowledge and consensus would result in public engagement and action. However, it was later challenged that the underlying idea behind this model might be overly simplified: giving laypeople information does not necessarily translate to an acceptance of scientific consensus, nor does it always lead to a convergence towards taking action or behavioural changes.

This model's underlying flaw is its assumption that communication follows a linear path. Indeed, as we have discussed above, communication is deeply grounded in dialogue between contextual understanding and many other influencing factors

and responses. The "deficit model" [38], which often accompanies studies on the public understanding one, also assumes that laypeople are 'empty vessels', waiting to be filled with information upon which they can take rational action.

Carvalho and Burgess [39] on the other hand, have argued for a cultural perspective to be included in studies on climate change perception and communication. In their development of the "circuit of culture", they maintain that consumers of information and media are simultaneously engaging in dynamic, meaning-making activities that are all context-specific. These dynamics and contextual differences can be caused by both internal and external factors - eg. political situation, cultural differences.

Overall, the existing body of research on climate change communication, although heavily centered on traditionally "westernised" countries, paints a picture of the landscape of the progress that has been made and the elements that still need to be explored. Raising awareness is an important and crucial aspect of this process, but proving more or better information will not be enough. The linear and vacuum sealed format of communication are not the most effective. In the context of this study, the specific aspects of framing and behavioural models were of particular interest, leading to the following analysis of related works.

2.4. The Study of Framing

2.4.1 A Brief History

Conceptually, the study of framing is rooted in many disciplines and fields, spanning from the 19^{th} century to today. Some examples include "Gestalt psychology" [40], where the emphasis is on analyzing how people organize their impressions into cognitive perceptions based on cultural and social pressures, and "Interpretive sociology" [41], where it is argued that perceptions and interpretations are negotiated in human interaction and communication. More recently, the framing of media has become a popular topic of study in communication science.

Overall, framing analyses assume that information is not - or cannot be - perceived objectively and similarly by different audiences or individuals. Instead, perception and communication always combine an element of "selection, empha-

sis and exclusion" [42]. This means framing is a fundamentally constructive concept. One of the most widely used scholarly definitions of framing comes from sociologists Gamson and Modigliani [43], who define frames as "the central organising idea or storyline that provides meaning to an unfolding strip of events". In this definition, framing is seen as suggesting the essence of an issue and can be represented in different ways - text, visuals, metaphors, or other forms.

In communication processes, different types of framing devices can be employed. Some of them are summarised in the following flowchart on Figure 2.2 [35].

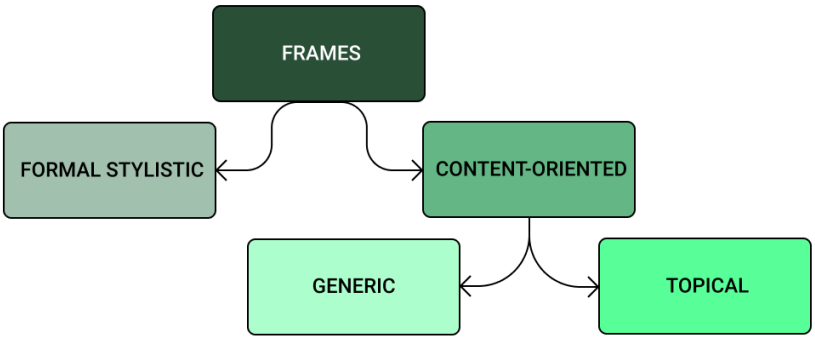


Figure 2.2 Types of media frames, adapted from Schäfer.

"Formal-stylistic" frames are structured based on the presentation of communicative text rather than its content. For example one can describe episodic frames and thematic frames, the former focusing on an isolated issue and the latter including background information for context. These frames usually have a higher degree of abstraction - "diagnostic" vs "pronostic", or "gain" vs "loss" are some possible comparisons.

On the other hand, "content-oriented" frames will focus on the content of the communication. Within this category one can distinguish "generic" frames, which are not issue-specific, and "topical" frames, which are.

2.4.2 Framing Research

Analysing framing research is not confined to a single method. From content analysis to linguistic sciences, there are many ways to interpret studies on the effects of framing.

More often than not, this includes the use of qualitative research where frames are inductively constructed based on existing media or content and studied in small samples. The main questions often raised with regards to these methods are selection bias and methodology differences. In linguistic approaches, frames are usually identified by analyzing the selection and placement of certain words or blocks of information [41]. One can also distinguish the syntax, script, theme and rhetoric of certain frames, although it can become difficult to analyse if there are too many variables. Computer-assisted analysis is currently possible on written text, but limited on visual materials.

When it comes to climate change communication, researchers have been increasingly interested in audiences' perceptions of climate change-framed information [44]. Studies on NGOs like Greenpeace and the World Wildlife Fund have shown that NGO framing often focuses on "diagnostic framing" [45] - i.e. aiming to describe the potential effects (and their extent) of climate change to raise awareness to a broader public. However, overall there still exists a gap in qualitative studies of NGO communications, whether it be visual or textual analysis. In the same way, political decision-makers and institutions are rarely included in framing studies. In contrast to these stakeholder frames, content and issue specific frames have been studied in media and online formats. Semetko and Valkenburg [46] proposed a set of five frames for climate change communication, based on political communication: conflict, human-interest, responsibility, morality and economic consequences. Many studies have used these frames as the basis for analysing content from within certain types of media of climate change coverage [47, 48], but they are often centered on developed countries of "the West", and lack any significant analysis of the user's perception of these different framing modalities. In order to go beyond the idea of defining and categorizing the ways in which we communicate climate change, it is important to identify and study its effect on the audience it is presented to. Moreover, specifically in the context of climate change, the visual dimension of communication has been neglected [49], and little of the research that exists draws on framing concepts. Frame-building and communication draws heavily on compelling imagery, and this is especially relevant to climate change communication. Studies have yet to truly integrate this understanding of visual framing into systematic approaches to analysing communication.

2.5. Environmental Identity

The study of environmental identity could play an intrinsic role in solving the climate crisis. People who are impassioned about environmental issues can experience their beliefs affecting other aspects of who they are, and environmental positions or behaviours perceived as different than one's own can sometimes elicit hostile reactions. Understanding identity and its role in mediating behaviour toward the natural world not only has implications for research, but also important practical significance. In a sense, the critical goal then becomes finding a way to unlock the psychological mechanisms capable of fostering protective environmental policies and behaviours [50]. Researchers in many countries have already investigated environmental identity, and some have found that sustainable behaviours require a strong sense of community identity because both personal and collective identity have an influence on the adoption of sustainable values [51].

An **environmental identity** - how we orient ourselves to the natural world - can describe the way in which abstract global issues become immediate and personal for an individual [52]. An environmental identity also prescribes a course of action that is compatible with individuals' sense of who they are. Our identity describes part of our social roles, entailing responsibilities. How we understand and portray ourselves in nature and society is infused with shared meaning and culturally influenced interpretations.

Truthfully, environmental conflicts will be neither understood nor constructively resolved unless we recognise the ways in which they reflect individual and group identities. Similarly, attempts to change behaviour towards a more "pro-environmental" direction which ignore people's underlying environmental and social identities may have only a short-term effect; their behaviours reverting to earlier forms when incentives to change are removed [53]. This implies that we need better, more unique and powerful ways of understanding the connections between environmental issues and identity.

So, how do we work towards facilitating long-lasting pro-environmental action? According to the authors of "Identity and the Natural Environment" [51], pro-environmental action will be facilitated when individuals see nature as an entity with moral standing rather than merely a source of resources to exploit - leading to a recognition that humans bear some responsibility to protect nature. Moreover,

they argue for designing more connected physical and conceptual social environments, as well as encouraging the acceptance of the existence of specific social contexts and shared concerns for the environments that cross and blur some of these boundaries.

Looking at a more recent and specific example, a 2019 study on sustainable consumption in Korea and Japan yielded some interesting findings. Their analysis led to the conclusion that consumers perform sustainable consumption behavior based mostly on socially shared connotations—the descriptive norm—while the other key variables affecting sustainable consumption are awareness, and pro-environmental self-identity [54]. Furthermore, the effects of "pro-environmental self-identity" were more noticeable in Japanese users, while Koreans were more likely to be sustainable based on their awareness. This can be interpreted as the Japanese being more likely to consider others' behavior, the group identity, since self-identity is shaped by social backgrounds and relationships [55]. To this effect, the researchers suggest that policies to increase the overall social norms and perception of sustainability would be more effective in Japan than simple awareness building campaigns promoting sustainable consumption. With the current degree of Japanese pro-environmental identity still being very low [54, 56], there is room for much improvement and progress in perception to achieve policy goals and climate literacy.

Chapter 3
Design Process

3.1. Overview

Based on the literature review and research that has been conducted on climate change communication, some challenges and objectives were determined.

Firstly, it is clear that it is not easy to effectively communicate and convey information about complex issues like climate change, progress towards the SDGs or sustainability. Not only can this lead to a lack of knowledge or awareness, it could also translate into insufficient policy making in the public sector.

Moreover, the field of climate change communication itself is still in development, which creates the potential for new theories and a dynamic field of study, but also limits research with regards to the homogeneity of its methodologies.

One of the objectives of this study is therefore to increase literacy and awareness of issues related to climate change and communication, to go towards tackling policy implementation and societal response through framework building, communication, design and tools like data visualisation.

Figure 3.1 represents an overview of the scope of this research. Data and statistics are considered as the source of information on climate change. Using this data, NSOs and other entities are charged with the role of gathering and organising information - for example using the SEEA Central Framework. It is only after this data is collected and analysed that the communication aspect comes into play. Here, the study diverges into two separate but interconnected elements: developing an online training course for employees of statistical offices and creating a user test on climate change communication using framing analysis.

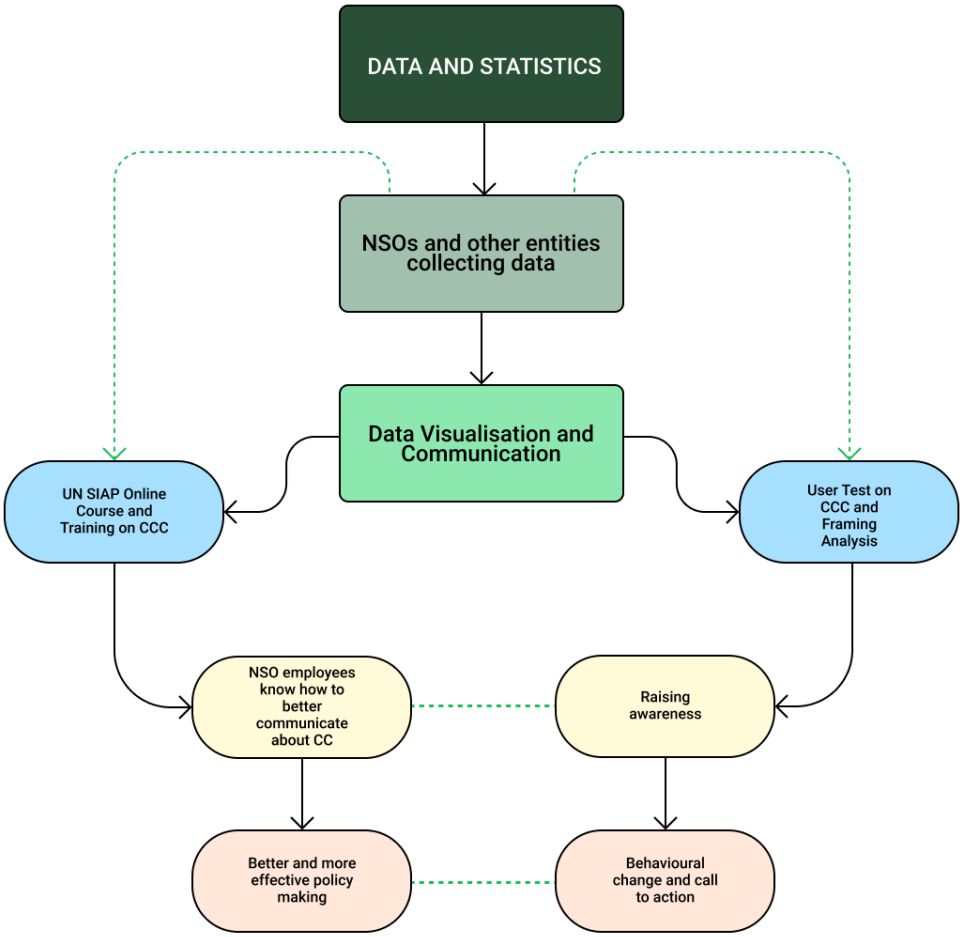


Figure 3.1 Overview of the scope of research.

These two elements of study are ultimately what will inform ways in which climate change is communicated to various groups and audiences, resulting in, for example, raised awareness, behavioural changes or implementation of policies. The complexity of climate change lies in its interconnected nature, which is why it is not surprising that studies on climate change communication reflect these intricacies similarly. In the next sections, both the development of the online course and climate change questionnaire will be delved into in more detail.

3.2. SIAP Online Course

3.2.1 Initial Brief

SIAP is a statistical training institute. Their main counterparts in member countries are therefore national statistical offices (NSOs). One of the demands SIAP has received from these countries is to conduct some training on communication around climate change statistics with a focus on indicators that can be derived from the System of Environmental Economic Accounting (SEEA). The overall aim of the training would be to understand how NSOs can effectively communicate climate change data to various user groups and build overall statistical literacy. Due to the ongoing COVID-19 pandemic, SIAP has moved all of their training online, which is why developed materials have to be suitable for online courses. Hence, the major output of this project is a set of slides and explanatory materials that can be used for online training on this topic using the SIAP e-learning platform [37]. The working title of the course is the following: "Developing good approaches to communicating about Climate Change using SEEA data and statistics". In collaboration with SIAP, the first step of the design process was to establish the needs and requirements for the course, summarised below:

- **WHAT?** This course focuses on effectively communicating about Climate Change using the SEEA. We will explore target audiences and communication practices based on accounts and data from national statistical institutes, as well as examples of good practices.
- **WHO?** This course is designed for those within the national statistical institutes that are compiling and disseminating SEEA accounts with a focus on Climate Change. Analysts, researchers or anyone curious about learning how to communicate about Climate Change effectively could also benefit from this course.
- **WHY?** Communicating about Climate Change is essential to bridging the gap between research/compilation of data and practice/applications. The social science of Climate Change Communication is a complex and challenging issue, as Climate Science can be uncertain, abstract and polarising. In some countries, the issue is already politically polarising, while in others it is the absence of a public and political discourse that poses a problem.

3.2.2 Survey to NSO employees

In order to further understand the requirements and necessary material to be included in the course, a survey was created and distributed to NSO employees who have previously used the SIAP e-learning platform. The aim of the survey was to question these statistical institute employees on their current understanding of how the SEEA is implemented within their working space and how it is communicated, as well as gauging possible improvements and materials to be included in the course. The full survey questions can be found in the Appendix B.1.

For the purpose of this thesis project, the development of the online course is considered as a pre-study and focuses on the initial development of the teaching materials based on the aforementioned survey. The evaluation of the course will happen at a later stage, once the course is published on the SIAP e-learning platform.

3.3. CCC - Frame analysis

Framing an issue is often defined as selecting certain aspects or characteristics of a given issue and making them more salient, in order to "frame" it in a specific way. This concept is key to communication sciences, and several studies have been conducted on framing within the specific construct of climate change communications, as seen in Chapter 2. Generally, the idea is to analyze perspectives in which climate change is presented - what is highlighted and what is not - and what can be deduced from it. Before delving into this idea, a Japanese survey was conducted on pro-environmental identity and veganism in Japan, to gauge current understanding of an example issue (in this case, the environmental impact of our food choices) in relation to public awareness.

3.3.1 Initial study on pro-environmental identity in Japan

In a 2018 Oxford University study – which is the most comprehensive analysis to date of the damage farming does to the planet – it was found that 'avoiding meat and dairy is the single biggest way to reduce your impact on Earth', as animal farming provides just 18% of calories but takes up 83% of our farmland [57].

Using this study as a stepping stone, a Japanese survey was created to assess awareness of veganism and vegetarianism in Japan, with the additional goal of understanding "pro-environmental" identity more generally.

This survey was sent out online to Japanese speakers, with a target user being defined as a Japanese city dweller. In this case, city dwellers are defined as : a resident or inhabitant of a city or urban area. This target user was determined due to cities being major contributors to climate change - according to UN Habitat, cities consume 78% of the world's energy [58], while covering only 3% of the world's surface and housing 54% of the population. A recent census shows 90.7% of the total Japanese population live in cities [59]. Moreover, the Tokyo Greater Area houses over 30% of the total Japanese population, which makes it the most populous urban area in the world.

Data was collected for approximately 2 weeks, during which the survey was answered by 160 city dwellers, from 18 years old to over 75, and with a 67% female to 33% male ratio. One of the questions in the survey was related to identifying which lifestyle decisions are the most effective at limiting our carbon footprint : "In order to minimise impact on the environment, what do you think are the most significant changes one can do?".

The results are shown in the Figure 3.2 below - an overwhelming majority of participants answered that they believed "recycling properly" and "saving energy" were the most effective ways to limit their carbon footprints. Figure 3.3 examines the survey results in more details, using a heatmap matrix to compare age ranges to significant changes in behaviour. One can notice that the age ranges do not seem to significantly affect the distribution of answers, which could suggest that Japan does not have a strong generational divide when it comes to climate change knowledge, unlike countries like the United States [60]. Most people seem to believe recycling properly to be important and significant.

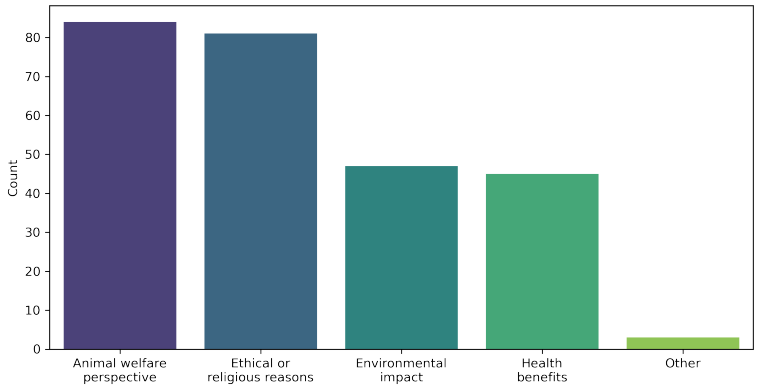


Figure 3.2 In order to minimise impact on the environmental, what do you think are the most significant changes one can do?

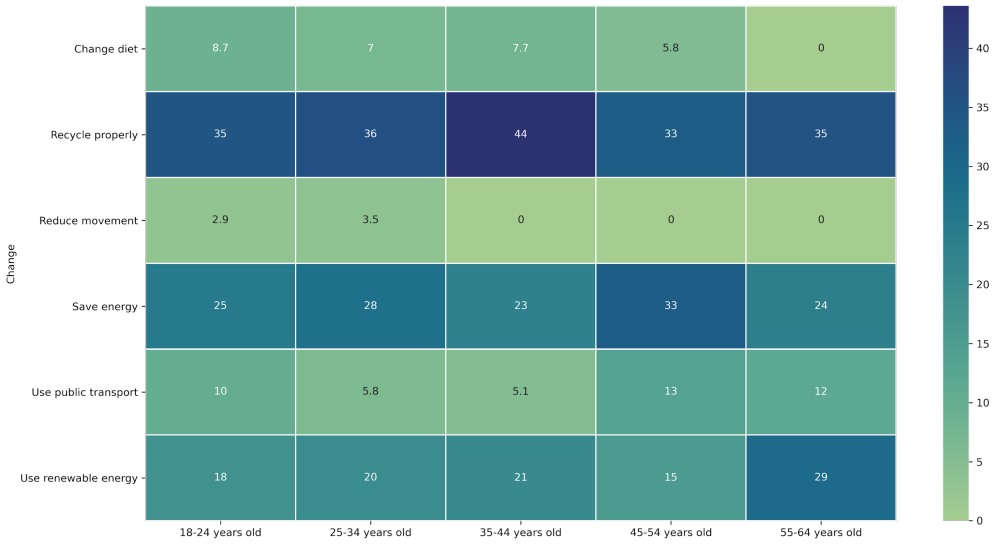


Figure 3.3 Heatmap matrix comparing age range with frequency of answers for the most significant environmentally friendly changes.

However, the environmental impact of recycling has less to do with limiting emissions, and more to do with reducing personal waste and eliminating plastic pollution. Annual emissions savings for an individual who is recycling as much as possible are estimated to be around 0.2 tonnes of CO2 equivalent, which is over 5 times smaller than switching to a plant based diet [61]. In fact, according to an international survey of more than 21000 people across 30 countries, the majority of people are unable to identify which lifestyle decisions are the most effective at limiting their carbon footprint [56]. In that same survey, one of the most unexpected findings considering the misconceptions, was that nearly 70 percent of respondents believed they knew how to lessen their impact on the environment (see Figure 3.4 [56]). But people in Japan were least confident about how to lessen their carbon footprint, with only 40% answering positively. Similarly, our survey revealed that 45% of participants don't consider themselves to be "pro-environmental", and an additional 6% didn't actually know the meaning of the term. This exemplifies not only the growing issue of lack of awareness and understanding of the impact that everyday tasks and purchases can have on the environment, but more importantly the need for creating literacy tools and new ways of science communication.

According to Klein [62], the smart use of data – big and small – can be used to tell us how and why climate change is happening, inform climate mitigation and adaptation strategies for our cities, and provide evidence that governments, private sector partners, and citizens need to increase their support for local climate action. 81% of the Japanese survey participants answered that they believe knowing more about environmental impact would help them make more informed decisions. Using data and visual modalities to contextualise certain issues, is it therefore possible and beneficial to inform and raise awareness for impact?

In an article on misconceptions about our carbon footprints, Kelly Beaver, managing director of public affairs at Ipsos Mori said: "*Our research shows that the issue of the environmental crisis is familiar to people around the world, but people remain confused about what actions are most likely to have a significant effect on their carbon footprint.*" [61]

Figure 3.5 [56] visually illustrates this point and paints a picture of the global landscape surrounding environmental identities.

This initial survey and study was used as a gauging tool for public understanding of climate change in Japan, as well as an incentive for working towards creating more impactful and meaningful climate change communication strategies.

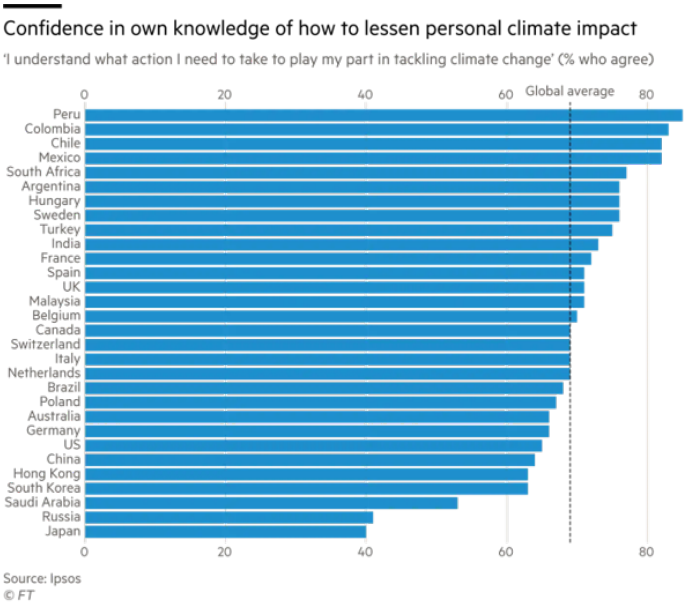


Figure 3.4 Confidence about how to lessen carbon footprint per country.

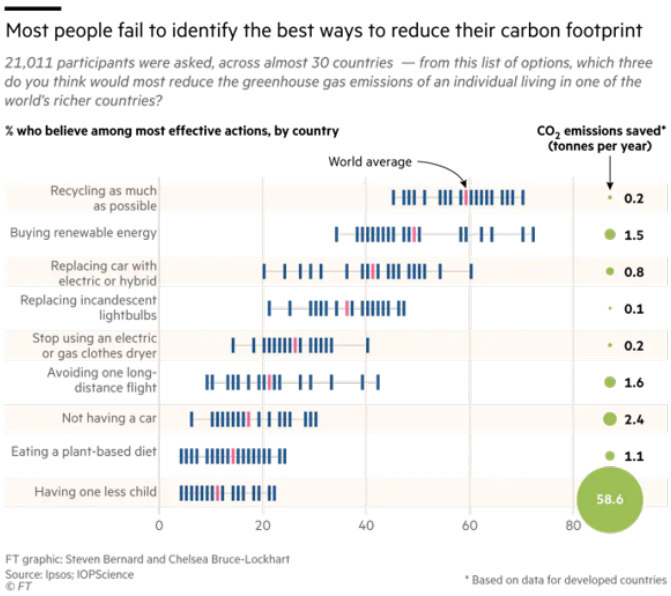


Figure 3.5 What is the best way to reduce carbon footprints.

3.3.2 Climate Change Communication Questionnaire

Based on the above survey, the extensive literature review from Chapter 2 and research conducted within the United Nations on climate change communication and statistics, the idea of this user test is twofold:

- Create a user study on Climate Change Communication to go towards building and developing a conceptual framework on communication.
- Use statistics and models to gauge behaviour and understanding of information related to Climate Change based on frame analysis and design modalities.

The design of the user test is based on framing analysis for Climate Change Communication. For simplification purposes, this analysis was limited to testing 4 different variations of frames, based on the models that have been used in previous academic studies and research [35, 46]. These 4 modules are separated into two categories for comparative analysis:

1. Content-oriented topical frames:
    - Environmental framing
    - Human-centered framing
2. Formal stylistic frames:
    - Inclusion of graphs
    - Exclusion of graphs

The following Figures 3.6-3.7 and 3.8-3.9 illustrate the design and layout of these two distinctive comparative framing elements, as well as examples of the final outputs.

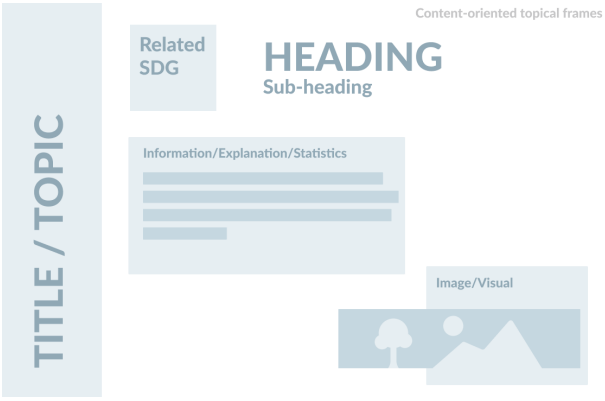


Figure 3.6 Content-oriented layout.

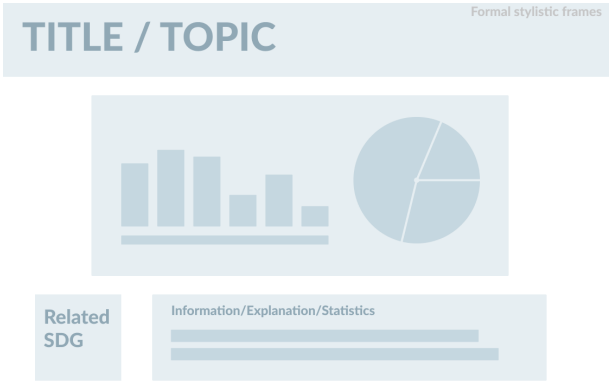


Figure 3.7 Formal stylistc layout.

Figure 3.8 Content-oriented example.

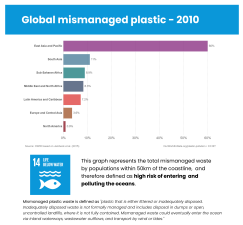
Figure 3.9 Formal stylistc example.

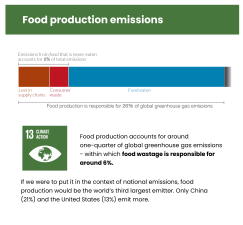
The information included on these communication slides was gathered from Eurostat, Our World in Data, and individual statistical accounts published by NSOs [63–65]. Moreover, the design was kept consistent for each type of framing, and each topic was related to one of the SDGs based on its relevance to both the frame and content. Figures 3.10 and 3.11 contain all of the designed elements grouped into the 4 modules.

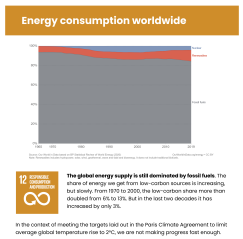
Figure 3.10 Climate Change Communication slides - Content-oriented framing.

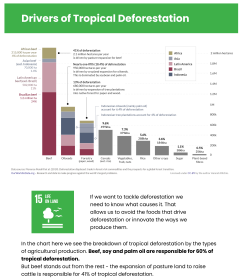
Formal stylistic frames

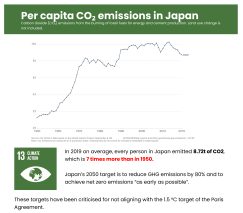
Inclusion of graph

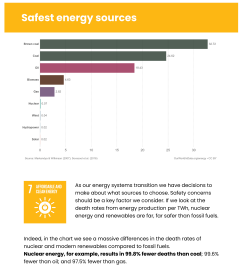




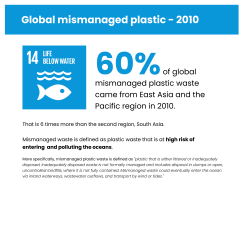


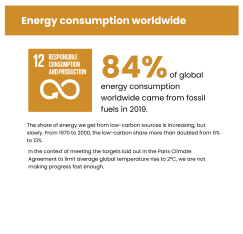


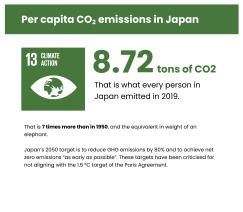




Exclusion of graph







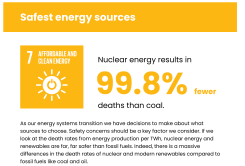


Figure 3.11 Climate Change Communication slides - Formal stylistic framing.

User test design and logic

The survey was designed and implemented using Qualtrics, which is a web-based survey tool used to develop and conduct survey research, evaluations and other data collection activities.

The questionnaire is separated into four main blocks:

1. Introduction and demographics
2. Information slides
3. Retention, confidence and awareness questions
4. Exist questions

Figure 3.12 represents the survey flow, which is a block-level view of the questionnaire. It illustrates the pathways that respondents will take when answering the survey. Additionally, it is also used to represent "branch logic" - e.g. randomizations and types of questions for each section.

The information slides are limited to 4 per user, in order to minimise information overload during the questionnaire. In total, 24 slides were created, 6 for each of the categories that were described above (see Figures 3.10 and 3.11). Once a respondent agreed to participate and completed section 1 of the survey, they were prompted to take their time to read and examine 4 randomized information slides carefully. The randomization made sure each participant was given two slides from the content-oriented framing category and two slides from the formal stylistic framing category. After having examined these slides, the appropriate set of questions was displayed to the user, 6 in total, in addition to a confidence and awareness question after each set (total of 4). The retention questions were based on information and statistics included within the communication slide, categorized in either text based questions, or text and visuals based questions.

The structure and flow of the questionnaire was designed with the aim to study longer term memory rather than short term recall [66] . The idea as to attempt to reproduce a more natural setting in which information is casually read and displayed, in the same way that people would encounter it during the day. What is being remembered and absorbed the best? What is the best way to communicate this type of information?

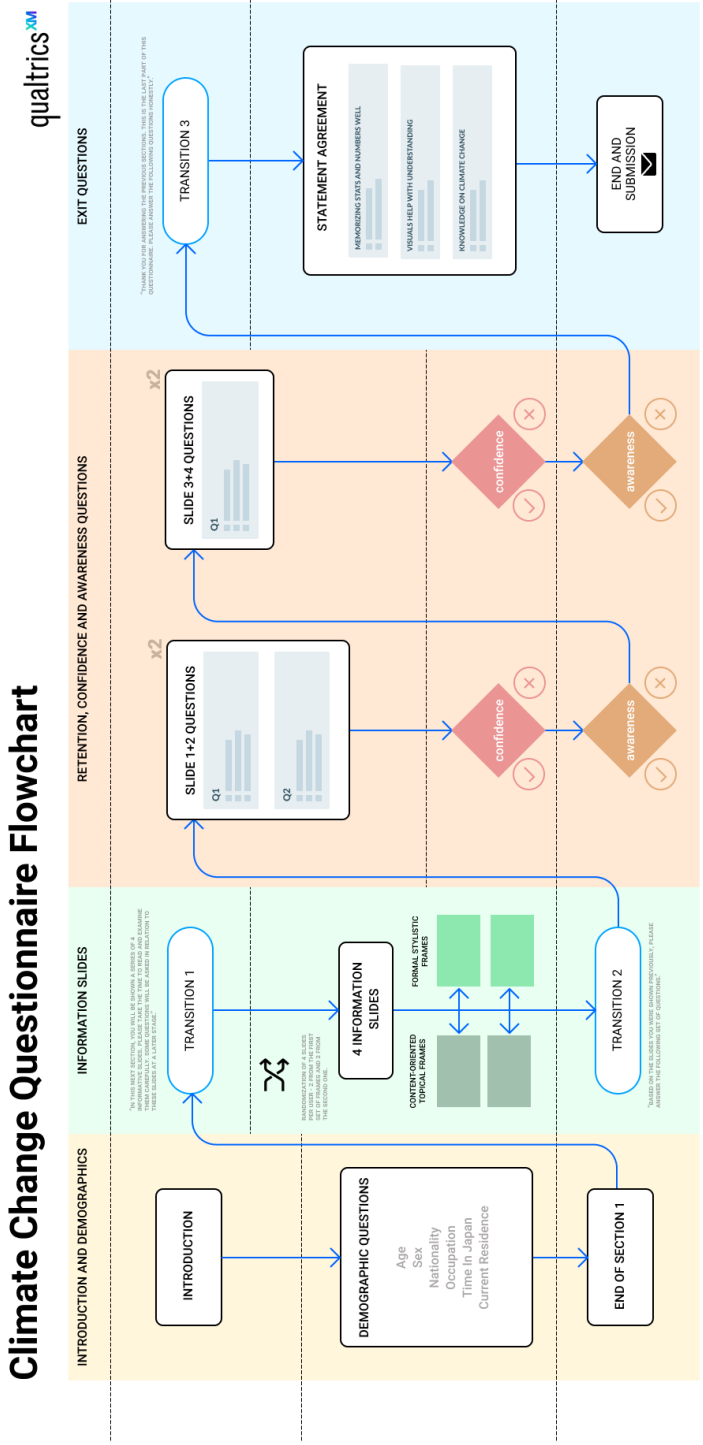


Figure 3.12 Flowchart for the questionnaire.

Chapter 4
Implementation and Evaluation

4.1. Online course

As stated in Chapter 3, a survey was sent out to employees of National Statistical offices worldwide who have already participated in online courses using the SIAP e-learning platform. In total, 23 people responded, with an almost equal representation of both genders, and 60% of the participants fell in the 30-49 age range.

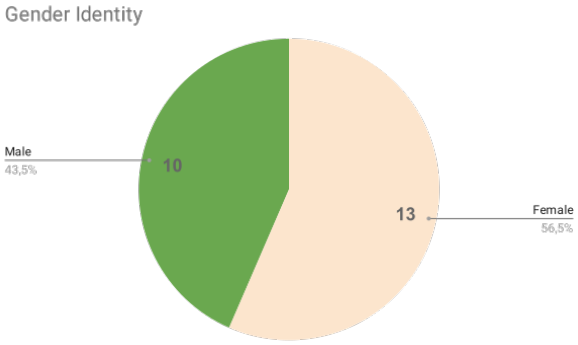


Figure 4.1 Gender Identity.

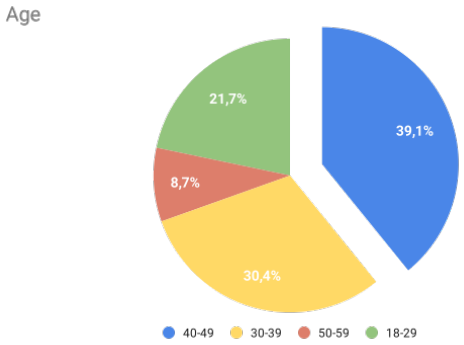


Figure 4.2 Age.

Because of the nature of the survey distribution and its target, over 90% of the respondents identified as NSO employees, with 8% directly working in relation to the SEEA framework and its implementation. In terms of nationality and country of residence, 26% of the respondents were from Indonesia, with the rest of them being equally distributed between the following list of countries: Egypt, Nigeria, Azerbaijan, Turkey, Mongolia, Philippines, Palestine, Uzbekistan, Nigeria, Vietnam, India, Gabon, Kenya and Morocco.

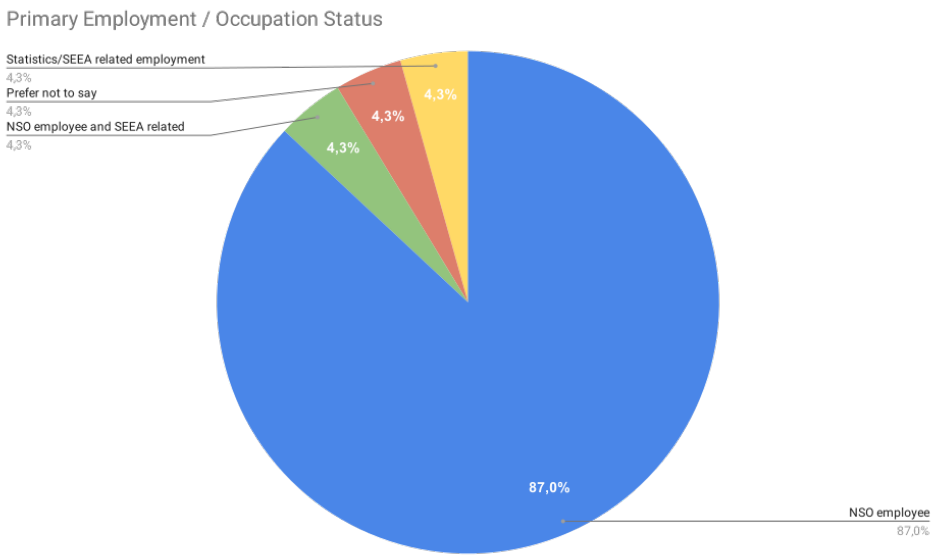


Figure 4.3 Employment of respondents.

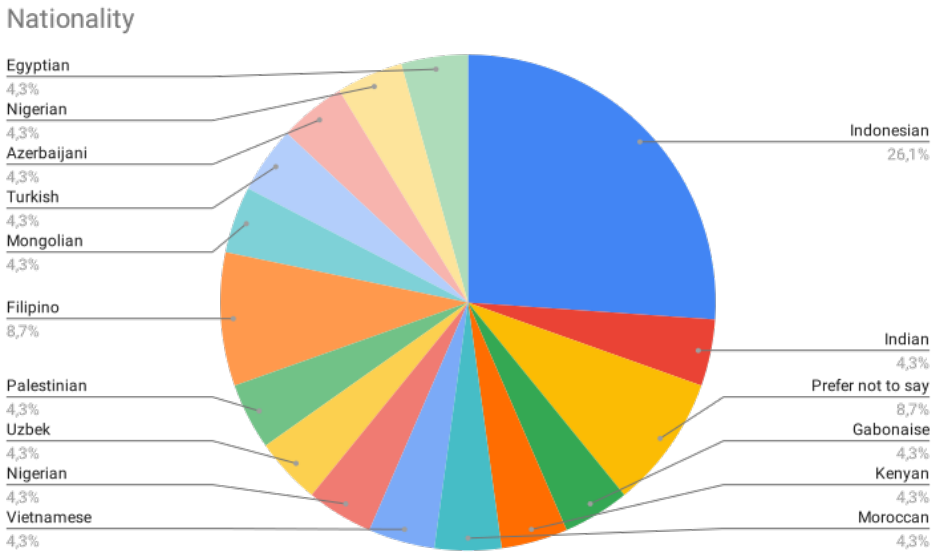


Figure 4.4 Distribution of Nationalities.

4.1.1 Likert scale section of the survey

Figure 4.5 Likert scale distributions for the survey.

Figure 4.5 summarises the results for this portion of the survey. One can notice that 70% of the respondents strongly agreed on the importance of Climate Change Communication using the SEEA. However, there is less consensus on whether or not the current strategies in place inside NSOs are clear or correctly applied: 30% only strongly agree about the existence of a communication strategy for the SEEA, and 35% think that NSOs currently do not know how to apply and disseminate SEEA data and accounts to different user group properly, even though 50% of the users responded that their office currently does communicate about climate change using the SEEA. This indicates a clear gap in the current practices.

In addition to this, 40% of the respondents also do not think information is easily accessible in multiple forms when it comes to climate change and the SEEA.

Unsurprisingly, 95% of the employees agreed that an online course would help them improve Climate Change Communication related to the SEEA.

More specifically, they were asked about what they would like to see on such a course and who is most important to communicate with, as seen on Figure 4.6 and 4.7:

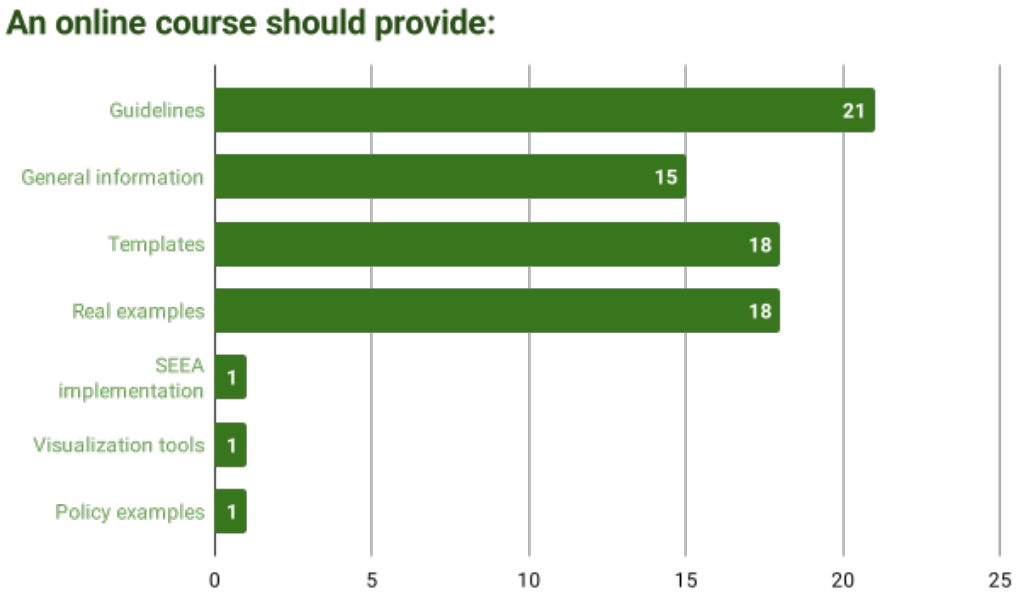


Figure 4.6 What should an online course provide?

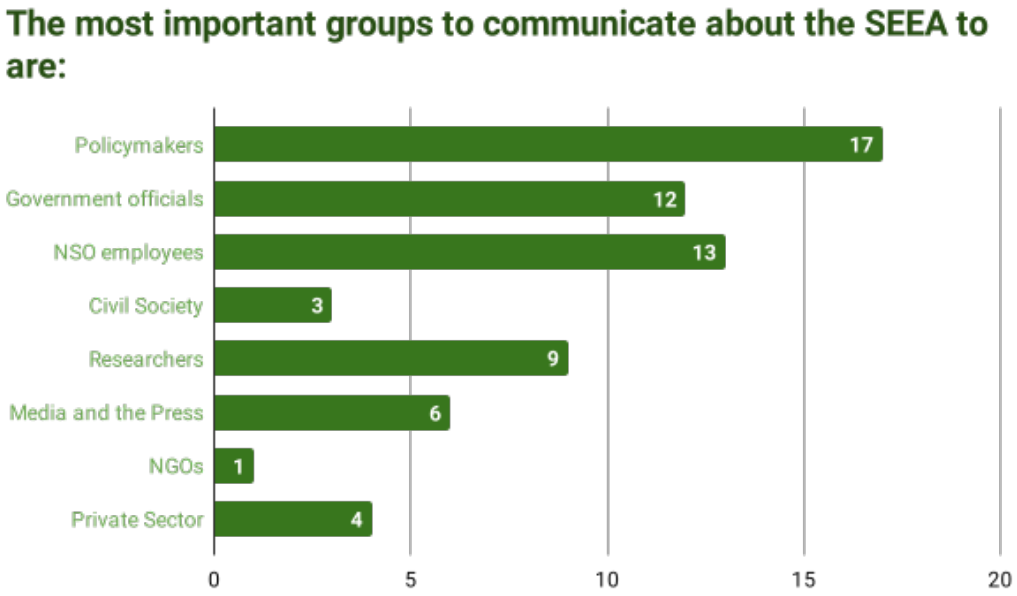


Figure 4.7 Who are the most important groups to communicate to?

The most requested topics and materials to include were **guidelines** (90%), **templates** (78%) and **real examples** (78%) of how to communicate about climate change using the SEEA accounts.

The respondents want to learn about how to communicate to **policymakers and government officials** the most (73%), followed by **fellow NSO employees** (56%), **researchers** (40%) and the **media and general public** (40%).

4.1.2 Interviews

In addition to the survey responses, online interviews were conducted with 5 respondents, who wished to remain anonymous. Their backgrounds ranged from statistical office employees for over 25 years to contract workers who work on macroeconomics and create workshops to teach statistics to developing countries. The interviewees were all asked about their opinion on current existing pain points within the field of Climate Change Communication in NSOs, with the following summarising their responses:

1. The overall complexity of climate change statistics is to be considered at all times.

2. Some countries (e.g. Nigeria) have yet to begin compiling the SEEA accounts, and are therefore still at an earlier stage than climate change communication.

3. The lack of knowledge on indicators that can be derived from the SEEA has created an additional barrier to furthering communication efforts.

4. National conversion is an important and time consuming factor to take into consideration for each country.

When asked about the most important information to communicate, the answers included accounting for flows of natural inputs and residuals, understanding climate change indicators and trends, as well as mitigation and adaptation tools. Some respondents also made it clear that there exists a gap in linking the SEEA to policy, and requested the online course to include important information on communicating to policymakers and convincing them, as well as benchmarks from already successful countries.

Finally, in order to gauge the working conditions and education tools at their disposal, participants were asked about their preference of format for online learning. Most of the respondents wished for pdf files or slide presentations, as well as easier access to SEEA documentation from the UN or short videos on specific subjects.

4.1.3 Draft - course structure

Figure 4.8 is the initial draft for the content of the first module, and is included here for reference on the process for developing the materials for the course. In addition to research on climate change communication and the SEEA and the above survey, this course was developed with the help and under the supervision of Mr. Sokol Vako, responsible for SIAP's program of work on environment related information, including relevant SDGs.

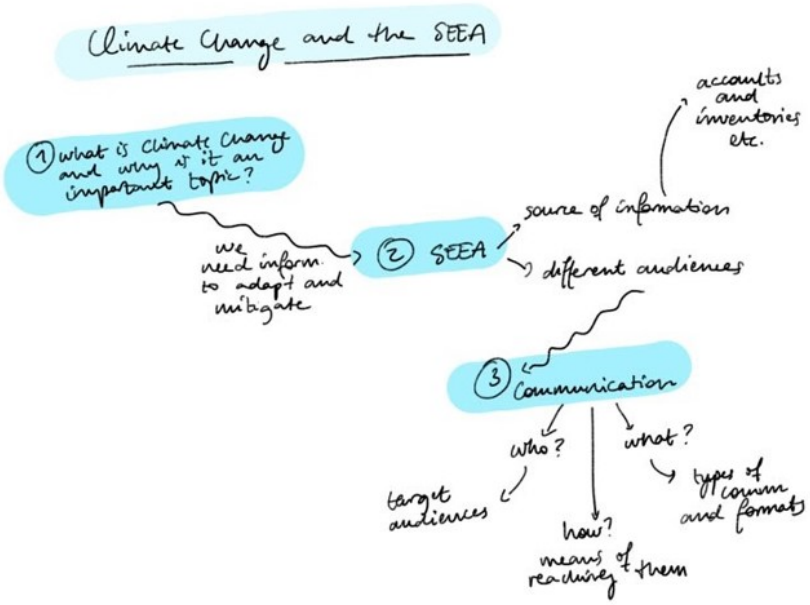


Figure 4.8 Module 1 initial draft.

Among others, he edited SEEA Energy and drafted a chapter of the book. He also worked directly with countries to increase capacity, formalize national SEEA implementation plans and compile pilot environmental economic accounts. He led the development of the SEEA e-learning courses. His expertise on subjects related to statistics and the SEEA helped bring together the elements of the course that link statistics to communication.

The following is a draft of the full course structure, divided into 5 modules and including an overview of the learning outcomes.

1. **Module 1 – Introduction**
   - Climate Change and the SEEA
     - *What is CC, what is the SEEA and why its information is relevant to the issue of communicating about sustainability?*
   - Communication practices
     - *Developing a communication strategy*
     - *General introduction to different types of information dissemination approaches and their characteristics*

  - *Some definitions and important terms/practices to understand (climate literacy, etc.)*
- Target audiences
  - *Categorization of the different audiences that you may encounter and their expected needs.*
  - *Means of reaching these different audiences*

2. **Module 2 – Communicating to experts**
   - Policy makers and government officials
     - *Who are they and what do they do?*
     - *What do they need and how do we make that available to them effectively?*
     - *What is a policy brief?*
     - *How to design a policy brief?*

3. **Module 3 – Communicating to the public**
   - General public/civil society
     - *Seeing the bigger picture and communicating it effectively*
     - *Understandable language*
     - *Framing and Storytelling*
     - *Images and Visuals*
     - *Distribution*
   - Social Media
     - *Social media strategy*
     - *What types of media/press releases exist and how to cater information to them?*

4. **Module 4 – Communicating to the Private Sector**
   - The private sector and environmental accounting
     - *The private sector and the SEEA*
     - *Introduction to communication with the private sector*

  - *CSR and NCA*
  - *What can we do?*
  - *Generally - SEEA-water and SEEA-energy*

5. **Module 5 – Summary and conclusion**
   - Putting it all together – full example
     - *General steps to understanding your audience and effectively communicating or making data available*
     - *Short Policy Brief template*
     - *Snapshots*
     - *Press Releases and template*
   - Final summary
   - What does the future look like?

4.1.4 Completed Draft and next steps

The full course draft is included in Appendix C in pdf format for reference. After initial review, this version will go through a testing and extensive review process with experts from New York and Bangkok UN offices. Moreover, the SEEA Technical Committee (about 12 experts from different countries) will assess the course contents before its publication on the e-learning platform.

Figure 4.9 Mockup for pdf version of the course.

4.2. Questionnaire Statistical Analysis

As established in Section 3.3.2, this questionnaire was created as a study on climate change communication, and more specifically as an exploration of framing. In order to support the following analysis, a demographic breakdown was created based on the information that was collected from 50 participants over two weeks.

4.2.1 Demographic Breakdown

Figure 4.10 illustrates the socioeconomic information collected from the 50 respondents to the questionnaire. This sample population[1] was gathered through online chain sampling. This means that users were not selected from a sampling frame, which is why snowball samples can be subject to numerous biases. However, because of current social distancing and emergency state regulations in Japan [68], the use of a web-based survey posed more advantages than inconveniences. Indeed, the respondents were allowed to take their time and complete the questionnaire at their own pace. Moreover, the lack of an interviewer means web surveys suffer from less social desirability bias [69] than interviewer-administered modes. Finally, web-based surveys also allow researchers to use multimedia elements and logical structures such as randomizations in an effective and controlled way. In order to answer the questionnaire, participants were asked to have lived in or currently be residing in Japan. One can notice from the demographic breakdown below that 78% of respondents were non-Japanese, while 22% were Japanese citizens (including dual citizenships). The distribution of ages includes 46% of participants aged between 18-29, of which one can assume 34% are students based on the Occupation graph. The residence distribution is heavily skewed towards people living within the city (80%) and suburbs (18%), which accurately reflects the population of Japan as discussed in Section 3.3.1, but is not conducive to further analysis due to the small sample size overall. Based on this demographic breakdown, the distribution of occupations and ages could be used for further analysis, whilst nationality and residence are too skewed for this sample size.

1 In this study, a population refers to a distinct group of individuals, whether that group comprises a nation or a group of people with a common characteristic. It is the pool of individuals from which a statistical sample is drawn for a study. The information obtained from the statistical sample allows for developing hypotheses about the larger population. [67]

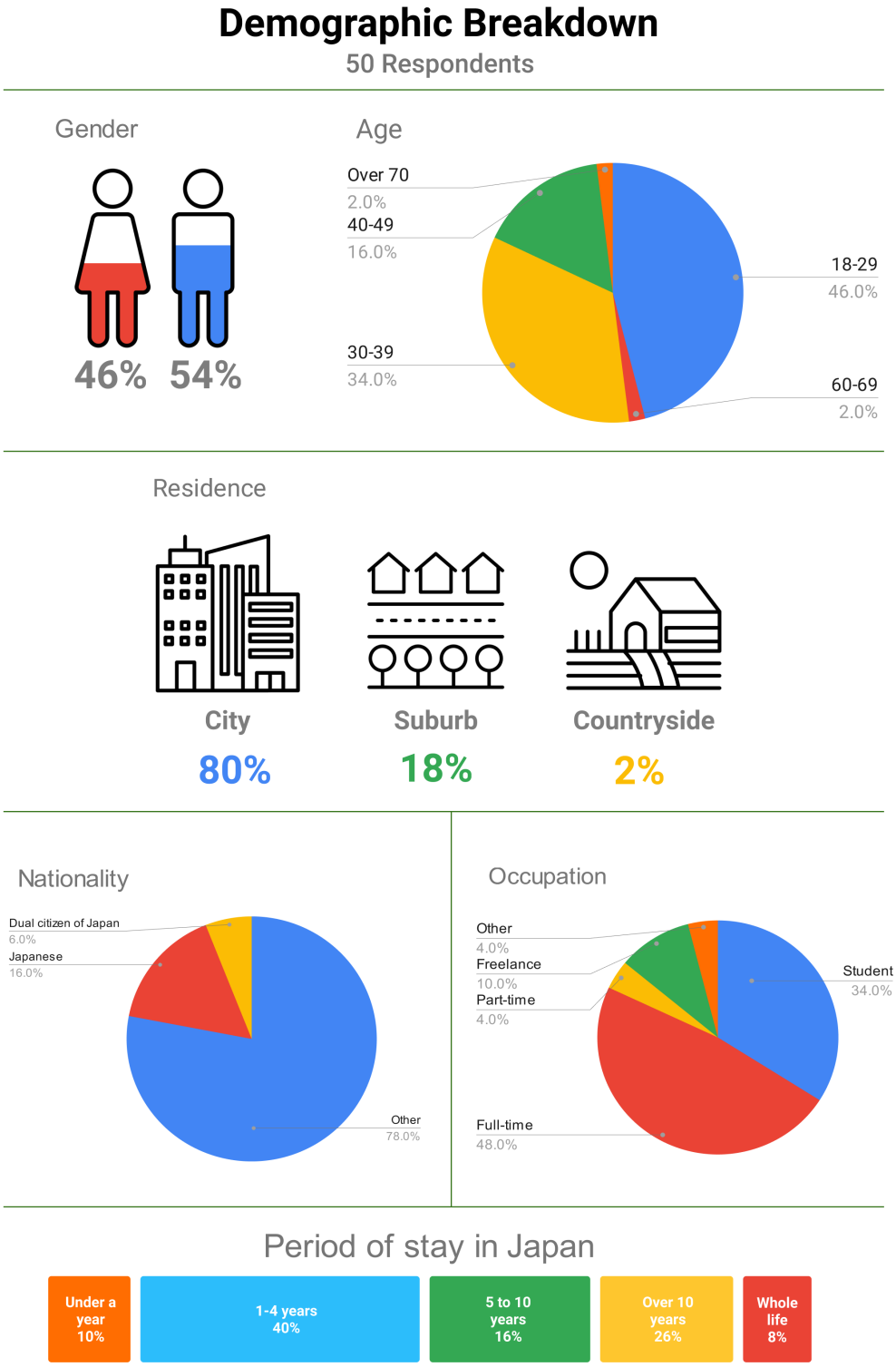


Figure 4.10 Demographic breakdown.

4.2.2 Statistical Analysis

Figures 4.11 and B.1 illustrate the distribution of scores for the questionnaire. Each user answered a total of 6 questions, scored on a binary scale of correctness and resulting in a scale of 0-6. One can observe that the results can be grouped into three categories of users - scores from 1-3 (13 users), scores from 4-5 (31 users), and users who got all answers correct and scored 6 (6 users).

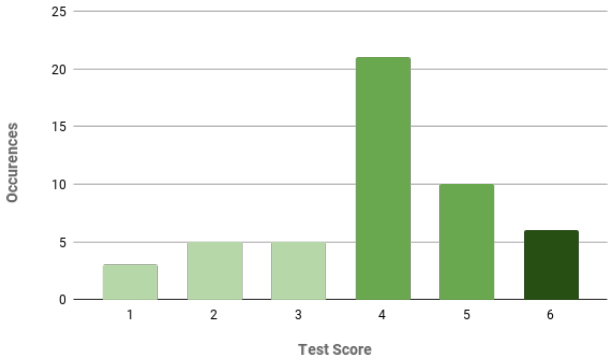


Figure 4.11 Distribution of scores.

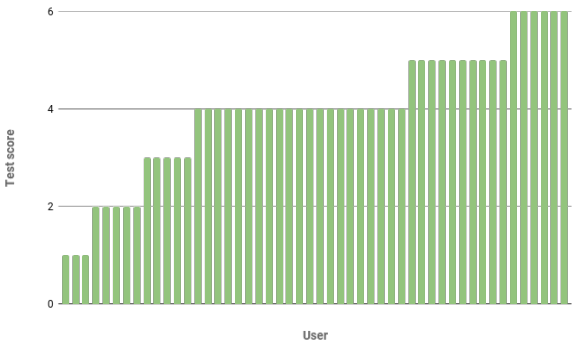


Figure 4.12 Scores per user.

Based on this initial observation, the idea is to investigate the results more closely in order to identify trends and potential pain points related to either the framing of the questions or the confidence and awareness scores of each user or user group.

Tables 4.1 and 4.2 summarise the distribution of wrong answers per module for low scoring users (1-3) and high scoring users (4-5). Based on these tables, one can notice that module 1 - Environmental framing - seems to have induced a larger amount of errors from all users. This is especially noticeable when comparing the *text-only* and *text+visual* questions for modules 1 and 2. However, limiting the analysis to these number is generally inconclusive, as there is no significant or observable difference in the percentages of wrong answers between scorer groupings and modules.

Table 4.1 Users who scored 1-3 (13 in total).

Module	**(1) Env. framing**		**(2) Human framing**		**(3) Graph**	**(4) No graph**
Additional delineation	*text*	*text+visual*	*text*	*text+visual*		
Wrong answers	11	13	6	5	9	5
Total answers	17	17	9	9	16	10
Wrong answers [%]	64.71	76.47	66.67	55.56	56.25	50

Table 4.2 Users who scored 4-5 (31 in total).

Module	**(1) Env. framing**		**(2) Human framing**		**(3) Graph**	**(4) No graph**
Additional delineation	*text*	*text+visual*	*text*	*text+visual*		
Wrong answers	10	10	12	8	6	6
Total answers	28	28	34	34	34	28
Wrong answers [%]	35.71	35.71	35.29	23.53	17.65	21.43

In addition to measuring correctness, the data set includes confidence and awareness scores linked to the questions from each module. The idea is therefore to, for example, match up users who are confident and incorrect. One might want to explore the following types of questions:
Are betters scorers able to identify what they don't know? Are certain things universally missed? Is there a link between a type of information and misplaced confidence?

Based on these questions and what can be observed directly from the data, the people who scored lower have an equal distribution of misplaced confidence in their answers, whereas for people who scored higher, it's mostly concentrated in the first half of the questionnaire where the confidence was associated with 2 questions. Additionally, the Environmental framing seems to have led to more confusion than the Human-centered framing based on the amount of wrong answers (see Figures B.2 and B.3 in Appendix B.3).

What can be reasonably assumed in this case is that the misplaced confidence (for 4-5 users) is more of a representation of the user having remembered one

of the two pieces of information only. Further analysis is needed in order to provide pertinent answers with regards to the use of confidence scores and the influence of the modules themselves on correctness, which ultimately lead to the implementation of a statistical mixed effects model.

Mixed effects model

Mixed effects models offer a more flexible approach to correlated data, because they allow for a wide variety of correlation patterns (or variance-covariance structures) to be explicitly modeled. The term mixed model refers to the use of both fixed and random effects in the same analysis. Fixed effects have levels that are of primary interest and would be used again if the experiment were repeated, in this case elements like the module type and confidence scores. Random effects have levels that are not of primary interest, but rather are thought of as a random selection from a much larger set of levels, in this case the users are therefore random effects. Indeed, subject effects are almost always random effects, while treatment levels are almost always fixed effects. Moreover, mixed effects models assume a hierarchical data structure in which data points are grouped or nested in higher order categories (e.g. students within classes) [70, 71].

In light of this, one can set up a logistic regression where the dependent variable is correct/incorrect, and the random effects are the users (they are being sampled multiple times). The idea is to statistically link correctness with the module type and confidence while controlling for the users. This will allow the results of the model to be generalized to any user. Using the lme4 package in R [72], the data can be fitted using a generalized linear mixed-effects model (GLMM) with the following function:

$$\text{glmer}(\text{Correct} \sim \text{Confidence} + \text{Module} + (1|\text{User}))$$

Table 4.3 Mixed effects for Module and Confidence.

	Estimate Std.	**Error**	**z value**	**Pr(>(|z|)**
(Intercept)	1.6855	0.4045	4.166	3.09e-05
Module	-1.4201	0.2167	-6.554	5.59e-11
Confidence	1.3401	0.3091	4.336	1.45e-05

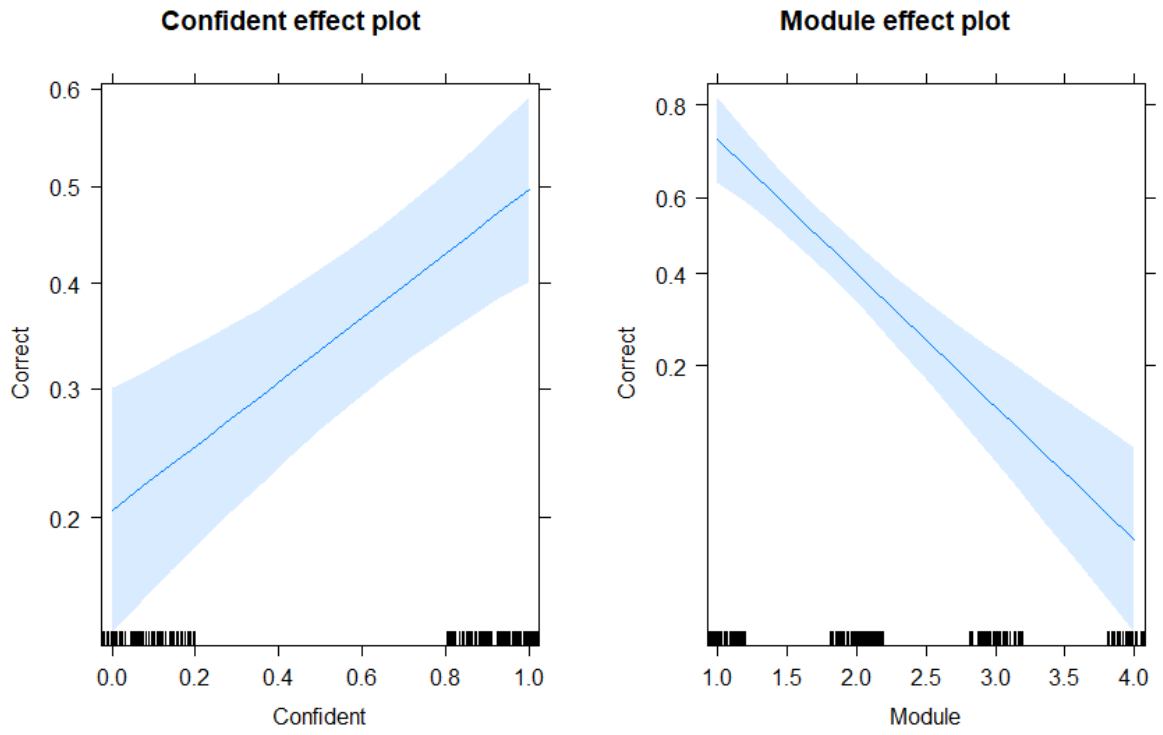


Figure 4.13 Mixed effects visualisation of the positive correlation between correctness and confidence and the fitted module effect plot (not statistically significant).

Table 4.4 Analysis of Deviance Table (Type II Wald chisquare tests).

Response: Correct	**Chisq**	**Df**	**Pr(>Chisq)**
Module	2.1327	3	0.5453
Confidence	19.1231	1	$\mathbf{1.226e^{-5}}$

Based on the analysis of deviance Table 4.4, the modules are not significant, but confidence is (p = $1.226e^{-5}$ < 0.05). Indeed, the p-value represents the significance level - whether a term significantly affects the response or not. Usually, a significance level $\alpha = 0.05$ works well[2]. For a fixed effect like the confidence score, the null hypothesis is that the fixed factor term does not significantly affect the response. This means that if p-value $\leq \alpha$, the fixed factor term significantly affects the response. In this case, because the confidence effect model returned a

2 A significance level of 0.05 indicates a 5% risk of concluding that an affect exists when there is no actual effect.

correlation of 1.3401, there is a positive correlation between high confidence and high scores from respondents. To summarize, the main takeaways are:

1. There is no "bad" module, as there does not seem to be a significant correlation between correct scores and the type of framing.
2. Individuals may have problems or pain points, but they seem to be specific to the individuals themselves.
3. Confidence estimation techniques may be interesting to use in future training sessions, as the results are significant for confidence predicting correctness.

To expand on the first point, while the mixed-effects model did not show significance between the modules and the correct rate (taking into account the repeated samples from users) we can see that there is a potential difference in Figure 4.14 between Environmental framing and Human-centered framing, as well as module 3 and 4 comparing the inclusion and exclusion of graphs. These differences in scores seem to be consistent for both users with low scores and high scores, which could indicate a significant effect from the module type. However, a larger study would need to be completed in order to draw accurate conclusions, as the sample size of 50 users did not produce statistically relevant results. On the other hand, the confidence scores were statistically significant in the model, which leads to the conclusion that confidence estimation techniques could be further explored during training sessions. A pseudo r-squared was constructed for the model using Nakagawa and Schielzeth's method [73]. The result was $R^2_{GLMM} = 0.3718$, which indicates that the model explains roughly 37% of the correctness score.

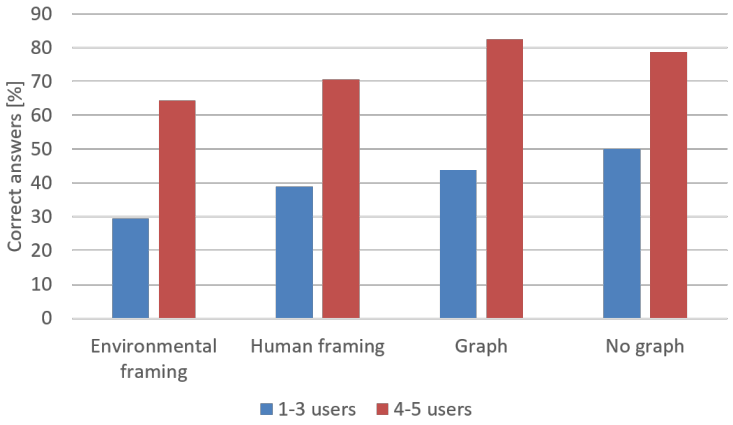


Figure 4.14 Correct answers per user group.

Finally, the last portion of the questionnaire included binary statements for the respondents to agree or disagree with, as illustrated on Figure 4.15. Almost 90% agreed that visuals substantially help them understand text-based information, which is not surprising considering existing studies on visual learning [74–76]. However, when comparing the scores of questions supported by visuals and questions based on text-only information in this study, there is no significant difference from either format. This observation leads to the assumption that further testing is necessary within the specific context of understanding the influence of visuals on retention and learning. When it comes to the perception of respondents on their knowledge of climate change issues, one can observe that the distribution is completely equally divided. Comparing this data to the questionnaire results, there is no statistically significant relationship between previous knowledge of climate change and user scores.

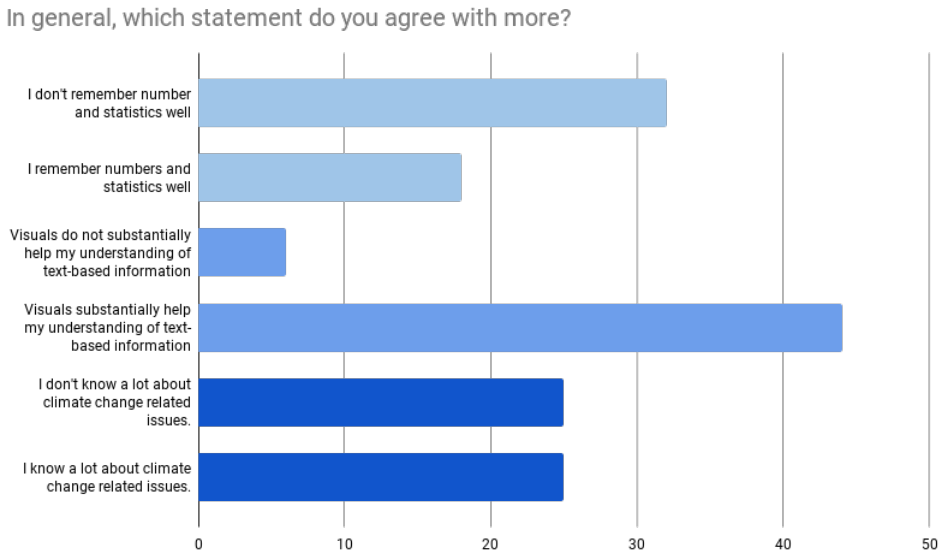


Figure 4.15 Results from the last section of the questionnaire.

Regarding the question about remembering numbers and statistics well, 64% of users responded negatively. In order to further investigate these two groups, a Point-Biserial Correlation test was conducted to relate user scores to their perceived capacity to remember statistics. The results are summarised in Table 4.5.

Table 4.5 Point-Biserial Correlation for scores VS memory of statistics.

Pearson's product-moment correlation		
data: memory (0-1) and total scores (1-6)		
t = 2.2506	df = 48	**p-value = 0.02903**
95 percent confidence interval	0.03348523	0.54079463
sample estimates	**cor = 0.3089533**	

The analysis shows weak positive correlation, suggesting that respondents who answered they remember numbers and statistics well tend to score higher. However, it is not statistically significant when taking into account the Bonferroni corrected alphas from running the correlation test with the answers from climate change knowledge as $\mathbf{p = 0.02903 > 0.025}$. This result is not surprising as the correlation was weak, and a larger sample size would need to be tested in order to further investigate these questions.

Chapter 5
Discussion

The overall scope and scale of this project covers not only a wide range of users and subjects, but also currently growing, developing and highly relevant fields of academia. For this reason, the following discussion explores some of the findings and conclusions from the previous section in an attempt to paint a larger picture of the contributions and potential of this type of work.

5.1. The Bigger Picture

At the first level of information dissemination, the source of data for creating communication is naturally of high importance. However, once data has been collected, classified and analysed following national or international standards, the subsequent communication of these results is what will ultimately have an impact on how to mitigate or adapt to climate change. The opportunity to inform and train statisticians and employees from NSOs provides the chance for creating change at the root and possibly setting in motion a trickle down effect. This work and research into climate change statistics and communication highlighted the importance of having common standards, frameworks and methodologies surrounding the aggregation and distribution of information. Although the developed course for SIAP is not online yet, the draft and learning outcomes from this research will hopefully provide some guidance and go towards a better implementation of climate change communication.

Having data and methodologies is important, but some findings and studies require user testing, and the literature review on climate change communication clearly established a gap within studies on framing in the Asia Pacific region. This initial questionnaire's aim is therefore to pave the way towards further develop-

ing this field within Japan, as well as informing current practices. Although the analysis on the framing of information did not produce statistically significant results, this study highlighted the possible use of confidence measurement to gauge understanding and retention of climate change related information. Indeed, not only correctness, but also self-confidence have been shown to play an important role in improving education and the acquisition of knowledge [77]. Measuring respondents' confidence levels can become a tool for adapting teaching or communication methods, and prevent learning from spreading misconceptions. For example, situations where users were confident-incorrect or unconfident-correct can cause problems in long term memory recall and general understanding - being correct and unconfident has been linked to lower recall [78] and being incorrect and confident could lead to further misunderstandings.

Quantified learning has been shown to have high potential in digital education [79], and refers to sensing learning behaviours and patterns and giving contextual and personalised feedback to learners. Self-confidence is an affective state that has shown particularly promising results in improving the performance and efficiency of learning [80–82].

Moreover, both the initial survey on pro-environmental identity and the above-mentioned questionnaire highlighted the general lack of awareness on climate change in Japan, as well as the misunderstanding of mitigation and adaptation efforts, corroborated by many other studies [56, 83–85].

All in all, these two works are part of the larger scope and landscape covered by climate sciences, both social and physical/applied. Whilst some of the findings were not as significant as anticipated, the potential for further investigations and large scale testing is promising.

When looking to understand the bigger picture, the question at the heart of understanding climate change is why, having lost all plausible deniability of the link between human activity and global warming in 1988, have we failed to respond in ways that would prevent dire futures [86]. Climate change can seem overwhelming in its complexity and scope, and sometimes even imperceptible. It is local yet global, can be undetectable yet undeniable, and seem urgent yet distant. Communicating and opposing these problems is not an easy task. Some

countries have made significant progress in the last decades, others are locked in - politically, physically or culturally. We need a positive vision, a story to pull us towards a future that we want to inhabit. This goes beyond mere "reason" and scientific credibility, which has not yet proven to be effective enough. A culture has a story, a framing narrative that can operate on a larger scale than several decades. Our civilization has already been through great shifts - e.g. from the agricultural to industrial ages - but a new one is coming. The Chinese Constitution was amended in 2018 to include "Ecological Civilization" [87]. It serves as a vision of sustainable development with Chinese characteristics and refers to philosophical and civilizations traditions. It seeks to complement the three core dimensions of the concept of sustainable development - the environmental, the economic, and the social dimensions. Perhaps this is an example of such a positive vision to unite and frame the climate crisis.

5.2. Limitations and Future Works

Firstly, and as discussed previously, the sampling method potentially introduced biases in the data, which needs to be kept in mind when analysing the data for trends. This limitation is one that comes with any study involving user sampling, but should nonetheless be taken seriously when talking about or generalising findings and trends within data.
Overall, more users would be needed to produce statistically relevant results on the framing study, which itself was also limited in its scope: more testing would include a more in-depth bottom-up design approach to the questionnaire, and the addition of other types of frames and contextual elements. Contextualizing this study more specifically to Japan is also a possible future route, which would require translating materials and further research into specific design paradigms, cultural norms and user groups.

With regards to the online course, the time frame of production and execution for these projects is unfortunately larger than that of this thesis, resulting in the finalisation of the draft but not the implementation on the e-learning platform and potential testing of users and students. Although a thorough and exhaustive surveying and interviewing process was conducted for this initial step, additional

information and insights would be gathered from having students take the course and give feedback on their learning experiences. Moreover, the spread of e-learning platforms has its advantages in accessibility and convenience, but it also comes with its flaws and downsides. Real time, in person workshops used to be conducted in conjunction with the development of these materials at SIAP, and in the future these might return and provide an additional source of training for both statistical institute employees and civil society.

Regarding the statistical tests and questionnaire methodology, future improvements could involve moving away from self-reported scales for self-confidence and awareness, as there are already existing methods for automatic confidence prediction based on hand-writing analysis or eye-tracking technology [82, 88, 89]. These have not yet been used within the context of climate change communication, but could contribute to furthering the field and the ongoing debate on how to effectively disseminate information to various user groups.

Chapter 6
Conclusion

Climate change communication has become a salient topic in science and society. This research situates the theory of climate change communication within a historical context and the field of science communication, and explores some of the inherent challenges in talking about climate change to different target users using various tools and strategies.

In particular, the user study on climate change communication suggests that the use of confidence measurements may have an impact on memory and recall of information. This was confirmed through the use of a mixed-effects model, and prompts further studies to be conducted at the intersection of HCI and climate change communication. With regards to the frame analysis, more research is also needed but the initial findings show promise for the use of contextualisation and its potential to improve efficacy of communication.

In addition, the development of an online course to train statistical institute employees contributes to the overall spread of climate literacy and effective dissemination of information. The modules engage with the difficult issue of the relationship between data, communication and demand from differing user groups, as well as providing an overview of emerging frameworks for statistical communication and aggregation like the SEEA.

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Appendices

A. The United Nations: ESCAP and SIAP

About ESCAP

According to their website, the Economic and Social Commission for Asia and the Pacific (ESCAP) serves as "the United Nations' regional hub promoting cooperation among countries to achieve inclusive and sustainable development" [90].

Moreover, ESCAP represents the largest regional intergovernmental platform with 53 Member States, enabling the dissemination of analytical and statistical products for economic, social and environmental purposes. Recently, the focus of the Commission has been the delivery of the 2030 Agenda for Sustainable Development, which includes reinforcing and promoting regional and global cooperation and integration of practices such as the SEEA. Indeed, in addition to its research and analysis work, ESCAP provides policy advisory services and capacity building to governments with the aim of deepening their understanding of sustainability and inclusivity issues. With this in mind, it is clear that the ESCAP's current priority is the implementation of the Sustainable Development Goals (SDGs). The following Figure A.1 represents the areas in which ESCAP is carrying out work, in cooperation with other United Nations entities and intergovernmental organizations.

Figure A.1 ESCAP areas of work.

According to their website, these are the ways in which the products and services provided by ESCAP build national capacities:

- Strengthening and implementing equitable and sustainable economic and social development policies and programs, including regulatory and institutional frameworks;
- Preparing for, participating in and benefiting from multilateral and regional trade, transport, information and communication technology, energy and environmental partnerships and agreements;
- Building effective partnerships with civil society entities and the private sector;
- Reviewing progress in achieving the internationally agreed development goals and targets adopted at global and regional conferences.

About SIAP

The Statistical Institute for Asia and the Pacific (SIAP) was established in May 1970 as a centre for statistical training in Asia and the Pacific by 20 Governments [Afghanistan, Australia, Ceylon, China, India, Indonesia, Iran, Japan, Laos, Malaysia, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Republic of Vietnam, Singapore, Thailand, United kingdom (Hong Kong) and Western Samoa], the United Nations and United Nations Development Programme by the initiative of Government of Japan [5].

As of today, the Institute is a subsidiary body of ESCAP, and its mission is to strengthen the capability of developing members and associate members and economies in transition within the region to collect, analyze and disseminate statistics. Moreover, SIAP provides statistical training and other related educational activities.

Since 2015, SIAP has aimed to provide high quality information and training to its member countries to deepen their understanding of how to implement and achieve the SDGs, and more specifically how to use statistical frameworks like the SEEA to do so. Improving the use of statistics for evidence-based decision-making is an essential part of achieving these sustainability goals, as well as building resilient and future-proof societies in the ESCAP region.

B. Surveys, forms and data

B.1 UN Course Survey

Online Survey - Developing good approaches to communicating about Climate Change using the SEEA

This research and the following survey will be used to inform the development of an online course for the SIAP e-learning platform (https://siap-elearning.org/). In order to better understand the landscape of communication on climate change statistics, we would like to gather some information from potential users and people who mainly work within the context of the SEEA and National Statistics Offices (NSOs).

This survey includes both multiple choice questions and open-ended, text-based ones - separated into two sections. Not all questions have to be filled in in order to move onto the next section, and not all sections are mandatory to complete the survey. Participants can decide to complete the first section only (multiple choice), which should take approximately 5 minutes, or both sections (multiple choice and open-ended questions), which should take approximately 10-15 minutes. The data collected in this survey will be kept anonymous, and will only be used in the context of this research. It will not be shared with any other party beyond SIAP and Keio University. Additionally, if you have any questions or concerns, please feel free to email the following address: lawrence.quest@un.org (Primary Researcher)

Demographic questions

1. Age
    - 18-29
    - 30-39
    - 40-49
    - 50-59
    - 60-69
    - Over 70
    - Prefer not to say

2. Gender Identity
    - Male
    - Female
    - Non-binary
    - Other
    - Prefer not to say
3. Nationality
4. Country of Residence
5. Primary Employement/Occupation status
    - NSO employee
    - Statistics/SEEA related employment
    - Other
    - Prefer not to say

Likert Scale Questions *This section of the survey contains statements that use a Likert scale of 5 points for evaluation. Please use this scale to express how much you agree or disagree with a particular statement. If you do not know, please select 3. If you do not know how to answer or if it does not apply to you, please skip the statement.*

1. It is important to effectively communicate about Climate Change using the SEEA and statistics.
2. People who work with or within NSOs need to know how to effectively communicate about Climate Change in relation to the SEEA and statistics.
3. There is a clear communication strategy in place for communicating about the SEEA and statistics related to Climate Change.
4. The NSO knows how to present and apply SEEA accounts and data to different user groups and audiences (e.g. policymakers, civil society) in your country.

5. The NSO currently does present and apply SEEA accounts and data to different user groups and audiences (e.g. policymakers, civil society) in your country.

6. Information on the SEEA and Climate Change related accounts and statistics is easily accessible in multiple forms in your country.

7. An online course could help improve the communication of Climate Change indicators related to the SEEA.

Multiple Choice Questions

1. An online course should provide:

   - General information
   - Guidelines
   - Templates
   - Real examples
   - Other

2. The most important groups to communicate about the SEEA to are:

   - Policymakers
   - Government officials
   - NSO employees
   - Civil society
   - Researchers
   - Media and the Press
   - NGOs
   - Private Sector
   - Other

B.2 Climate Change Communication Questionnaire Consent Form

You are invited to participate in a study investigating communication of climate change issues. This questionnaire can be answered by anyone who has lived in Japan most of their life and/or is of Japanese nationality and has previously lived in Japan. This questionnaire is only available in English. This questionnaire requires no prior knowledge in order to be completed.

Time involvment: The questionnaire will take approximately 15 minutes. The first section will ask a few demographic questions. The second part involves reading and examining 4 informative slides, followed by a series of multiple choice questions on them.

Data collection: The data that will be gathered from you is twofold, first we will ask for some demographic information and an email address (both on a voluntary basis). Secondly, we will be collecting your answers to the questionnaire. The data collected in this survey will be analysed in an anonymous way, and will only be used in the context of this research.

Risks and benefits: There are no risks associated with your participation. The collected data will be securely stored. We guarantee no data misuse and that privacy is completely preserved. There will be no compensation for answering this questionnaire.

Participant's rights: If you have read these conditions and have decided to participate in the study, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time. Your identity will not be disclosed unless we directly inform and ask for your permission.

B.3 Climate Change Communication Questionnaire data

User	Score_topical	Score_stylistic	Age	Sex	Nationality	Occupation	Period stay	Residence	Score_total
1	1	0	18-29	Male	Other	Student	1-4 years	City	1
2	3	1	60-69	Male	Other	Full-time	Over 10 years	Suburb	4
3	1	1	18-29	Female	Japanese	Student	Whole life	City	2
4	2	2	18-29	Female	Dual citizen of Japan	Student	5-10 years	City	4
5	2	2	30-39	Female	Other	Part-time	1-4 years	Suburb	4
6	2	0	18-29	Female	Other	Student	Under a year	City	2
7	3	2	18-29	Male	Other	Full-time	1-4 years	City	5
8	2	2	18-29	Male	Other	Full-time	1-4 years	City	4
9	3	2	18-29	Female	Other	Student	1-4 years	City	5
10	4	2	18-29	Female	Japanese	Student	Over 10 years	Suburb	6
11	3	1	30-39	Male	Other	Full-time	Over 10 years	City	4
12	2	2	40-49	Female	Japanese	Full-time	Whole life	City	4
13	3	1	18-29	Male	Other	Student	1-4 years	City	4
14	4	2	18-29	Female	Japanese	Student	Whole life	City	6
15	2	1	18-29	Female	Other	Part-time	Under a year	Suburb	3
16	2	2	40-49	Female	Other	Full-time	Over 10 years	Suburb	4
17	2	2	40-49	Female	Other	Freelance	Over 10 years	City	4
18	3	2	30-39	Female	Other	Full-time	5-10 years	City	5
19	3	1	18-29	Female	Other	Student	1-4 years	City	4
20	3	1	Over 70	Male	Other	Freelance	Over 10 years	Suburb	4
21	2	1	30-39	Female	Other	Full-time	1-4 years	City	3
22	2	1	18-29	Female	Other	Full-time	1-4 years	City	3
23	3	1	30-39	Male	Other	Freelance	1-4 years	City	4
24	2	2	30-39	Female	Other	Full-time	5-10 years	City	4
25	4	2	18-29	Female	Japanese	Full-time	1-4 years	City	6
26	1	1	40-49	Male	Other	Full-time	Over 10 years	City	2
27	3	2	18-29	Male	Other	Student	Under a year	City	5
28	3	1	30-39	Female	Other	Full-time	Over 10 years	City	4
29	2	1	40-49	Male	Other	Full-time	1-4 years	City	3
30	3	2	30-39	Male	Other	Full-time	5-10 years	Suburb	5
31	2	2	40-49	Male	Other	Full-time	Over 10 years	City	4
32	4	2	18-29	Male	Japanese	Full-time	Over 10 years	City	6
33	2	2	30-39	Male	Japanese	Freelance	Whole life	City	4
34	4	2	30-39	Male	Other	Full-time	5-10 years	City	6
35	3	2	18-29	Male	Other	Student	1-4 years	City	5
36	2	2	30-39	Female	Other	Student	1-4 years	City	4
37	4	2	30-39	Male	Other	Full-time	5-10 years	City	6
38	3	1	18-29	Male	Other	Student	5-10 years	City	4
39	3	2	40-49	Male	Dual citizen of Japan	Other	Over 10 years	Suburb	5
40	3	2	18-29	Female	Dual citizen of Japan	Student	1-4 years	Countryside	5
41	0	1	30-39	Female	Other	Student	1-4 years	City	1
42	3	1	18-29	Male	Other	Full-time	1-4 years	City	4
43	3	1	18-29	Male	Other	Student	Under a year	City	4
44	3	2	30-39	Female	Other	Full-time	5-10 years	City	5
45	1	1	30-39	Male	Other	Full-time	1-4 years	City	2
46	3	1	18-29	Male	Japanese	Student	Over 10 years	City	4
47	4	1	30-39	Male	Other	Full-time	1-4 years	City	5
48	0	1	40-49	Female	Other	Freelance	Over 10 years	City	1
49	1	2	30-39	Male	Other	Full-time	Under a year	Suburb	3
50	1	1	18-29	Male	Other	Other	1-4 years	City	2

Figure B.1 User scores and demographics table.

incorrect and confident | confident

	Incorrect				Confident			
Score 1-3	*environmental framing*	*human framing*	*graph*	*no graph*	*environmental framing*	*human framing*	*graph*	*no graph*
User	**A1A2**	**B1B2**	**A**	**B**	**A1A2**	**B1B2**	**A**	**B**
1	1.5	0	2	0	0	0	0	0
2	0	1.5	1	0	0	0	0	0
3	1	0	2	0	0	0	0	0
4	1	0	1	0	0	0	0	1
5	1	0	0	1	0	0	2	0
6	0.5	0.5	0	1	0	1	0	1
7	1	0.5	0	1	0	0	0	1
8	0.5	0.5	1	0	1	0	1	0
9	1	1	0	1	0	0	1	0
10	1.5	0	0	1	1	0	0	1
11	0	2	1	0	0	0	0	1
12	1.5	0	0	0	1	0	2	0
13	1.5	0	1	0	2	0	0	1

	Incorrect				Confident			
Score 4-5	*environmental framing*	*human framing*	*graph*	*no graph*	*environmental framing*	*human framing*	*graph*	*no graph*
User	**A1A2**	**B1B2**	**A**	**B**	**A1A2**	**B1B2**	**A**	**B**
1	1	0	0	0	0	1	1	0
2	0.5	0.5	0	0	1	1	1	1
3	0	0.5	0	0	0	2	1	0
4	1	0	0	0	1	0	1	1
5	0.5	0	0	0	1	0	0	0
6	0.5	0	0	1	0	1	0	0
7	0	1	0	0	0	1	0	1
8	0	0.5	1	0	0	1	0	1
9	0	1	0	0	1	0	1	0
10	0	1	0	0	0	1	1	1
11	0.5	0	0	0	1	1	2	0
12	0	0.5	1	0	1	0	0	0
13	0	0.5	1	0	1	0	0	0
14	0.5	0	0	1	1	1	1	0
15	1	0	0	0	2	0	1	1
16	0	0.5	0	0	0	2	1	1
17	0.5	0	1	0	1	0	1	0
18	0	0.5	0	0	0	2	1	0
19	1	0	0	0	1	0	1	1
20	0	1	0	0	0	0	2	0
21	0	0.5	0	0	0	2	0	0
22	0.5	0.5	0	0	0	1	1	0
23	0	0.5	1	0	0	2	0	1
24	0.5	0	0	0	1	1	0	1
25	0	0.5	0	0	0	1	0	1
26	0.5	0	0	1	1	1	1	0
27	0.5	0	0	1	1	0	0	1
28	0	0.5	0	0	0	0	1	1
29	0.5	0	1	0	1	0	1	1
30	0	0	0	1	0	0	0	1

Figure B.2 Incorrect and Confident responses for 1-3 and 4-5 users.

correct and unconfident | unconfident

	Correct				Unconfident			
Score 1-3	*environmental framing*	*human framing*	*graph*	*no graph*	*environmental framing*	*human framing*	*graph*	*no graph*
User	**A1A2**	**B1B2**	**A**	**B**	**A1A2**	**B1B2**	**A**	**B**
1	0.5	0	0	0	2	0	2	0
2	0	0.5	1	0	0	2	2	0
3	0	1	0	0	1	1	2	0
4	1	0	0	1	2	0	1	0
5	1	0	1	0	1	0	0	1
6	0.5	0.5	1	0	1	0	1	0
7	0	0.5	0	1	1	1	0	1
8	0.5	0.5	1	0	0	1	1	0
9	0	0	1	0	1	1	0	1
10	0.5	0	0	1	1	0	0	1
11	0	0	0	1	0	2	0	1
12	0.5	0	2	0	1	0	0	0
13	0.5	0	0	1	0	0	1	0

	Correct				Unconfident			
Score 4-5	*environmental framing*	*human framing*	*graph*	*no graph*	*environmental framing*	*human framing*	*graph*	*no graph*
User	**A1A2**	**B1B2**	**A**	**B**	**A1A2**	**B1B2**	**A**	**B**
1	0	1	1	1	1	0	0	1
2	0.5	0.5	1	1	0	0	0	0
3	0	1.5	1	1	0	0	1	0
4	1	0	1	1	1	0	0	0
5	1.5	0	0	2	1	0	0	2
6	0.5	1	0	1	1	0	1	1
7	0	1	0	2	0	1	0	1
8	0	1.5	0	1	0	1	1	0
9	1	0	2	0	0	1	1	0
10	0	1	1	1	0	1	0	0
11	0.5	1	2	0	0	0	0	0
12	1	0.5	1	0	0	1	2	0
13	1	0.5	0	1	0	1	1	1
14	0.5	1	1	0	0	0	0	1
15	1	0	1	1	0	0	0	0
16	0	1.5	1	1	0	0	0	0
17	1.5	0	1	0	1	0	1	0
18	0	1.5	2	0	0	0	1	0
19	1	0	1	1	1	0	0	0
20	0	1	2	0	0	2	0	0
21	0	1.5	1	1	0	0	1	1
22	0.5	0.5	2	0	1	0	1	0
23	0	1.5	0	1	0	0	1	0
24	0.5	1	1	1	0	0	1	0
25	0	1.5	1	1	0	1	1	0
26	0.5	1	1	0	0	0	0	1
27	1.5	0	0	1	1	0	0	1
28	1	0.5	1	1	1	1	0	0
29	1.5	0	0	1	1	0	0	0
30	1	1	0	1	1	1	0	1

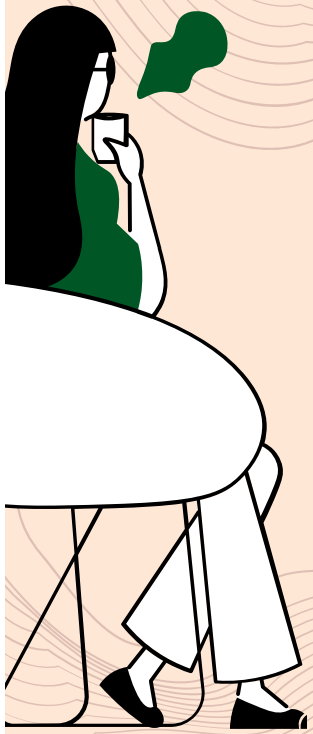
Figure B.3 Correct and Unconfident responses for 1-3 and 4-5 users.

C. Online Course Materials

The following is the completed first draft for the SIAP course on climate change communication, converted to pdf for the purpose of this thesis.

COMMUNICATING ABOUT CLIMATE CHANGE USING THE SEEA

Developing good approaches to communicating about Climate Change using SEEA data and statistics.



DRAFT #1

JUNE 2021

Overview

WHAT?

This course focuses on effectively communicating about Climate Change using the SEEA. We will explore target audiences and communication practices that would benefit from the information contained in the SEEA accounts and data from national statistical institutes, as well as examples of good practices.

WHO?

This course is designed for those within the national statistical institutes that are compiling and disseminating SEEA accounts with a focus on Climate Change.

Analysts, researchers or anyone curious about learning how to communicate about Climate Change effectively could also benefit from this course.

WHY?

Communicating about Climate Change is essential to bridging the gap between research/compilation of data and practice/applications. The social science of Climate Change Communication is a complex and challenging issue, as Climate Science can be uncertain, abstract and polarising. In some countries, the issue is already politically polarising, while in others it is the absence of a public and political discourse that poses a problem.

Module 1
Introduction

Overview and learning outcomes

Climate Change and the SEEA

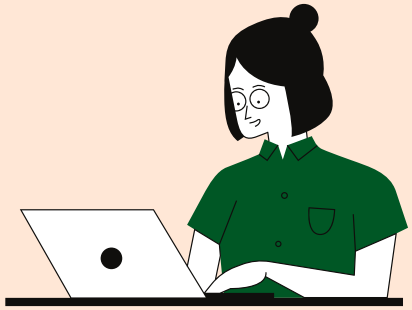
- What is CC, what is the SEEA and why its information is relevant to the issue of communicating about sustainability?

Communication practices

- Developing a communication strategy
- General introduction to different types of information dissemination approaches and their characteristics
- Some definitions and important terms/practices to understand (climate literacy, etc.)

Target audiences

- Categorization of the different audiences that you may encounter and their expected needs.
- Means of reaching these different audiences



(1) Climate Change

"Climate change" is defined by the UNFCCC as: **a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.**

These changes in the mean and/or variability of its properties can be caused by natural processes or external forcings (this includes the generation of GHG for production and consumption).

Climate Change is a complex issue with many components (see course on CC indicators). For example, human activities such as burning of fossil fuels leads to GHG emissions which are a main contributor to climate change. The response to ever-increasing GHG emissions focuses on two main components: **mitigation** (avoid consequences – reducing the flow of heat-trapping GHG into the atmosphere) and **adaptation** (adapt to consequences – adapting to life in a changing climate, adjusting to an actual/expected future).

https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf

Moreover,

- *Climate Change is a global phenomenon, which is why response requires a mixture of international agreements (1992 UNFCCC, 2015 SDGs, 2016 Paris Agreement,...), national plans and individual action. What all of these interventions have in common is the need for **high quality data**, in order to create effective policy interventions based onindicators and trustworthy information.*
- ***Statistical indicators** are used to inform Climate Change responses in many ways (tracking, raising awareness of issues, promoting accountability, supporting policy development and integration).*
- *In order to have an integrative approach and to compile all of these indicators and data, one must combine information from economic, social and environmental domains within a **statistical framework.***

(2) SEEA - System of Environmental Economic Accounting

"The SEEA provides a comprehensive approach to the organization of environmental and economic information, covering both stocks and flows, and conceptualizing the interconnected relationship between the environment and economy in a coherent manner.

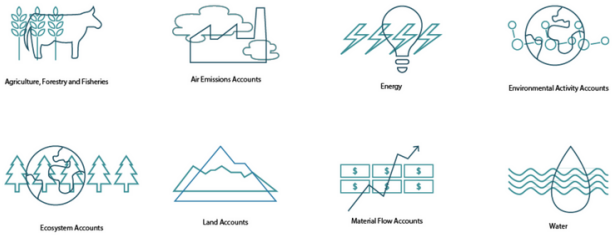
It therefore **connects the different policy domains associated with environmental and economic data, which is precisely the type of information needed to inform the climate change policy process.** The link between the environment and economy in the SEEA is made possible because the SEEA uses the same concepts, definitions, classifications and boundaries as the System of National Accounts (SNA), from which GDP is derived.

The SEEA is the agreed upon international statistical standard for understanding the relationship between the environment and the economy, and it uses aligned definitions and classifications as a conceptual framework.
The Central Framework (CF) of the SEEA deals with environmental flows (of materials and energy) and stocks (of natural resources), as well as environmental economic statistics (transactions, taxes, subsidies,...).

System of Environmental Economic Accounting

https://seea.un.org/sites/seea.un.org/files/seea_-_climate_change_-_web_ready.pdf

The SEEA is divided into the following **thematic areas**:



As a source of information, the SEEA's accounts and indicators need to be communicated to a multitude of audiences with different needs and levels of understanding.

Therefore, using these accounts and data, the challenge is to create and disseminate communications about these CC statistics effectively, whether it be for policy makers or the general public.

The Central Framework comprises the following types of **tables and accounts**:

(a) supply and use tables in physical and monetary terms showing flows of natural inputs, products and residuals;

(b) asset accounts for individual environmental assets in physical and monetary terms showing the stock of environmental assets at the beginning and the end of each accounting period and the changes in the stock;

(c) a sequence of economic accounts highlighting depletion-adjusted economic aggregates; and

(d) functional accounts recording transactions and other information about economic activities undertaken for environmental purposes.

Examples of indicators

***SEEA-Energy** is a subsystem of the central framework related to energy accounts. It provides inputs for calculating indicators relevant to climate change related to energy consumption.*

Here are some examples of energy indicators related to climate change and derived from energy accounts:

(1) Total energy use by the national economy

- This measures the amount of energy used by resident units of a given economy
- Measure in PJ (petajoules)
- Globally, the use of energy represents by far the largest source of greenhouse gas emissions from human activities, linking it directly to climate change. At the core of the energy challenge is our overall consumption and our dependence on fossil fuels. Climate change can alter our energy generation potential and energy needs. For example, changes to the water cycle have an impact on hydropower, and warmer temperatures increase the energy demand for cooling in the summer, while decreasing the demand for heating in the winter.

(2) Share of fossil fuels in total energy use by the national economy

- This includes coal, peat, oil and natural gas
- This does not include non-energy related production, such as oils used to manufacture plastics
- Measured in PJ (petajoules)
- About two thirds of global greenhouse gas emissions are linked to burning fossil fuels for energy to be used for heating, electricity, transport and industry. Knowing the share of fossil fuels in total energy use is an important tool for policymakers to advocate for mitigation as part of the 2015 Paris Agreement.

(3) Renewable energy share in total energy use by the national economy

- Measures as the percentage of renewable energy within the total energy use of the national economy
- To succeed in limiting global warming, the world urgently needs to use energy efficiently while embracing clean energy sources. The target of the Paris Agreement — limiting the global average temperature rise to well below 2 °C, while aiming to limit the increase to 1.5 °C — is ambitious and cannot be achieved without a major overhaul of global energy production and consumption. This includes reducing current emissions and/or replacing them with cleaner alternatives like renewable energy (wind, solar, etc).

Examples of indicators

*The **air emissions accounts** in the SEEA provide information on emissions released to the atmosphere by establishments and households as a result of production, consumption and accumulation processes using the structures and principles laid out in the Central Framework.*
Air emissions indicators related to climate change are computed using information from the air emissions accounts. Here are some example of relevant ones (all measured in kt (kilotonnes) of CO2 equivalent):

(1) Total GHG emissions from the national economy

- Describes the total emissions from all residents of a national economy – households and industries.
- Total greenhouse gas emissions are the sum of emissions of various gases: carbon dioxide, methane, nitrous oxide, and smaller trace gases. An increase in the atmospheric concentrations of greenhouse gases produces a positive climate forcing, or warming effect. From 1990 to 2019, the total warming effect from greenhouse gases added by humans to the Earth's atmosphere increased by 45 percent.

(2) Total GHG emissions from production activities

- Describes the total emissions from production activities of industries and services
- Global greenhouse gas emissions continue to rise, at a time when they need to be rapidly falling. The previous indicator encompasses emissions from the whole economy of a country. But to effectively reduce emissions, we need to know where they are coming from – which sectors contribute the most? How can we use this understanding to develop effective solutions and mitigation strategies?

(3) Carbon Footprint

- Describes the amount of CO2 emissions associated with domestic final use and those indirectly emitted by households.
- In summary, a carbon footprint represents the total amount of greenhouse gas emissions that anything - a person, organization, event or product - has produced. Greenhouse gases are the gases in the atmosphere that produce the "greenhouse effect" and contribute to global warming and climate change. Therefore, carbon footprints are a way to measure the environmental impact of lifestyles or total cycles of use for products.

(3) Communication

When it comes to communicating about SEEA accounts and indicators derived from them, there are many factors that need to be considered.
A **Communication strategy** is a plan to achieve communication objectives. This can apply to internal communications as well as public relations or promoting. The main components to be considered are:

- **WHY?** Communication goals – the desired end-results, these are typically the first step, and designed to be measurable (eg: goal is to generate awareness about a specific issue, measurement is an estimated number of people reached)
- **WHAT?** Messages/Content – the necessary information to effectively deliver the communication goal.
- **WHO?** Target audience - the people who you seek to communicate with. They need to be clearly defined, as they often determine the content of the communication strategy.
- **HOW?** Channels – the means of reach.

Combing all this information, one can create a **Communication Plan** – an outline and summary of how the strategy will be achieved.

Why and What - Goals and messaging

Based on the desired end result of the communication and the target audience, content needs to be catered differently and formatted specifically.

Generally, readers require information which is tailored according to:

- Relevance to purpose
- Type of information
- Format of presentation
- Regional and/or thematic context
- Language
- Terminology

The same set of raw data and information may need to be presented in entirely different ways to address the specific user needs, and this applies to SEEA accounts too.

This adaptation process is an important step to make sure the data and information can be understood and used properly by the audience. This task can most effectively be taken on by ***people who understand the users' needs and have access to relevant information.***

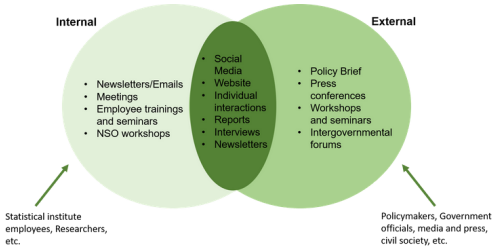
https://www.reeep.org/sites/default/files/CKB-Manifesto.pdf

Who - Target Audiences

As we have mentioned, many people need to make use of climate knowledge and statistics to support them in making their decisions. These audiences often require access to high quality information that is tailored to their specific circumstances, whether it be simplified, accessible or contextualized to their sector and locality. Here is a non-exhaustive list of potential target audiences:

1. **General public / Civil society** - people who are not members of a particular organization or who do not have any specific type of knowledge on the subject at hand - Instrumental in achieving Green Growth and sustainability.
2. **Policy makers** - member of a government department, legislature, or other organization who is responsible for making and formulating new rules, laws.
3. **Government officials** (policy and planning ministries) - any officer or employee of a Governmental Entity or any department, agency or instrumentality thereof, including state-owned entities, or of a public organization or any Person acting in an official capacity for or on behalf of any such government, department, agency, or instrumentality or on behalf of any such public organization.
4. **Statistical Institute employees** / NSO and environmental agency staff.
5. **Academics and Researchers / Scientific bodies** (meteorological, geospatial, etc.) - e.g., employed at universities or colleges, who conduct exploratory, constructive or empirical research. Can help support an enduring pipeline of SEEA compliant data. Can develop approaches that are compatible with SEEA.
6. **Media and Press** - e.g., reporters and news outlets or media - Instrumental in reaching a large audience.
7. **Private Sector** - companies and corporations that are part of the national economy and not under direct state control.
8. **NGOs** - a non-profit organization that operates independently of any government, typically one whose purpose is to address a social or political issue (potential partners in implementation of the SEEA).

How - Means of reaching different audiences



https://seea.un.org/sites/seea.un.org/files/seea_communications_strategy_2019_v2.pdf

An introduction to Communication Practices
Useful Definitions

How information is conveyed and disseminated is as important as the information itself. Indeed, the skills required for effectively communicating knowledge and ideas are often overlooked, but play an essential role in catering to the value systems and interpretation of the audience.

Let's introduce some useful guidelines as well as a few definitions to better understand communication practices in the real of Climate Change.

(1) Science/Climate Communication

Science communication is the successful dissemination of knowledge to a wide range of audiences, including non-scientists.

Good science communication uses storytelling, context, visualizations, and synthesis in order to:

- help convey scientific information.
- help make a good impression on your audience.
- help make a difference.

Climate communication or climate change communication is a field of environmental communication and science communication focused on facilitating the communications of the effects of anthropogenic climate change. Most climate communication focuses on bringing knowledge about and potential action for responding to scientific consensus on climate change to a broader public.

(2) Climate Literacy

Understanding of the impacts of large-scale human activities on communities, and how the natural world is being affected is arguably the largest area of research outside of the health sciences, and the two are intricately linked. Yet despite scientific consensus on human-induced climate change, many publics remain divided about its existence and impacts. More alarming still are the contradictory positions from leading governments around the world to address climate change. The most convincing scientific evidence is in vain if scientists fail to communicate key facts to policy makers or to the general public.

Climate Science Literacy is an understanding of your influence on climate and climate's influence on you and society. A climate-literate person

- understands the essential principles of Earth's climate system,
- knows how to assess scientifically credible information about climate,
- communicates about climate and climate change in a meaningful way, and
- is able to make informed and responsible decisions with regard to actions that may affect climate.

(3) Information

is recorded facts/observations (data) or descriptions about events and the world, as well as expressed or recorded thoughts and opinions. Information can be shared, transferred and moved around.

(4) Knowledge

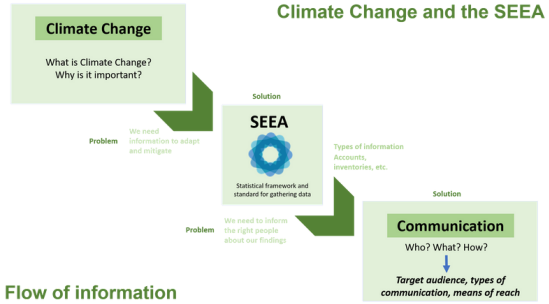
on an individual basis is what people know. It is contextualised information, plus thoughts and justifiable opinions. We must learn something, or accept information, for it to become part of our knowledge. Organisational knowledge is the sum of the knowledge of the individuals connected with an organisation that is relevant to the purpose and activities of the organisation, including what might be termed 'meta-knowledge' of who knows what.

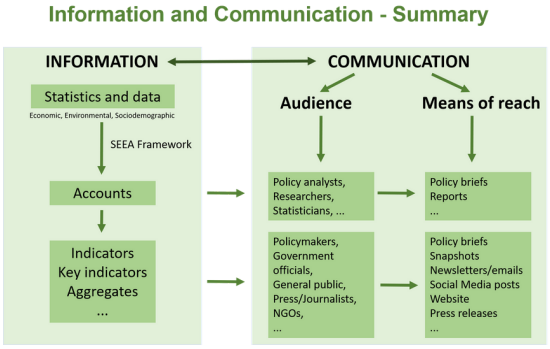
https://downloads.globalchange.gov/Literacy/climate_literacy_highres_english.pdf
https://www.reeep.org/sites/default/files/CKB-Manifesto.pdf

Summary and conclusion

We now have a general understanding of Climate Change Communication and the different potential audiences, as well as the structure and links that exists between statistical information, the SEEA and communication.

DON'T FORGET





Module 2

Communicating to Policy makers

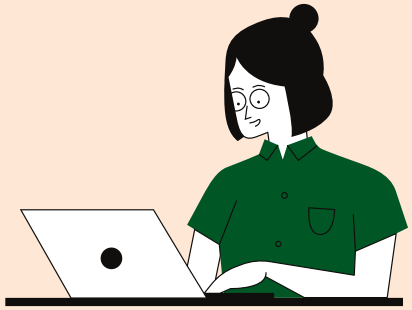
Overview and learning outcomes

Policy makers and government officials

- Who are they and what do they do?
- What do they need and how do we make that available to them effectively?

Policy Brief

- What is a policy brief?
- Real examples of policy briefs
- How to design a policy brief?



Introduction

Climate change as the subject of a public communications or policy advocacy campaign is like other campaigns; the messenger matters as much as the message. People listen to, and act on information from, people they can trust. Trust is important because acting on climate change requires difficult policy choices and/or personal behavior changes.

The strength of the SEEA lies in its integrative capacity, which facilitates understanding of the interactions between the economy and the environment and is wholly consistent with the System of National Accounts (SNA). While the SEEA has broad applicability across the public and private sectors, **the majority of decisions that SEEA can support are made by governments, in policy and planning ministries.**

Thus, it is important to understand and be able to reach those persons who are skilled at promoting new ideas within, and to, government as well as organizational or cultural leaders in National Statistical Offices (NSOs) and policy and planning ministries.

COMMUNICATING TO POLICY MAKERS

Definitions:

In politics, policymakers are people who are involved in making policies and policy decisions. Policymakers can be local, state or central-government officials who write laws and regulations, craft budgets and govern communities.

A policy is a set of ideas or plans that is used as a basis for making decisions, especially in politics, economics, or business.
An official organization's policy on a particular issue or towards a country is their attitude and actions regarding that issue or country.

https://seea.un.org/sites/seea.un.org/files/unceea_communication_strategy_2017_v2.pdf

What do policy makers require? How does the SEEA help inform policy?

Policymaking requires a range of information, but especially the capacity to connect and integrate across different domains.
Policymakers can benefit from consistent, comparable and comprehensive statistics and indicators on the economy-environment interface.
The SEEA, by using a rigorous, systems approach, provides the international statistical standard and a means to provide coherent and consistent data on the economy, human activity and environment.

More in depth

SEEA accounts can be used to inform a wide range of climate change related policy questions related to climate impacts and adaptation strategies. It can also help with mitigation strategies, for example through using ecosystem accounting to understand impacts on ecosystems and to develop nature-based solutions. Moreover, it can help with developing mitigation strategies by providing consistent information on emissions by different economic sectors, allowing decision makers to understand inefficiencies in the economy.

https://seea.un.org/sites/seea.un.org/files/seea_-_climate_change_-_web_ready.pdf

The SEEA and policy
Additional consideration: The SEEA and SNA

SEEA is a satellite system of the SNA (System of National Accounts) and consistency between both is essential for integrating environmental and economic data. SEEA and SNA share the same accounting rules, concepts, and principles to facilitate this integration.

In a policy context, it is important to understand the differences in data collection methods and classifications.

First, let's differentiate the SEEA and SNA:

- In monetary terms, the asset boundaries of the SEEA central framework and SNA are the same.
- In physical terms, the asset boundary of the SEEA central framework is broader as it includes all natural resources and land areas of an economic territory that may provide resources and space for use in economic activity. Thus, the scope in physical terms is not limited to the assets with economic value.

DIFFERENCES BETWEEN INVENTORIES AND ACCOUNTS

Next, we can look at the differences between inventories and accounts from the SEEA. The following points summarize some of the differences and specific characteristics related to each.

Inventories

- Limited to economic drivers
- Follow the territory principle and measure all emissions taking place on a specific territory
- Cannot provide a full picture of the potential costs of mitigation and adaptation policy

Accounts

- Connected to the SNA - includes economic, social and environmental drivers
- Include all activity undertaken by residents of a specific territory - suited to our increasingly globalized societies
- Immediately connected/related to to other policy relevant data systems that provide information on mainstream economic indicators - useful for mitigation/adaptation policy

https://seea.un.org/sites/seea.un.org/files/seea_-_climate_change_-_web_ready.pdf

Example

STATISTICS DENMARK

Different estimates of greenhouse gas emissions in Denmark

Air emissions can be estimated using different methods and frameworks. For example, let's look at both the IPCC-UNFCCC methods and the method for calculating the green national accounts (SEEA) in Denmark.

UNFCCC - This calculation method is based on a territorial demarcation and therefore includes emissions generated by production and consumption within the borders of a country. In a Danish context, this means that UNFCCC estimates do not include emissions by Danish-owned transport abroad. These estimates do, however, include emissions from foreign-owned ships, planes and cars in Danish territory.

Green accounts (SEEA) - In contrast to UNFCCC estimates, the green national accounts, which are calculated based on the SEEA Central Framework international guidelines, include all emissions connected with Danish economic activity, regardless of whether the activity takes place inside or outside of Danish borders.

For this particular example, this distinction is important, as emissions from international transport activities are particularly high for Denmark compared with many other countries. Moreover, including international transport activities in the green national accounts is in accordance with the principles for the National Accounts.

Bridge tables *- they illustrate the relationship between the estimates for CO2 emissions pursuant to the UNFCCC principle and the estimates in the green national accounts.*

According to the UNFCCC method, Danish economic activity in 2015 emitted 35.7 million tonnes of CO2, while according to the green national accounts, this activity generated a total of 86.3 million tonnes of CO2 emissions. **The difference between these two numbers comes from the inclusion of biomass emissions and emissions from international transport activities.**

Table 5.1 Bridge table for CO_2 emissions - UNFCCC method and the green national accounts

		1990	1995	2000	2005	2013	2014	2015
		million tonnes						
1	Total emissions: UNFCCC method	54.2	62.1	55.0	52.2	42.2	38.0	35.7
2	CO_2 from biomass used as fuel	4.6	5.6	6.8	10.7	15.0	14.9	15.7
3	Total emissions abroad (international transport)	9.4	11.4	19.6	34.4	34.0	33.0	34.0
	Of which: ships:	9.2	10.9	19.1	32.3	30.9	30.0	30.3
	aircrafts:	0.3	0.4	0.5	1.6	1.8	2.0	2.4
	vehicles:	0.0	0.0	0.0	0.5	1.3	1.0	1.2
4	Other differences in emissions from transport and cross-border trade	2.5	1.8	2.0	0.8	0.9	0.7	0.9
5 (=1+2+3+4)	Total emissions from Danish economic activities, incl. biomass	70.7	81.0	83.4	98.1	92.0	86.6	86.3
6	Total emissions from Danish economic activities, excl. biomass	66.2	75.3	76.5	87.4	77.0	71.7	70.6

Note: Emissions are calculated excl. LULUCF.
Source for total emissions reported to the UNFCCC and UNECE is the DCE (Danish Centre for Environment and Energy).

This example illustrates the importance of understanding the framework that is being used to measure indicators and statistics related to climate change, especially in a policy context.

https://www.dst.dk/Site/Dst/Udgivelser/GetPubFile.aspx?id=27468&sid=gnatuk

Tackling complex policy challenges

Today, the majority of countries across the world are facing a diverse range and an increasing magnitude of social, economic, environmental and political challenges such as climate change, biodiversity loss, poor air quality, inadequate resource management, inequality and poverty, financial imbalances and health crises, among others.

In order to effectively tackle these problems, fundamental societal and economic transformations are needed that not only require innovative thinking but also integrated policies.

This complex policy reality has significant implications for the type of information that is required for effective policymaking. For example, today's policy issues require data and policy models that can sufficiently deal with the complexity at hand. The System of Economic and Environmental Accounting (SEEA) is an information framework that can help tackle such complexities.

Implementation of the SEEA is spreading rapidly. In 2020, close to 100 countries have compiled the SEEA. International organizations such as the United Nations, European Commission and World Bank are investing great efforts into the global implementation of the SEEA. At the national level, it is often the National Statistical Office which implements the SEEA, though in other cases it is the Central Bank, Ministry of Finance or Ministry of Environment. Whatever the case, implementation of the SEEA necessitates cutting across data siloes and inter-institutional collaboration.

However, producing SEEA accounts is not an end goal; it should also be adopted to support integrated policies that strive towards well-being and sustainability.

This is why communicating to policymakers – and doing so effectively – is so important.

https://seea.un.org/sites/seea.un.org/files/seea_-_overview_-_web_ready.pdf

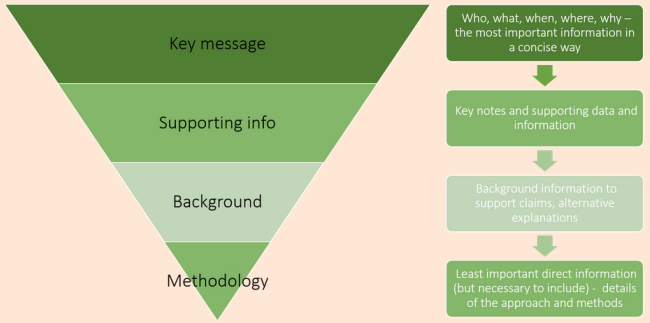
Policy Briefs

*A policy brief presents a **concise summary of information that can help readers understand, and likely make decisions about, government policies.** Policy briefs may give objective summaries of relevant research and data, suggest possible policy options, or go even further and argue for particular courses of action.*

Policy briefs are distinctive in their focus on **communicating the practical implications of research to a specific audience.** They are also distinctive in their ability to work as stand-alone documents, usually focused on a single topic.

Policymakers want scientists to be informal advisors. They want simple and straightforward frameworks and briefs that will help them make sense of the complex issues they have to make decisions on.

The best way to deal with this is to **keep the message simple**. To do this, one can follow the principles of the **inverted pyramid** to understand what to prioritize when addressing policymakers. This model will help you write and structure policy briefs in a way that will benefit the policymakers the most.



https://academy.europa.eu/

Template

Policy briefs often include some of these sections (this is a non-exhaustive list, it can work as a basic structure/starting-point for writing a policy brief):

- **Title:** A good title quickly communicates the contents of the brief.
- **Executive Summary:** This section is often one to two paragraphs long; it includes an overview of the problem and the proposed policy action – this is your key message.
- **Context or Scope of Problem:** This section communicates the importance of the problem and aims to convince the reader of the necessity of policy action.
- **Policy Alternatives:** This section discusses the current policy approach and explains proposed options. It should be fair and accurate while convincing the reader on why the policy action proposed in the brief is the most desirable.
- **Methodology/Approach:** This section explains how the study was conducted, who conducted it, how the data was collected, and any other relevant background information.
- **Results/Findings/Analysis:** This section should interpret the data in a way that is accessible and clearly connected to your policy advice.
- **Policy Recommendations and implications:** This section contains the most detailed explanation of the concrete steps to be taken to address the policy issue, as well as their implications.
- **Appendices:** If some readers might need further support in order to accept your argument but doing so in the brief itself might derail the conversation for other readers, you might include the extra information in an appendix.
- **Consulted or Recommended Sources/References:** These should be reliable sources that you have used throughout your brief to guide your policy discussion and recommendations.

Designing a Policy Brief - Additional elements and strategies

A policy brief should be not only convincing but interesting to read. This means that the design and presentation of a policy brief are important considerations and can help keep the reader engaged. Here are some design elements and helpful tips:

Titles and headings

A title should act as a reference point for readers. Sub-titles or headings can be useful to break up the text and draw the reader's attention to the main topic of each section. The best titles contain relevant information without being too long.

Sidebars

An effective sidebar should be short, descriptive, engaging, and action-oriented. The goal is to add extra detail and depth to help the reader understand and engage with the topic. Sidebars also visually break up the brief and make the document easier to read. Sidebars, like all other content in the policy brief, should advance the main argument.

Lists

Lists are an effective and visually interesting way to simplify dense content. They are useful for highlighting important information because they draw the reader's eye. Lists should be no longer than five to seven bullet points (if lists are too short they may seem pointless, if they are too long they may be daunting). Each bullet point should express complete thoughts (avoid using bullet points that are only one or two words in length).

Graphics

Visuals are easily one of the best ways to make policy briefs more interesting for readers. Choose effective visuals for the type of information you would like to communicate. Include captions for photos and other visuals that explain the content to the reader. Every visual should serve a purpose and help to illustrate your argument.

Have clear and actionable recommendations

- Providing specific recommendations – this makes acting on policy briefs much easier. Specificity is also important when defending and justifying recommendations.
- Suggestions should be feasible. Every government body is constrained by its mission and budget. Do your best to propose actions that fall within your target agency's authority.
- Making recommendations is not the same as advocacy. One of the most valuable inputs a policy brief can have is laying out likely pros and cons of different policy options.

Repackage your work.

- We have seen in Module 1 that different audiences demand different formats — policy briefs need to be accessible and understandable. A policy brief can be as short as 2 pages and needs to synthesize key findings and recommendations so that it can easily be distributed online or in person.

Write well

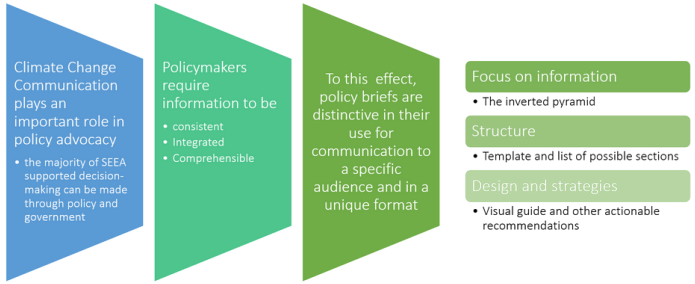
- Organization and clarity are most important when it comes to policy writing.
- Add headings to separate sections, and use visual cues, such as bullet points, to draw attention to key points.
- Define technical terms and spell out acronyms.

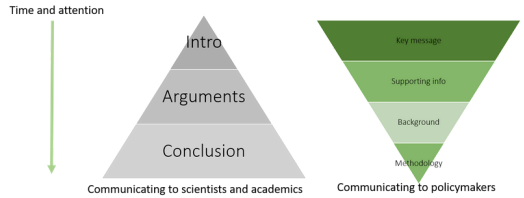
Pick your moment

- Strategically selecting when to engage increases the chance that your idea will fall on receptive ears. Electoral and legislative calendars can help you to choose a good time. Meetings with elected officials tend to be much more effective towards the beginning of a term (when policy priorities are being set) than towards the end.
- When in doubt, engage early.

Summary and conclusion

DON'T FORGET



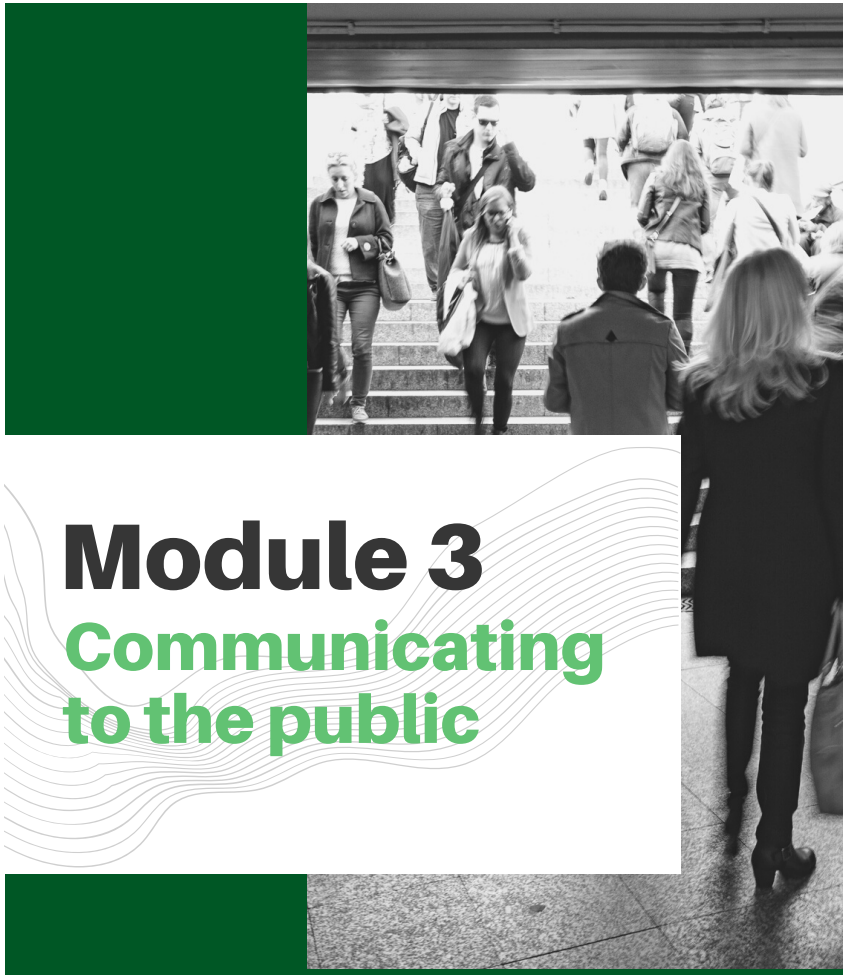


Some examples of Policy Briefs to read and examine:

Wealth Accounting and the Valuation of Ecosystem Services - Knowledge Center
https://www.wavespartnership.org/en/knowledge-center

[1] Nipa Palm Products in the Ayeyarwady Region Value Chain Analysis
https://www.wavespartnership.org/sites/waves/files/kc/Insight%20Brief%20Nipa%20Palm%20Products%20in%20the%20Ayeyarwady%20Region.pdf

[2] Uganda Wood Asset & Forest Resources Accounts - Brief
https://www.wavespartnership.org/sites/waves/files/kc/Uganda%20Wood%20Asset%20and%20Forest%20Resources%20Forest%20Accounts%20Brief.pdf



Module 3
Communicating to the public

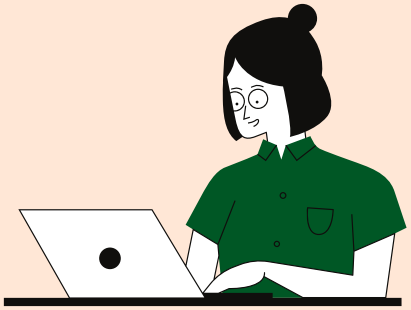
Overview and learning outcomes

General public/civil society

- Seeing the bigger picture and communicating it effectively
- Understandable language
- Framing and Storytelling
- Images and Visuals
- Distribution

Media and Press

- Social media strategy
- What types of media/press releases exist and how to cater information to them?



Public awareness and the Paris Agreement

Public awareness and the effective communication of climate change information are marked as critical issues in the Paris Agreement on climate change. This agreement was adopted by 195 nations in 2015. Its central goal is to keep global warming this century well below 2°C (compared to preindustrial levels) and to pursue efforts to limit the temperature increase to 1.5°C

Article 11 of the Paris Agreement calls for investment in capacity building, where:

'Capacity-building under this Agreement should enhance the capacity and ability of developing country Parties, in particular countries with the least capacity, such as the least developed countries, and those that are particularly vulnerable to the adverse effects of climate change, such as small island developing States, to take effective climate change action, including, inter alia, to implement adaptation and mitigation actions, and should facilitate technology development, dissemination and deployment, access to climate finance, relevant aspects of education, training and public awareness, and the transparent, timely and accurate communication of information.'

Communicating Climate Change is an important contribution toward meeting this goal of the Paris Agreement.

Research has shown that in order for climate science information to be fully absorbed by audiences, it must be actively communicated :

1. with appropriate language;
2. combined with narrative storytelling;
3. contextualized through visual imagery and data visualization;
4. and delivered by trusted messengers in the right settings.

Let's look at some of these points in more details.

(1) Language

One possible reason for the public's lack of responsiveness to climate change communications may be caused by low comprehension of pieces filled with scientific language. **When talking to the general public, research shows that communicators should, whenever possible, avoid using jargon, complicated scientific terms, and acronyms. Instead, use words that will make sense to the audience.**

The table below contains some examples of words or phrases that are commonly used when discussing climate change and statistics, and alternative words that get the same idea across more simply.

Sometimes only a scientific term is sufficient for getting a point across. In that case, it is important to thoroughly define the term for the audience.

Communicators should remember, however, that stringing together too many scientific terms and acronyms may cause the audience to spend their time and mental energy deciphering vocabulary instead of absorbing the overall point.

Obscure/Complicated word	Better understood word(s)/explanation(s)
Anthropogenic	Human induced, man-made
Mid-Pleistocene	1 million to 600,000 years ago
CH4	Methane
Aerosol	Small atmospheric particle
Natural Capital	The stock of renewable and non-renewable resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people.
IPCC	The group of scientists who issue comprehensive assessments on climate science.

(2) The Importance of Framing/Storytelling

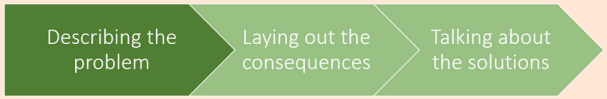
Most people understand the world through anecdotes and stories, rather than statistics and graphs, so **aiming for a narrative structure** and showing the human face behind the science when presenting information will help you tell a compelling story.

Framing climate change information and/or statistics as a story has been shown to be an effective form of communication. Studies have shown that climate change narratives structured as stories were better at inspiring pro-environmental behavior than just facts alone [1].

Indeed, these "climate stories" often spark action by allowing each user to process the information experientially, increasing their engagement and empathy. Finding the "human interest" - people's own words about their own experiences – will help to show real impacts while also giving your audience something they can better relate to.

For the purposes of climate change communication, using a simple narrative form could mean describing the problem, laying out its consequences and talking about solutions. Including this final element (talking about solutions) is crucial, because without a clear indication of how people can respond to the risks of climate change, it can feel overwhelming.

[1] https://link.springer.com/article/10.1007%2Fs10584-019-02425-6



(3) Images and visuals

In exactly the same way that the language you use has a powerful impact on how people conceptualize climate change, the 'visual language' of climate change communication is also extremely important.

Data visuals and images are integral to most forms of communication. Whilst data visuals often contain important information relevant to diverse stakeholders in society, they can often be difficult for non-experts to understand. It's important to ensure data is represented in the clearest and most accessible manner possible, and that images and photos represent the topic accurately and effectively.

Data Visualization

Designing for data is a unique challenge. It requires considerable precision and numeracy, but also careful thinking about audience, perception and accessibility constraints. Because the information needs to be conveyed accurately and understood properly, there are constraints when it comes to writing chart titles and displaying connection between labels and data. Styles and colors that may work when applied to illustration do not always work when applied to the density of information data visualization often needs to convey.

Choosing visual formats that are familiar to your audience enables them to quickly grasp how the data are structured, so that they can then focus on the message of the visual.
Where possible, use visual formats that your audience is familiar with. For example:

- Bar graphs and line graphs are the most common.
- Simple thematic maps are generally well understood.

For more information on this, check out the data visualization course.

Images and photos

It has been shown that currently, a narrow visual vocabulary frames climate change in the public mind:
polar bears, melting ice-caps, smokestacks and images of environmental protesters.
This can undermine the effectiveness of outreach activities by failing to engage audiences and can detract from the reach and value of efforts to engage with the public and communicate the importance of climate change. Even when dealing with statistical accounts and data, it's important to include visual/photographic elements in reports and other forms of communication. Here are some basic tips to consider:

- Show 'real people': staged/stock photographs can be seen as gimmicky or manipulative.
- Show local climate impacts: When images of localized climate impacts show an individual person or group of people, with identifiable emotions, they are likely to be most powerful.
- Understand your audience: Images depicting 'solutions' to climate change generated mostly positive emotions.
- Tell new stories: Familiar, 'classic' images - polar bears, smokestacks, deforestation - can prompt cynicism and fatigue. Less familiar (and more thought-provoking) images can help tell a new story about climate change.

(4) Distribution

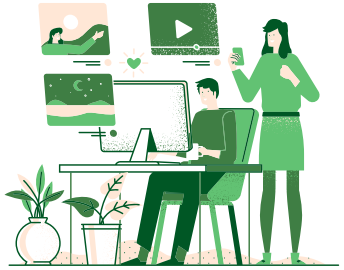
Public awareness and understanding of climate change are linked to media coverage. **In general, more media coverage of climate change is associated with more awareness.** The public is generally unaware of climate-related issues that are not covered in the media.

But, this information needs to be delivered in trusted settings and in an accessible form.

For example, when communicating to civil society, the main points that usually need to be communicated about the SEEA are that:

- It provides data to measure the sustainability of economic growth by accounting for the natural environment
- Accounts are objective and show both sides of the ledger
- The methodology is detailed but resulting indicators are easy to interpret

The best ways to communicate these three things is through web presence, which encompasses the SEEA website, Newsletter and social media like Twitter.



Examples

"The SEEA website is the main platform from which the communication strategy is delivered. The website reaches the largest audience and thus must facilitate learning, communication and discussion for a variety of parties. The website should maintain a general and open character with subsites that may be more technical or closed in nature. Since the website is the main means of communication with civil society, technical jargon should be kept to a minimum, particularly on the main pages. The website is also the launching point for the SEEA newsletter, with sections devoted to updates from each program and from international agencies and countries. Communication products planned for the website include case studies, briefings, media releases, frequently asked questions and plain language talking points or speeches."

This is part of the communication strategy laid out for the SEEA website, which highlights some of the points discussed previously (e.g. Language, accessibility).

In 2017, the Department of Statistics Malaysia (DOSM) provided an excellent example of the communications strategy in action. During a national workshop launching the Malaysia national plan for SEEA implementation, Dr. MohdUzirMahidin, Chief Statistician of DOSM, unveiled a promotional video for the SEEA.

The video, which has been posted on DOSM's portal, Facebook and Twitter (as well as the SEEA website), explains the SEEA in a short, succinct manner using appealing graphics. The video was developed in-house by the Agriculture and Environment Statistics Division and Information Management Division at DOSM and DOSM plans to further promote the SEEA using the capsule at a variety of seminars and workshops.

This type of communication bridges building awareness and educating the public on the SEEA.

https://seea.un.org/sites/seea.un.org/files/seea_communications_strategy_2019_v2.pdf
https://seea.un.org/events/closing-national-workshop-un-development-account-project-malaysia

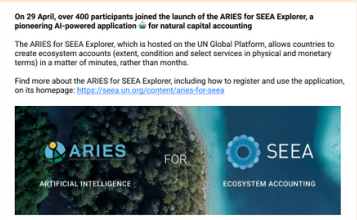
Social Media Strategy

A social media strategy is a summary of everything you plan to do and hope to achieve on social media. It guides your actions and lets you know whether you're succeeding or failing. The more specific your plan is, the more effective it will be. Keep it concise.

For example, a social media strategy has been developed, primarily utilizing Twitter, to promote upcoming meetings and conferences, current projects and keep on top of SEEA related projects (i.e. natural capital accounting, etc.). Within the context of this course on climate change communication within the SEEA, the social media strategy is contained within the broader scope of the communication strategy within NSOs. Developing good online practices and sharing information on social media has become an important component of communicating climate change to various stakeholders. Some platforms have specific format requirements (see Twitter example later), but generally, social media posts include:

- A short and clear message
- Visual elements – photos, infographics, graphs, etc
- Links or other calls to action
- Platform specific elements, e.g. hashtags, emojis

Examples



Summary and conclusion

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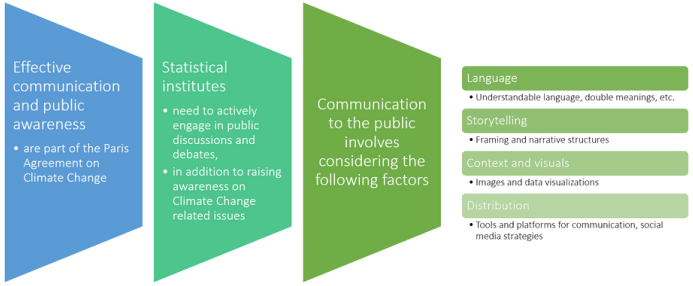
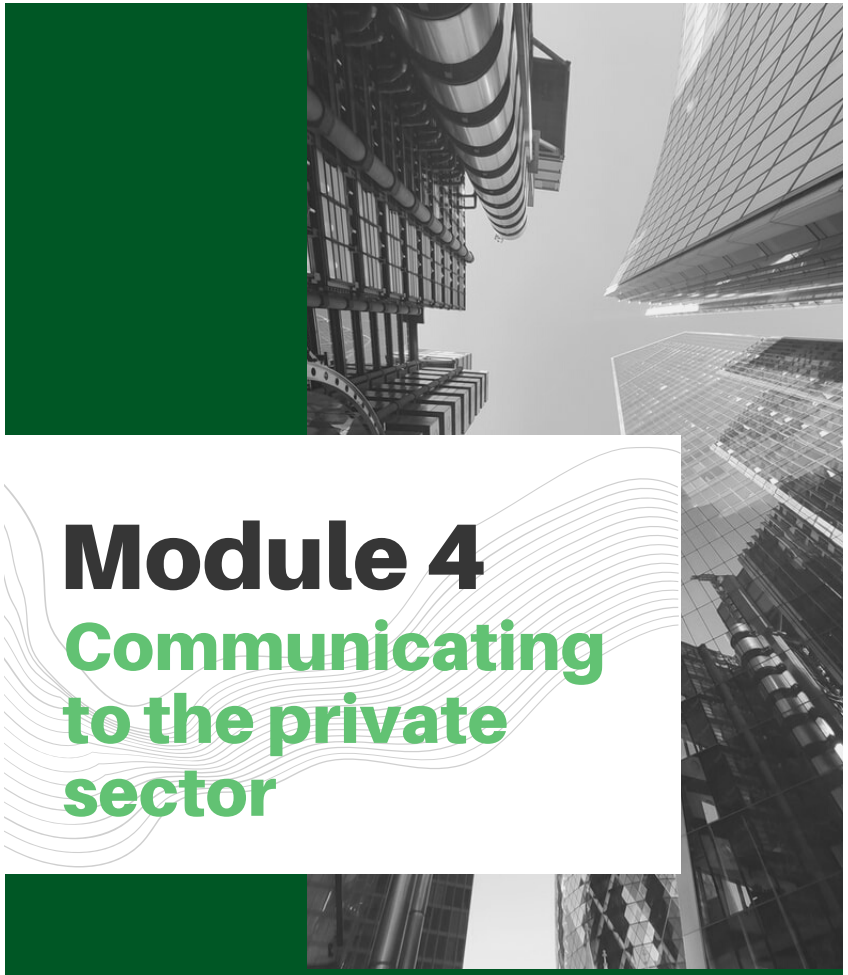


The SEEA created a "Twitter Cheat Sheet", available to download here, to help inform good practices on communicating and raising awareness about the SEEA.

In summary:

- Understand the components of a tweet, or any other social media platforms posting format.
- Use the same strategy as mentioned in Module 1 to identify your target audience and message – information from other sources like policy briefs can easily be repackaged for Twitter.
- Optimize your reach by following good practices: use of hashtags, calls to action, good framing and context.
- Engage and interact, this is a social media platform!

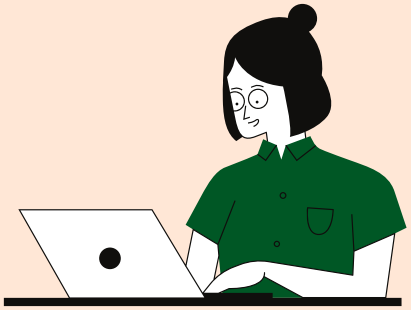


Module 4
Communicating to the private sector

Overview and learning outcomes

The private sector and environmental accounting

- The private sector and the SEEA
- Introduction to communication with the private sector
- CSR and NCA
    - What can we do?
    - More generally
    - SEEA-water
    - SEEA-energy



The private sector and environmental accounting

There is an increasing recognition within the private sector on the importance of including environmental risk assessments in the business decision-making process. A pre-requisite for doing so effectively and efficiently is the ability to capture environmental impacts and dependencies into business risk management processes and related accounting and company reporting systems. There are a growing number of companies implementing such environmental accounting systems, albeit these comes with different names.

In order for the public and private sectors to join forces in decision making and reporting on the relationships between the economy and environment, effort is needed for both communities to understand the needs and approaches of the other. At the national level, the System of Environmental-Economic Accounting (SEEA) is the international statistical standard that produces internationally comparable statistics and accounts that provide a view of the interrelationships between the economy and environment.

https://seea.un.org/sites/seea.un.org/files/concept_note_scoping_workshop_businesses_and_seea_eea_final_distro_v1.pdf

Why is the SEEA relevant to the private sector?

With more and more businesses beginning to undertake sustainability accounting and reporting, there is now an opportunity to **align business sustainability accounts with the SEEA**, as they pertain to the environment and ecosystems, .

At this moment there is no globally accepted standardized way for business accounting on natural capital. On the contrary, there is 'total freedom', and as a consequence company performance on these indicators is hard to assess by stakeholders, including the investors.

As a result, there is a growing tendency towards harmonization of corporate environmental accounting approaches and towards impact reporting.
SEEA accounts produced by national statistical offices, in particular ecosystem accounts, could provide valuable information and context to businesses with regards to their impacts and dependencies on natural capital.

Communication with the private sector
An overview

Some of the problems with communication that have been identified within the private sector range from a lack of access to data, data gaps, and lack of infrastructures in place to analyze it.

In order to produce sustainability accounting and reporting, companies and businesses need to align and share their approaches more.

Most of the time, this information falls under the umbrella of Corporate Social Responsibility (CSR) and Natural Capital Accounting (NCA).

Corporate Social Responsibility

Corporate Social Responsibility is a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. This concept integrates communication practices heavily, usually in the form of sustainability reports and web presence.

Corporate social responsibility is a broad concept that can take many forms depending on the company and industry. Through CSR programs, philanthropy, and volunteer efforts, businesses can benefit society while boosting their brands.

As important as CSR is for the community, it is equally valuable for a company. CSR activities can help forge a stronger bond between employees and corporations, boost morale and help both employees and employers feel more connected with the world around them.

Natural Capital Accounting

Natural capital accounting is he process of compiling consistent, comparable and regularly produced data using an accounting approach on natural capital and the flow of services generated in physical and monetary terms. The majority of applications are done at a national level and by the public sector. Natural capital accounts are a possible output from a natural capital assessment.

NCA by businesses is part of CSR. This is where SEEA accounting has the potential to harmonize practices in the private sector worldwide.

Natural capital "assessment" is the method most typically used in the private sector. The majority of assessments will use natural capital information to answer a specific question or inform a decision. A key step in the process is to identify an objective prior to undertaking the assessment (a so-called business application) - the aim is not about collecting a set of indicators. However, for larger corporations and businesses, implementing NCA methods in the future will become more relevant. The EC Communication Roadmap to a Resource Efficient Europe had set 2020 as the year by which businesses, along with public authorities, will properly account for natural capital and ecosystem services.

Climate Change and the private sector

Overall, engaging the private sector in identifying climate change risks, adaptation and mitigation needs to be a much higher priority in developing countries.

Private companies play an evident and important role in the economy and its relation to the environment, and successful engagement in adaptation can be used to catalyze greater investments in climate funds and other high impact solutions. This idea heavily relies on the idea of climate change communication, and even public policy should provide appropriate incentives for such investments through communication of risks, incentives for resilience measures, and where necessary regulation.

Stronger public-private partnerships will also be an important vehicle to enhance climate resilience and at the same time create business opportunities.

SO, WHAT CAN WE DO?

Members and employees of statistical offices who work within the SEEA framework have the opportunity to raise awareness and disseminate information on best practices to the private sector. This can range from:

- Increasing collaboration and exchange of experiences between the statistical and business communities
- Creating Intergovernmental Working Groups of Experts on International Standards of Accounting and Reporting
- Contacting regional or national organizations/platforms
- Organizing / participating in events bringing together the statistical and business communities
- Communication and promotion of the activities within both the business and statistical communities
- In general, increasing the availability, accessibility and visibility of information related to the SEEA and climate change accounting

More concretely,

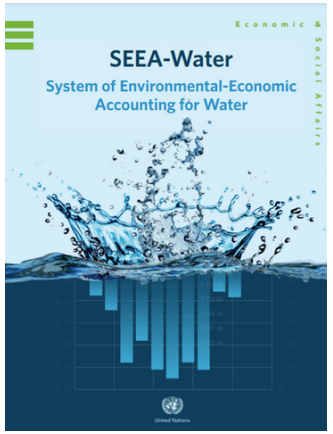
Knowing what data from within SEEA accounts could be provided to the private sector is very important. Many businesses and corporations require macro level information in order to make decisions and comply with national or international standards within their field of operation.

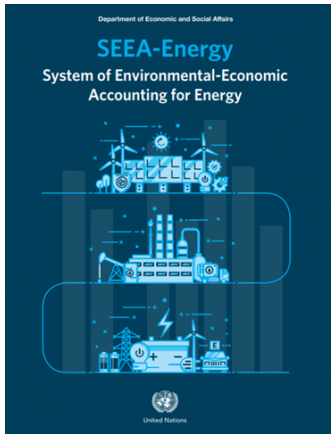
What are some examples of statistical data that can be provided to them?

Initial focus was on the measurement of business response to the challenge of climate change with a focus on the measurement of GHG emissions and associated carbon accounting.

Beyond GHG emissions and pollution, companies have increasingly looked to measure other impact drivers, including :

- **Water usage** - **SEEA Water**
- **Energy usage** - **SEEA Energy**





Module 5

Putting it all together

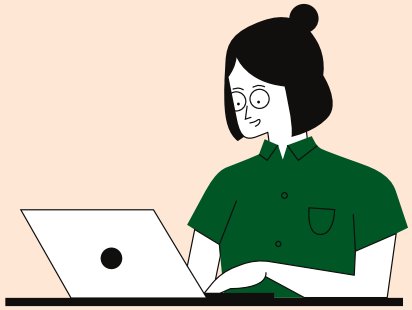
Overview and learning outcomes

Putting it all together - full example

- General steps to understanding your audience and effectively communicating or making data available.
- Short Policy Brief template
- Snapshots
- Press Releases and template

Final summary

What does the future look like?



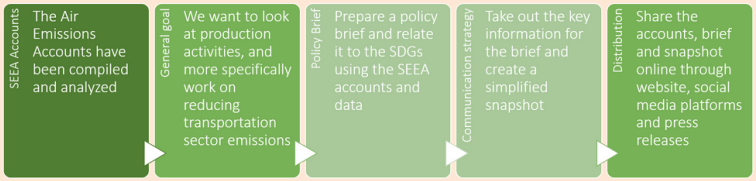
Putting it all together

Communication practices for the SEEA are ultimately all linked together, and distribution is all about understanding the ways in which information can be repackaged and used for different audiences. The end goal and objective is to develop accurate, reliable and relevant accounts which can be used to inform decision making across all sectors of society.

Methodological consistency resulting from implementation of the SEEA can help reduce the burden of reporting and communicating. Indeed, data can be compiled once for many purposes, and the standardisation reduces the need for arduous data adjustments for international reporting. Moreover, these consistent definitions, classifications and units allow for direct transmission of information.

Let's look at an all-encompassing example using air emission accounts and data from the SEEA.

A STEP-BY-STEP TIMELINE - EXAMPLE



Air Emission Accounts

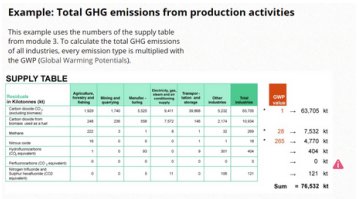
Once the AEA has been compiled, the information and data within can be used as input for larger policy discussions in the form of policy briefs, or for other communication purposes as seen throughout this course.

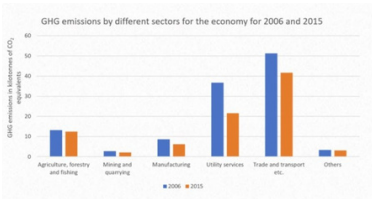
Let's look at total Greenhouse Gas GHG emissions from the AEA, and more specifically air emissions indicators computed using accounts. Some of these indicators are relevant to measuring the impact of human activity on climate change, and therefore can inform policy making decisions.

As a simple example, let's have a look at Total GHG emissions from the production activities. This indicator describes the total GHG emissions (in kt of CO2 equivalent) from production activities of industries, including services, of a national economy.

In addition to compiling these accounts, total GHG emissions trends over the years can be analyzed, as well as specific comparisons of relative changes. For example, this bar graph describes the evolution of total GHG for various industrial sectors from 2006 to 2015.

This can be used in policy contexts to argue for certain actions and measures. For example, let's say we are planning on writing a policy brief on **reducing emissions from the Transporation sector.**





Multiple channels for linking statistics and policy

As we have seen all along this course, the way in which statistical data is communicated has a large effect on its value.
Environmental statistics are most useful for – and have the most influence on – policy if they are presented in a 'policy-relevant' form; for example, by aggregating them, combining them with other statistics and processing them into indicators and standards.

There are various channels for publishing environmental statistics that focus on policy advice and evaluation. The three most important of these are:

1) Policy Briefs from government/national institutes and other institutes focusing on policy analysis
2) Online Environmental Data Compendiums
3) Mandatory Reports and National Committees.

Short Policy Brief Template

Here is an example of a short **2-page policy brief template** that could be used in this scenario. This structure follows what we saw in Module 2, with the aim of delivering concise, clear and actionable information and recommendations. Using additional data and insight from the SEEA accounts, a longer, more in-depth report could also be developed alongside this for experts who need more details. In this case, the policy recommendations and general subject can also easily **be related to the SDGs.**

Why link policy briefs to the SDGs?

The 2030 Agenda for Sustainable Development was adopted by all United Nations Member States in 2015. It is built around 17 Sustainable Development Goals (SDGs) and 169 targets that represent an ambitious plan for achieving sustainable development and serves as the basis for countries to shape their national policies and priorities. The interlinked nature of the SDGs calls for an integrated approach to policy decisions. As the international statistical standard for measuring the environment and its relationship with the economy, the SEEA is well positioned to support integrated policies based on a better understanding of the interactions and trade-offs between the environment and economy.

Currently 40 indicators for nine Sustainable Development Goals can be informed by the SEEA. The SEEA is particularly well-suited for deriving ratio indicators that compare environmental and economic information.

https://seea.un.org/content/sustainable-development-goals

Communication Strategy - Snapshots

Once the policy brief has been completed, the hard work has been done in terms of analysis and writing. However, communicating and sharing this information has only just started.

Using the information and recommendations from within the policy brief, it should be relatively easy to pull out key points and create a simplified snapshot for different audiences on social media, the press or a statistical institute website.

For example, let's have a look at how Australia communicates about their National Waste Accounts.

AUSTRALIAN EXAMPLE - BACKGROUND

Australia has been at the forefront of environmental-economic accounts development for over two decades with the national statistical agency, the Australian Bureau of Statistics, pioneering accounts from the mid-1990s. Since this time, the use of environmental-economic accounts has spread beyond that of the national government with several states and territories using environmental-economic accounting to enhance their policy and management activities.

The Australian Government, in collaboration with state and territory governments, has developed a National Environmental-Economic Accounting Strategy.
The strategy looks to build on the considerable work to date to achieve nationally consistent implementation of the United Nations System of Environmental-Economic Accounts (SEEA), as well as develop a set of coherent, comprehensive and integrated national SEEA accounts.

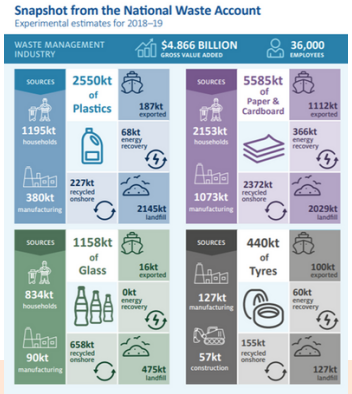
National Waste Accounts

The Australian Government Department of Agriculture, Water and the Environment has a website dedicated to Environmental-Economic Accounting (EEA).
They provide information on accounts and make data available and interactive, but also create simplified "snapshots" of each account.

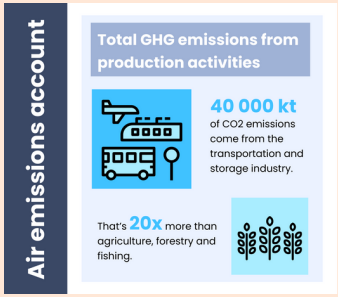
This makes information accessible to many different types of audiences with varying levels of understanding of the SEEA.

The snapshots are a good visual overview of the data and statistics related to the waste accounts and could be used for social media or press releases. On the other hand, detailed graphs and tables of the accounts are made available to download for researchers or experts to analyze and use.

https://eea.environment.gov.au/projects/national-waste-account



EXAMPLE SNAPSHOT



We've seen how Australia created snapshots of their waste accounts, now let's create a hypothetical one based on our Policy Brief for reducing emissions from the transportation sector.

Using some of the data from the production activities accounts table, this snapshot is a **comparison** of the total GHG emissions from the transportation and agricultural sector. One of the main ideas here is to **use relevant data, but present it so that it is simple to understand and would make sense to a lay person.**

Communication Strategy - Press Release

In addition to publishing the policy brief and creating snapshots of the accounts for the NSO website, press releases can be an important tool of communication to get information out to journalists and the general public.

A good press release should take a factual tone and be short and concise, giving the journalists and other readers the essence of the story (as well as the means to find further information or contact you). Press releases can be delivered to members of the media physically on paper and electronically. Nowadays, most press releases are made available online on websites and distributed as pdf files.

Definition

News/Press releases are usually one or two-page documents that are used to share breaking news with the public. They are typically read by journalists but can be made available to general audiences too. In terms of format, press releases are similar to traditional news articles and to an extent policy briefs, in the sense that they use the reverse pyramid method to place the most important information first.

Organizations of all sizes use press releases to achieve all sorts of goals. Some common objectives include:

- To get media coverage - Highlighting links to policy is the most direct route to getting publicity for the SEEA from media outlets.
- To build reputation - The SEEA would benefit from wider public recognition.
- To market and organization - A well-written press release can help garner public attention and news coverage. A strength of the SEEA is the volume of eye-catching visualizations such as maps and graphs that it can generate. Identifying compelling visuals that tell an interesting yet understandable story will generate fodder for web content and social media posts that are more likely to be viewed and shared.

Press Release Template

Press releases generally follow a familiar format. By keeping your formatting consistent, reporters will always know where to look for which information.

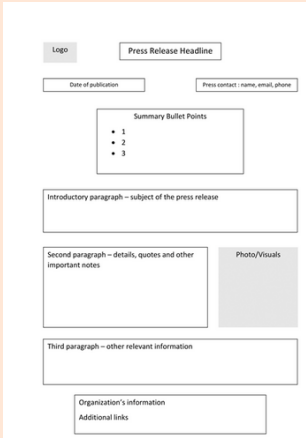
Here's what you should always include in your press releases:

- **Headline:** Be sure to make it clear why your story is interesting and important.
- **Press Contact:** How can the media get in touch with you?
- **City, State, Location:** Where are you, and where is your news happening?
- **Body copy:** Order information by level of importance.
- **Organization's information:** What's your organization all about? Links to additional information

The template below includes space for all of this information, in addition to an image and a bullet point summary – useful for highlighting the most important points of your release.

EXAMPLES OF PRESS RELEASES:

- https://www.ubos.org/wp-content/uploads/2019/11/SEEA-accounts-launch-press-release.pdf
- https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6691
- https://agenciadenoticias.ibge.gov.br/en/agencia-news/2184-news-agency/news/30598-experimental-study-estimates-value-of-water-bodies-during-abstraction-treatment-and-distribution-of-water
- https://www.un.org/en/desa/un-adopts-landmark-framework-integrate-natural-capital-economic-reporting



Summary and conclusion (1)

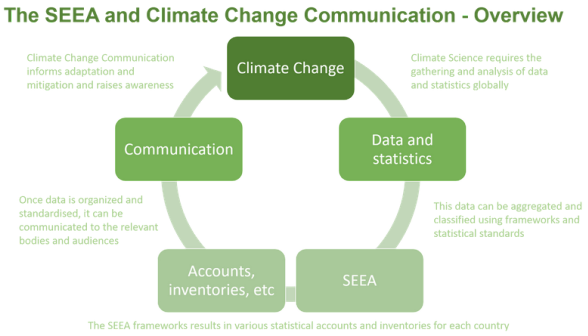
In the past decade, the growing interest and global conversations surrounding Climate Change have evolved into the idea of a collective societal and human effort to prevent the earth from warming past 1.5 degrees celsius.
Climate change communication is a fairly new field of study and practice. The area began to develop a presence in scholarly journals in the early to mid-1990s with a dominant focus on public understanding of climate change and risk perceptions. At the time, studies were often relating this concept to environmental communication practices and concerns. The progression of research on CCC has been brought about by a multitude of conflating forces, mostly originating in climate science itself. Most of the research on climate change communication has been conducted in the United States, United Kingdom, Australia, Canada, and Western European countries. **There is a need to expand the climate change communication research into other regions, particularly developing countries.**

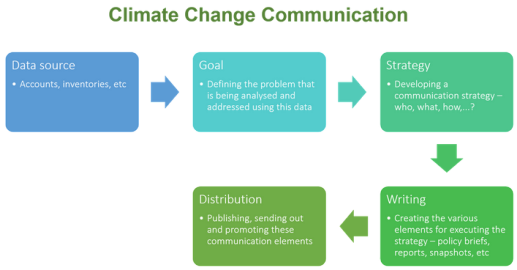
As we have seen over these 5 modules, communication of the climate crisis covers a vast array of audiences with varying needs and levels of understanding, cultures and backgrounds. Communication processes rely heavily on this idea of understanding one's audience, as well as the role of values, beliefs, identity and other variables.

The next page summarizes the links between types of information and communication, as well as the different means or reach and audiences found within the context of communicating statistical information like accounts from the SEEA.

Summary and conclusion (2)

DON'T FORGET





What does the future look like?

In this course, we have introduced communication practices and highlighted the important role it plays within the SEEA and the dissemination of statistics related to climate change. In the future, statistical offices should strive towards establishing robust channels of communication with their target audiences, ranging from policy makers to civil society. In general, here are some of the main changes that should be guiding this evolution.

TOWARDS

- Environmental transparency and accountability
- Established and systematic communication strategies
- Better integrated information for understanding relationships between people and the environment
- Improved local level information
- Promoting citizen participation and bottom-up action