

The Effectiveness of Policy-Relevant Science at the Interface of Climate Science and Policy

MIKAELA BEHRENS 2022
MVEM30 MASTER'S THESIS | APPLIED CLIMATE STRATEGY | 30 CREDITS
ENVIRONMENTAL SCIENCE | LUND UNIVERSITY



The Effectiveness of Policy-Relevant Science at the Interface of Climate Science and Policy

A Case Study of the WASP Science-for-
Adaptation Policy Briefs (SAPBs)

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2022



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MVEM30 Master's thesis 30 credits, Lunds universitet

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Abstract

Scientific information is playing an important role in policymaking on climate adaptation by providing insight and guidance on efforts needed to reduce risks, respond to impacts, and build resilience. However, the extent to which science is influencing policy is questioned, as efforts being made are not reflecting efforts needed. Barriers in the interface between science and policy has found to be connected to the social behaviors and practices between producers and user of scientific knowledge. Yet, deeper understanding of the relationship is needed to enable a more effective response on climate change adaptation. This study was set to investigate and assess how effective the production and use of policy-relevant science is, in contributing to evidence-informed policymaking for climate adaptation. Elements hindering the effectiveness together with areas of improvement was also explored. The study was conducted looking at a single case study of the Science-for-Adaptation Policy Briefs (SAPBs) produced by the World Adaptation Science Programme (WASP). Information was collected through nine semi-structured interviews with actors related to both the production process and use approach of the SAPBs. The study found several elements both enabling and limiting an effective production and use of policy-relevant science in the case of the SAPBs. Elements found hindering an effective production and use was the lack of a clearly identified target audience and set of key users, as well as a lack of communication and interaction between the producers and users. The findings conclude a need for an improved communication and dissemination strategy to more effectively contribute to evidence-informed policymaking for climate adaptation.

Keywords: policy-relevant science; effectiveness; policymaking; science-policy interface; climate adaptation

Hur skapas och förmedlas vetenskaplig klimatinformation så att den effektivt bidrar till relevant kunskap i beslutsfattandet?

Vetenskapliga underlag om klimatförändringars risker och effekter är en viktig komponent i de beslut som ligger till grund för att vidta åtgärder i syfte att stärka och skydda framtidens samhällen. Klimatforskningen pekar dock på att dagens insatser inte räcker till för att täcka den grad av klimatanpassning som är nödvändig för att motstå ett förändrat klimat. Ett sätt att stärka vetenskapens inflytande i beslutsfattandet är att förbättra samarbetet och kommunikationen mellan forskare och beslutsfattare. För att öka vetenskapens inflytande och effekt i beslutsfattandet behöver vi bättre förstå vilka utmaningar som finns, och vilka förbättringar som krävs, för att öka klimatsatsningarna.

Denna studie har undersökt om vetenskapliga underlag kan produceras och förmedlas på ett mer effektivt sätt för att överbrygga informations- och handlingsgapet mellan forskare och beslutsfattare. Detta har gjorts genom en fallstudie och undersökning av vetenskapliga policyöversikter producerade av the World Adaptation Science Programme (WASP) - ett internationellt klimatanpassningsprogram, vars uppgift är att stärka vetenskapens inflytande i beslutsfattandet, i ledningen hos sju olika FN-organisationer. Resultaten visar att producenter av policyöversikterna saknar en tydlig identifiering av både sin målgrupp och sina huvudanvändare, vilket i sin tur påverkar möjligheten att hålla informationen på en relevant nivå. Därtill visar resultaten att det saknas samspel och kommunikation mellan producenter och användare av policyöversikterna. Dessa brister pekar på att det finns ett behov att förbättra kommunikations- och förmedlingsstrategierna mellan producenter och användare av the WASP:s policyöversikter. Detta arbete avser bidra till en ökad förståelse av fortsatta utmaningar mellan vetenskap och beslutsfattande samt ger en inblick i hur produktionen och förmedlingen av klimatvetenskap kan bli mer effektiv. Studien kan användas som inspiration kopplat till liknande fallstudier. I studien identifieras och lyfts både styrkor och svagheter inom produktionen och förmedlingen av policyöversikterna. Bland annat visar resultaten att bristen på resurser, både personal- och finansiella resurser, är en begränsning för att öka effektiviteten. Vidare undersökningar är av vikt för att bättre förstå utmaningar och på bästa sätt öka vetenskapens inflytande samt undersöka ifall det finns bättre alternativ än policyöversikter att kommunicera med. Vetenskapen har en viktig roll i beslutsfattandet genom att bidra med forskningsunderlag kopplat till komplexa och riskfyllda samhällsproblem. Forskare och beslutsfattare utgör grunden för att uppnå förbättringar i samhället. Förståelsen för varandras roller och behov liksom samspel mellan de båda är en förutsättning för att de gemensamt ska uppfylla målen. Resultaten från studien är baserat på intervjuer med producenter/forskare av the WASP:s policyöversikter samt aktörer/beslutsfattare kopplade till dess användare.

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Abbreviations

NORAD - Norwegian Agency for Development Cooperation

SAPB - Science-for-Adaptation Policy Briefs

SIDA - Swedish International Development Cooperation Agency

SPI - Science-Policy Interface

UNEP - United Nations Environment Programme

WASP - World Adaptation Science Programme

Introduction

Context

Human induced climate change is causing widespread impacts on human and natural systems globally. The impacts are unevenly distributed in which most vulnerable regions of the world are also most affected by climate change. As the risk of exposure to climate hazards are increasing, the magnitude of impacts is becoming more difficult to manage in which future outcomes are strongly depending on our near time actions to mitigate and adapt (IPCC, 2022). This is what the latest contribution to the Sixth Assessment Report (AR6) on climate change impacts, adaptation, and vulnerability by the Intergovernmental Panel on Climate Change (IPCC) states (IPCC, 2022). Scientific information and consensus on climate change, including its impacts, future risks, and adaptation strategies, has been produced and offered since the First Assessment Report (FAR) in 1990 (IPCC, 1992). The scientific assessments have during the last three decades provided governments at all levels with scientific knowledge to develop effective policies and act against climate change, as well as assisted in international climate negotiations through the United Nations Framework Convention on Climate Change (UNFCCC) and its annual Conference of the Parties (COPs). Along with the scientific efforts being made, the global policy agenda on climate change has since its formal start at the United Nations Conference on Environmental and Development (UNCED), also known as the “Earth Summit” in Rio de Janeiro, Brazil, in 1992, evolved in more ambitious political agreements and policies through the Kyoto protocol and, since 2015, the Paris agreement. Research shows that regions and sectors around the world are taking measures against climate change; however there is a gap between efforts being made and efforts actually needed to reduce risks, respond to impacts, and build resilience, especially in lower income countries (IPCC, 2022). In other words, there is a disconnect between science recommendations and policies in practice on climate adaptation (UNEP, 2017).

Science has an important role in policymaking by providing information on what is known and what different outcomes it could lead to. Especially in times of uncertainty, policymakers request insight and guidance from scientists to solve complex societal problems (Kyte et al., 2020). Climate change is viewed as one of

the biggest societal problems of our time (EEA, n.d.) in which the extent of future impacts and risks are still uncertain (IPCC, 2022). Despite uncertainty, policymakers must take decisions that reduces the negative impacts of climate change of which science plays an important role by providing information and assessments based on different climate scenarios (IPCC, 2022). However, plainly providing policymakers with more scientific evidence hasn't resulted in better or more effective policies (Berrang-Ford, Ford & Paterson, 2011; Compston & Bailey, 2008; Kyte et al., 2020; UNEP, 2017), hence an effective translation of usable science to policy is not a straightforward road, but a complex and nuanced one in which scientific evidence is often not understood or used in policy development and implementation (UNEP, 2017). Research states that barriers in the production and use of science in policy are connected to the social aspects and relationship between scientists and policymakers (van den hove, 2007; Balvanera et al., 2020; UNEP, 2017).

Connecting scientists and policymakers by using a collaborative approach to develop climate data, information and knowledge is argued to improve the usability of science in policymaking (Arnott, Neuenfeldt & Lemos, 2020; Lemos, Kirchhoff & Ramprasad, 2012; Oliver & Boaz, 2019; Oliver et al., 2014; Sobel, 2021). The social interactions and cooperation between scientists and policymakers, also referred to as the Science-Policy Interface (SPI), is seen as a way to strengthen the relationship between science and policy by allowing a joint construction and exchange of knowledge (van den Hove, 2007), and make sure that policies are based on robust and sound scientific evidence. As argued by van den Hove (2007), by keeping the boundaries between science and policy both moving and negotiable, they allow for a recognition and transparency of the dependencies between science and policy. However, more research is needed to further understand and improve the social interactions and practices between producers and users of scientific knowledge (Maas, Pauwelussen & Turnhout, 2022; Ojanen et al., 2021), but also how the production and use of scientific knowledge can become more effective (Oliver & Boaz, 2019).

The importance of effective science-policy interfaces has led to a range of initiatives, one of them being the Science-for-Adaptation Policy Brief Series (SAPBs) by the World Adaptation Science Programme (WASP). The WASP is an UN-led programme that was launched during the 24th session of the Conference of the Parties (COP24) of the UNFCCC climate change conference held in Katowice, Poland, in December 2018. The overall aim of the programme is to make science work for climate adaptation by supporting international and national policy processes on climate adaptation with the provision of policy-relevant science products and services, one of them being the SAPB.

One of the important actors within international policy development on climate adaptation are the national development cooperation agencies such as SIDA and NORAD. Through evidence-informed policymaking, efforts and financial

support from the development agencies contribute to initiatives around the world working towards limiting climate change impacts and building resilience, especially in vulnerable regions (NORAD, n.d.; SIDA, 2022).

However, questions and challenges on whether scientific information is relevant or being used in policymaking remain, especially in an international context where scientific information have difficulties in being applicable on smaller scales (Engels, 2005; UNEP, 2017). Given these facts, this thesis aims to investigate how effective the production and use of policy-relevant science is, in contributing to policy development on climate adaption by assessing the effectiveness of the afore-mentioned WASP Science-for-Adaptation Policy Briefs.

Aim and research questions

This study aims to investigate: (a) if the production and use of policy-relevant science, embedded in the broader scope of the science-policy interface (SPI), is sufficiently effective in contributing to evidence-informed policymaking for climate adaptation, (b) if there is a need for an improved production process and use approach that would allow for a more effective contribution to policymaking and adaptation action, and (c) how such a production process and use approach can be improved to become more effective. The production process refers to the stages in which science-based products are delivered, from the initial planning stage to a finished product. The use approach refers to how the science is connected to the target audience and users. The purpose of this study is to improve the understanding of challenges connected to the science-policy interface (SPI) and provide insight on how climate science can increase its influence and use in policymaking moving forward.

The study is conducted by looking at the World Adaptation Science Programme (WASP) as a case study, with a specific focus on the WASP Science-for-Adaptation Policy Briefs (SAPBs). The aim of the research is being accomplished by answering the main research question (i) together with its two sub questions followed (a & b), as presented below:

- (i) How effective is the production and use of policy-relevant science in contributing to evidence-informed policymaking for climate adaptation?
 - a. What elements hinder an effective production process and use approach of policy-relevant science to policymaking?

- b. What areas within the production process and use approach could be improved to allow a more effective contribution to policymaking and action in the climate change adaptation arena?

Theoretical framework

The following chapter gives a background on the theory and definition of Science-Policy Interfaces (SPI) and the use of policy briefs as a science-policy interfacing tool. Literature on frameworks for investigating the effective production and use of science in policymaking is presented, which is applied to an analytical framework.

Science-policy interfaces (SPIs)

Science and policy have traditionally been portrayed as two separate worlds with communities functioning and operating in distinct ways. This point of view was characterized as the Two-Communities Theory some fifty years ago (Caplan, 1979). The differences were described by their separate concerns, in which scientists are focused on the production of pure knowledge while policymakers are action-oriented and focused on the immediate issues at stake (Caplan, 1979). The relationship between scientists and policymakers were in the past perceived as a linear model of knowledge-transfer in which scientists simply presented their research to policymakers (UNEP, 2017). The conceptual framework of the Two-Communities has, in more recent years, been examined and shown to be outdated in several aspects, as the relationship between science and policy today involves a broader range of actors, (UNEP, 2017) interactions (Newman et al. 2015) and more fluid boundaries (Wehrens, 2014) where knowledge and information is exchanged in a two-way direction (UNEP, 2017). Studies shows that interactions between science and policy are heading towards more co-producing alternatives (Sienkiewicz & Mair, 2020; Arnott & Lemos, 2021). By keeping the boundaries between science and policy moving and negotiable, they allow for recognition and transparency of the dependencies between science and policy (van den Hove, 2007). To further understand and manage the interactions between the world of science and policy, the concept of Science-Policy Interfaces (SPI) has been defined by Van den Hove (2007) as: “(. . .) social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making” (van den Hove, 2007). A visual of how science and policy can intertwine into a SPI is presented in the image below, see figure 1.

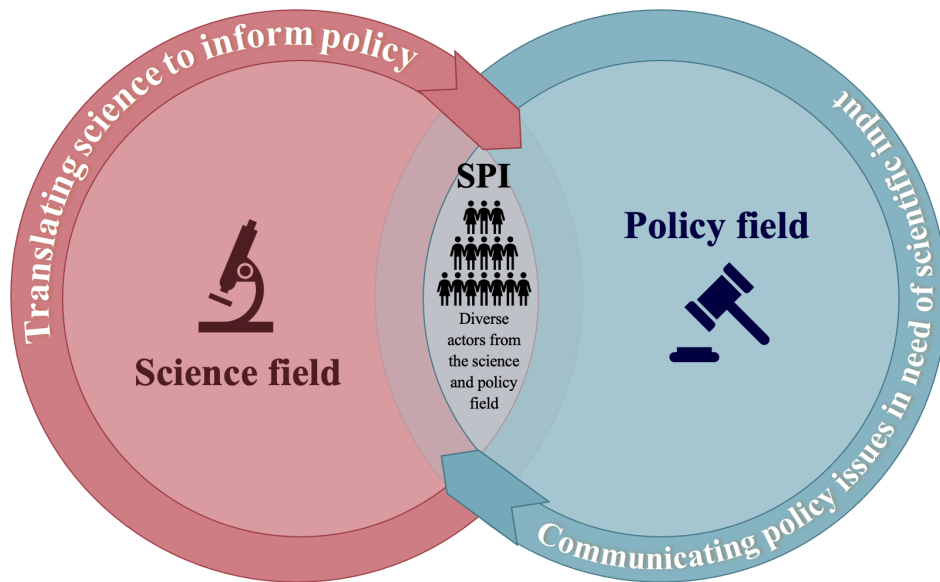


Figure 1. Visualizing image of a science-policy interface

The image shows an example of what a science-policy interface (SPI) can look like. The two circles represent the science-side (pink/red) and policy-side (blue) which are combined in the middle representing the interface between science and policy (SPI). The SPI shows diverse actors which come together to collaborate and exchange information with one another. The figure is constructed by the author with inspiration from the United Nations Conventions to Combat Desertification UNCCD's image of their SPI (UNCCD, n.d.)

SPI provides the opportunity for science and policy to interact and cooperate with each other to achieve more effective progress on the issues in question. SPI enables scientists to be better involved in the policymaking processes and translating science to inform policy, while at the same time giving policymakers an opportunity to better access expert knowledge and communicate policy issues in need of scientific input.

The definition or construction of SPIs is however subjective and differ depending on its context, structure, and scale (Hermann, Hogl & Pregernig, 2017; Mahon & Fanning, 2021; Ojanen et al., 2021; Sarkki et al., 2015). SPIs can take its form through institutional organizations on the international scale for example the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). SPI can also take form through meetings, seminars, or projects where scientists and policymakers come together and exchange knowledge (Ojanen et al., 2021). SPI can contain a wide range of different actors (MacDonald et al., 2016; UNEP, 2017), in which individual actors also can have shifting roles (Bednarek et al., 2018).

However, to simplify the concept of SPIs, this study will focus on two categories of actors within the SPI: producers of knowledge and users of knowledge.

The level of success in the SPI is dependent on how well the science is picked up and used in policy (UNEP, 2020). In the last three decades, IPCC has presented six assessment reports giving consensus in the scientific evidence on climate change stating the urgency to act (IPCC, 2022). The cost of inaction has also been stated to be many times higher than the cost of action, giving the development of climate policies more reasons to act (Stern, 2007). However, plainly providing policymakers with more scientific evidence hasn't equaled better or more effective policies (UNEP, 2017; Berrang-Ford, Ford & Paterson, 2011; Kyte et al., 2020; Compston & Bailey, 2008). Research shows that barriers in the SPI are rather connected to understanding the relationship and complex social interactions between actors in the SPI (Balvanera et al., 2020; UNEP, 2017; van den hove, 2007) but also understanding social approaches to change itself (O'Brien, 2012).

Barriers in the SPI has shown to be connected to the credibility of the knowledge produced. If the scientific evidence is produced and disseminated through an actor or network the user finds credible and trustworthy, it will have an impact on whether the knowledge is perceived credible and thereby picked up in policy (UNEP, 2017). Other frequently observed gaps in the effective exchange of evidence in the SPI is that the scientific knowledge isn't relevant or doesn't align with the timescale of the policy process resulting in it being outdated and not applied to policy (UNEP, 2017; Oliver et al., 2014). In addition, SPI are also facing issues with the lack of identifying the intended audience as well as lack of information and evaluation on whether the produced evidence is relevant and being used in policymaking (Arnott & Lemos, 2021; UNEP, 2017).

Balvanera et al. (2020) argues there is a continued need to further integrate policymakers in the knowledge creation process to produce more legitimate and relevant outcomes (Balvanera et al., 2020). In contrast, scientists have a better chance of effectively influencing policymakers by understanding and integrating the needs and working conditions of the policy arena (Kyte et al., 2020; UNESCO, 2017). To evolve a further understanding between science and policy, further communication and interaction between them is needed (Mahon & Fanning, 2021; Moser & Dilling, 2012).

Policy briefs as a science-policy interfacing tool

Policy briefs are communication tools used to support decisions and engage actors within the SPI by translating scientific information into a format for policymaking. The definition of a policy brief is by Beynon et al. (2012a) described as:

(. . .) a concise standalone document that **prioritizes a specific policy issue** and presents the evidence in a **non-technical and jargon-free language**. In general, the purpose of a policy brief is to distil or to synthesize evidence with the **intention of influencing** the thinking and actions of policy actors as they take decisions in complex policy processes. That is, to achieve the elusive outcome of evidence-informed policymaking.

Evidence-informed policymaking means that the best available scientific information is used to inform policy decisions (WHO, n.d.). Policy briefs are in general considered a useful and credible communication tool inform policymaking in a way that is easy to understand, however there is a lack of research on the use of policy briefs in policymaking (Arnautu & Dagenais, 2021). Research on policy briefs as a communication tool in the SPI shows there are many aspects playing a part in whether the information is being used and having an impact in policy. Firstly, the content and format of the policy brief needs to be created with the end users' needs and context in mind (Arnautu & Dagenais, 2021; Balian et al., 2016). To achieve this, personal engagement between scientist and policymakers is seen as essential when designing the brief (Balian et al., 2016). Building a more personal relationship between the scientist and policymaker has also shown to have an impact on whether the message of the brief is shared forward (Beynon et al., 2012a).

Furthermore, the information needs to be understandable and easy for the user to access (Oliver et al., 2014; Walsh, Dicks & Sutherland, 2015) as well as presented at a timing that fits policy process to have an effect (Arnautu & Dagenais, 2021). By having a dissemination strategy, that clearly states methods used to inform and share the information to key actors, the policy brief has a greater chance of having an effect (Balian et al., 2016). An important aspect to have in mind is that there are many factors affecting the policy process, such as competing agendas and priorities (Hawkins & Parkhurst, 2016), and what could be consider a well-informed policy brief might still not lead to action (Arnautu & Dagenais, 2021). Beynon et al. (2012a) also points out the complexity in translating policy briefs into action by concluding that the effect of policy briefs isn't linear, meaning the reader might take alternative routes to action which subverts from the briefs effectiveness.

Lastly, the effect of the policy briefs on its reader have shown to depend on the readers belief and opinion on the specific prior to reading the brief. The effect has shown to be higher when creating and forming an opinion among readers who doesn't have a strong former belief from earlier and vice versa (Arnautu & Dagenais, 2021; Beynon et al., 2012b; Masset et al., 2013).

Effective use of science in policymaking

Investigating and assessing an effective production and use of policy-relevant science in policymaking has shown to be complex and the usefulness of different frameworks and approaches has been discussed (Cash et al., 2003; Dunn & Laing, 2017; Greenhalgh et al., 2021; Heink et al., 2015; Sarkki et al., 2014; Sarkki et al., 2015; Tangney, 2017;).

According to Cash et al. (2003) research is most effective at informing policymaking when its *credible*, *relevant* (also referred to as *salience*) and *legitimate*. The three attributes presented by Cash et al. (2003), also referred to as the CRELE framework, is a well-known and often cited source (Dinesh et al., 2021; Greenhalgh et al., 2021; Ojanen et al., 2021; Sarkki et al., 2015; UNEP, 2017; van Enst, Driessen & Runhaar, 2014) when evaluating the effectiveness of knowledge produced and exchanged in the SPI. However, a more recent study by Heink et al. (2015) acknowledges the difficulties of applying CRELE in actual evaluations as the three attributes can have divergent meanings depending on who is interpreting it and at which stage in the knowledge management it refers to (Heink et al., 2015). Heink et al. (2015) therefore highlights the need to specifically define the three attributes related to the SPI in question to receive more useful results. The applicability of CRELE has also been criticized by Dunn & Laing (2017) due to its primarily focus on the involvement of scientist. Dunn & Laing thereby created a new framework including the four attributes *applicability*, *comprehensiveness*, *timing*, and *accessibility*, also referred to as ACTA, which were found to be more applicable regarding values of policymakers (Dunn & Laing, 2017).

Together with the attributes presented in CRELE and ACTA, a more recent study by Greenhalgh et al. (2021) found that the inclusiveness of attributes related to the relationship and interactions between the scientists and policymakers needed more consideration when assessing the effective use of science in policy. Attributes connected to the human dimensions of the knowledge producer and knowledge user, such as *capability*, *mindset*, and *trust*, were found to often be barriers in the effective use of science in policy and thereby important to assess (Greenhalgh et al., 2021).

In light of the different studies and perspectives presented above, this study will include a combination of the three different frameworks/attributes from Cash et al. (2003), Dunn & Laing (2017) and Greenhalgh et al. (2021), to investigate and assess an effective production and use of policy-relevant science that contributes to policymaking. The combination of attributes and frameworks aims to add a more nuanced and comprehensive analytical approach to this study context.

Analytical framework

The analytical framework, presented in table 1, will function as an analytical lens in this study to investigate and assess an effective production and use of policy-relevant science that contributes to policymaking.

Table 1. Analytical framework

The table presents the study's analytical framework. The framework includes seven criteria for an effective production and use of science together with a description. The analytical framework is inspired by: Cash et al. (2003), Dunn & Laing (2017) and Greenhalgh et al. (2021).

CRITERIA	DESCRIPTION
Credibility	Perception that the information is scientifically adequate and that the source is trustworthy.
Relevance	The information is found useful and matches the needs and problems of the policy process.
Legitimacy	Perception that the information has been conducted in an unbiased way with respect and fairness to different stakeholder's views and beliefs.
Accessibility	The information is delivered in a way and format that is accessible and understandable to the target audience.
Timing	Extent to which the research is aligned with the timescale of the policy development process.
Capability/mindset	Producer: Extent to which the producer is able and willing to understand the needs of the user. User: Extent to which the target audience/user is able and willing to understand and use the science.
Relationship	The science is produced through a two-way communication and interaction with the target audience.

The analytical framework is constructed by the author meaning that the criteria are chosen and defined hypothetical for this study with regards to the study context of the SAPBs. The criteria presented in the analytical framework have been chosen and defined with inspiration from the attributes presented by Cash et al. (2003), Dunn & Laing (2017) and Greenhalgh et al. (2021) but also with additional inspiration from the theoretical literature presented above, especially Jones, Fischhoff & Lach (1999), Sarkki et al. (2015) and UNEP (2017).

Method

The following chapter describes the research method used to answer the presented research questions of the study. The first part of this chapter gives a description of the research design and provides information regarding the study context of the WASP's Science-for-Adaptation Policy Briefs (SAPBs) as a single case study. The chapter then describes the process for developing the theoretical and analytical framework used to investigate and assess the case study. The empirical material for this research was collected through semi-structured interviews with actors connected to both the production process and use approach of the SAPBs. The chapter ends with a description of how the interviews were analyzed continued by a methodological reflection including ethical considerations.

Research design: A single case study with a comparative research approach

This study was conducted through a comparative research approach by looking at the WASP as a single case study, more specifically the production and use of their Science-for-Adaptation Policy Briefs (SAPBs) - from now on referred to as the SAPBs in this report. This research design was chosen to compare existing theoretical literature to the empirical data collected on the SAPBs - a new initiative that haven't been examined nor assessed yet. A comparative research approach is widely used within social and political research and indicates to find the "how" of the issue rather than the "what" (Halperin & Heath, 2017). By focusing on a single case study, a more intensively and detailed examination of the research aim could be achieved (Halperin & Heath, 2017). As the SAPBs aims to strengthen the SPI by presenting policy-relevant science for researchers, policymakers, and practitioners (WASP, n.d.a), it was considered a representative case to select and investigate for this research, based on both the research question and the domains of the theory aimed to test (Geddes, 2003). More information about the study context of the WASP and the SAPBs is presented below.

Study context of the WASP Science-for-adaptation policy briefs (SAPBs)

The WASP is one of four programmes within the World Climate Programme (WCP) with the aim to fill current and future research needs on climate adaptation while giving focus to policy-relevant science and research needs in vulnerable developing countries (WASP, n.d.b.). The WASP was launched during the 24th Conference of Parties COP24 in Poland 2018 and is built on the previous Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA) which ran from 2008 to 2018 (WASP, n.d.c).

The WASP is led by seven different UN agencies: 1. the United Nations Framework Conventions on Climate Change (UNFCCC), 2. the World Meteorological Organization (WMO), 3. the United Nations Environment Programme (UNEP), 4. the Intergovernmental Panel on Climate Change (IPCC), 5. the Green Climate Fund (GCF), 6. the Global Environment Facility (GEF) and 7. the United Nations University (UNU) (Ibid). Each of the seven UN-agencies are represented through members in the WASP management group along with the Chair of the WASP. Besides the management group, the WASP also consists of members from the research and policy community represented through the Science Committee and the Policy & Finance Committee. Lastly, the WASP management group and the two committees are supported by the WASP secretariat hosted by UNEP's science division in Nairobi (Ibid).

One of the core initiatives and products produced by the WASP are the Science-for-Adaptation Policy Briefs (SAPBs). The policy briefs targets researchers, policymakers, and practitioners with the aim to ensure they have the scientific information needed to make effective policy decisions and act on climate adaptation. The briefs also work as a communication tool to strengthen the science-policy interface on climate adaptation (WASP, n.d.a). Since 2020 up until April 2022, five policy briefs have been launched, addressing different issues on climate adaptation, see figure 2 below.

WASP Science for Adaptation Policy Briefs

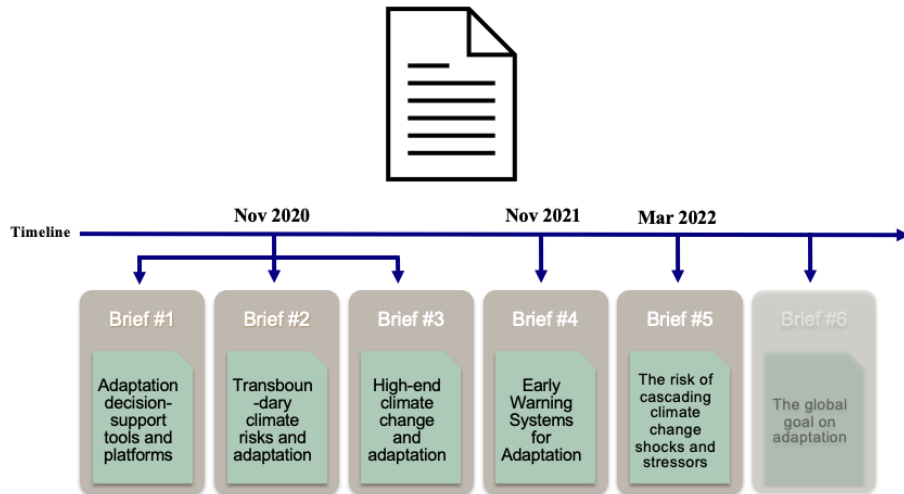


Figure 2. The WASP Science-for-Adaptation Policy briefs (SAPBs)

The figure shows a timeline of when the five SAPBs were published including their topic. The sixth policy brief is presented slightly transparent as it is yet to be published during 2022. Constructed by author.

Literature review

The theoretical and analytical framework, used as an analytical lens when investigating and assessing the case study of the SAPBs, was developed through an unsystematic literature review. The literature review included mainly scientific articles found through the search engine *Web of Science*. *Web of Science* provides a large international platform of peer-reviewed scientific articles within both natural and social science and could thus provide articles associated to the interdisciplinary character of the research topic. The production and use of scientific information in policy was found to be a topic discussed and addressed outside the scientific literature. Grey literature in terms of reports was thereby also included in the literature review.

The literature review was divided into two separate searches conducted from February to March 2022. The first search round focused on science-policy interfaces within the field of climate and sustainability and included the following search words: *"science policy interface*" OR "science policy" AND climate* OR sustainab**. The second search round focused on the effective use of policy briefs and included the search words *"policy brief*" AND "effectiv**. The search results

were sorted by relevance through the *Web of Science* sorting tool meaning that results which mostly related to the search words are placed at the top of the list. Relevant articles were chosen and assessed based on the article's relevance to the study's context by studying the title and abstract. In all searches, more relevant articles were found by looking at references cited next to a central argument in a study or by studying articles reference lists. This search method enables the researcher to find new useful sources connected to the study's context (Bryman, 2011).

The theoretical framework which resulted from the literature review was used to construct an analytical framework used as a guiding tool and analytical lens in the further process of collecting and analyzing the empirical material in the study.

Gathering data: a qualitative approach using semi-structured interviews

As the effective production and use of the SAPBs is embedded in a social context between the producers of knowledge within the WASP and the users of knowledge within the policy field, a qualitative research approach was chosen to find a better understanding of the participant's interpretation of these social processes (Bryman, 2011). This study seeks to explore and provide greater insight on the participant's subjective experiences and opinion by investigating what they find important and useful in the context of the SAPBs, thereby making a qualitative approach in terms of semi-structured interviews a relevant method to collect empirical material (Bryman, 2011).

In addition to the interviews, passive observations were made by attending the WASP third annual meeting between January 26-28. This was found to be an opportunity that would bring value to the research by increasing the understanding of how, and capture the context in which, the producers of the SAPBs interacts within the WASP. Knowledge and information about the WASP and the SAPBs were also collected through the WASP website and through internal documents, including the WASP Terms of Reference, provided by the WASP secretariat. However, the observations and documents were not used to collect the empirical data, but to gain a larger understanding of the study context when developing and conducting this study.

Selecting interview participants

Interview participants of interest for this study were the two stakeholder groups below:

1. actors related to the production process of the SAPBs i.e., the WASP members
2. actors related to the use approach of the SAPBs i.e., the target audience/users of the SAPBs.

Relevant participants within both stakeholder groups were identified through dialogue with the external supervisor at the WASP secretariat. The selection of participants on the production-side of the SAPBs focused on finding key actors/scientists who currently are or have been involved in the production process in either of the five published policy briefs. Consideration was taken to select various members of the WASP who are or have been involved at different stages of the production process, but also members representing the different positions and components within the WASP.

The selection of participants on the user-side of the SAPBs focused on finding policymakers/practitioners within the target audience who are involved in policy processes/decisions on an international/national policy development level within the field of climate adaptation. Given the time feasibility of this study, the selection of actors related to the use approach was limited to the following two national agencies/authorities, 1. the Norwegian Agency for Development Cooperation (NORAD) and 2. the Swedish International Development Cooperation Agency (SIDA). The two national authorities represent two countries', Sweden and Norway, international development cooperation agency. Each agency has a central role in enabling international climate adaptation progress by providing development aid and policy advice with a focus on adaptation needs in developing countries, hence making them a relevant stakeholder group for the SAPBs target audience. The two countries were selected through their geographical position to each other, representing a coherent, comparable, and single group of the target audience/users of the SAPBs. Interview participants from each national authority included policymakers/practitioners who either uses or are interested in the information produced in the SAPBs. Relevant interview participants within the two agencies who fulfilled the criteria for participation was identified through a contact person/or front desk at each agency. Given the contact person's knowledge about the agency network, suitable members according to the selection criteria could be identified (Hennink, Hutter & Bailey, 2011).

The number of interview participants from each stakeholder group and agency is presented in table 2 below.

Table 2. Interview participants

The table presents the two stakeholder groups included in this study. The agency/programme of the interview participants are presented for each stakeholder group together with the number of participants.

<i>Stakeholder group</i>	<i>Agency/programme</i>	<i>Number of participants</i>
Actors related to the production process of the SAPBs	World Adaptation Science Programme (WASP)	5
Actors related to the use approach of the SAPBs	Norwegian Agency for Development Cooperation (NORAD)	2
	Swedish International Development Cooperation Agency (SIDA)	2

Consideration was taken to include an equal number of actors from both the production-side and the user-side of the SAPBs to get a balanced representation of the SPI. The goal was to interview a total of ten participants, with five participants from each stakeholder group, see table 2. However due to unexpected circumstances, one interview got cancelled, resulting in an unequal number of nine participants.

By including actors from two stakeholder groups related to the SAPBs and within different agencies, the study is gathering data from several different sources and perspective, a method also referred to as data triangulation, which strengthens the study's quality (Guion, 2002).

Conducting interviews

All nine interview participants were contacted through email in which the study's research aim was presented together with a Letter of Consent, see Appendix A.1. More information about the Letter of consent and other ethical considerations is presented at the end of this chapter. Participants related to the use approach of the SAPBs were also sent the SAPBs issue number four on "Early Warning Systems for Adaptation" as a reference to look at prior to the interview. This brief was chosen as it was the latest published brief at the time of initial interview contact.

The semi-structured interview approach means that an interview guide with open questions was used and followed to a certain extent while also allowing the emerge of more spontaneous and unstructured questions depending on the interviewees answer. The flexibility with semi-structured interviews allows the participants to address and include what they find valuable hence giving the study more valid data (Halperin & Heath, 2017). The interview guide, see appendix A.2,

consisted of approximately 15 questions to each stakeholder group, and was constructed on basis of the criteria in the analytical framework, see table 1. The interview guide was structured through four sections, introduction, opening questions, key questions and closing questions, according to Hennink, Hutter & Bailey (2011). When constructing the interview questions, considerations was given to formulating them in a clear, un-leading and open way (Dalen, 2015).

The nine interviews were conducted individually with each participant through video call via Zoom from the end of March 2022 to beginning of May 2022, see table 3 below. Each interview lasted approximately 30-60 minutes and was audio recorded. The interview participants were given an individual participant code related to their involvement in one of the two stakeholder groups: actor related to the production process (P) or actor related to the use approach (U), see table 3 below.

Table 3. Participant coding and date of interview

The table presents the participant codes and date of interview for each of the nine interview participants. Each participant is associated to one of the two stakeholder groups which is also clarified by the letter in the participant code.

<i>Stakeholder group</i>	<i>Participant code</i>	<i>Date of interview</i>
Use approach	U1	March 25
Use approach	U2	March 28
Production process	P1	March 29
Use approach	U3	March 29
Production process	P2	April 4
Use approach	U4	April 5
Production process	P3	April 8
Production process	P4	April 12
Production process	P5	April 26

Data analysis

The initial stage of the analysis included transcribing the recordings from the nine semi-structured interviews. The transcribed material collected from the interviews were then analyzed through the three steps of *data reduction*, *coding* and *drawing conclusion* presented by Halperin & Heath (2017). The first step included reducing the amount of text to analyze by selecting and abstracting data that is the most relevant in relation to the research aim. This is an important step of the analyzing process as it eliminates data which is not considered comprehensible for the issue

being addressed, thereby making the analysis more manageable (Halperin & Heath, 2017).

After reducing the amount of data, the interview material was manually coded by breaking down the text segments into different themes. The analysis used both closed and open coding. Closed coding means that themes were pre-constructed prior to the analysis process (Halperin & Heath, 2017). These themes align with the study’s analytical framework and the seven criteria used to assess the effectiveness of the SAPBs. Two more pre-constructed themes were added in the closed coding, *challenges* and *improvements*, which related to the study’s two sub-questions. All nine pre-constructed themes are presented in the coding scheme in table 4 below.

Table 4. Coding scheme

The table represents the coding scheme used to analyze the collected data. The coding scheme includes nine themes which are correlated to the criteria of the analytical framework as well as the study’s two sub questions. The description of each theme is presented which demonstrates what is looked for in the coding.

THEME	DESCRIPTION
Credibility	Text describing whether the scientific information is perceived as scientifically adequate and that the source is trustworthy.
Relevance	Text describing whether the scientific information is found useful and matches the needs and problems of the policy process.
Legitimacy	Text describing the perception on whether the information has been conducted in an unbiased way and with respect and fairness to different stakeholder’s views and beliefs.
Accessibility	Text describing whether the information is perceived to be delivered in a way and format that is accessible and understandable to the target audience.
Timing	Text describing the extent to which the research is aligned with the timescale of the policy development process.
Capability/mindset	Text describing to what extent the producer is able and willing to understand the needs of the user in the production process.
Relationship	Text describing the extent to which the target audience/user is able and willing to understand and use the scientific information in the policy briefs. Text that describes whether the science is produced through a two-way communication and interaction with the target audience.
Challenges	Text describing challenges or barriers in production process and use approach of the scientific information.
Improvements	Text describing how the production process and use approach could be improved.

The data analysis also included open coding, meaning that the researcher was open to the arise of new themes during the analysis process (Halperin & Heath, 2017). New themes would be added to the analysis if it was found to be a reoccurring theme in the interview material. The variety of participants involved in the interviews as well as the use of open questions means that new themes, found to be important in this study context, could arise. As the study's analytical framework was constructed hypothetically for the study context of the SAPBs, the inclusion of both closed and open coding allowed a broader inclusiveness of meaningful themes associated to the study context. Any new codes are presented in the analysis chapter. The use of a systematic coding as presented above strengthens the study's quality as the data is coded consistently by the author in accordance with the coding scheme (Halperin & Heath, 2017).

Lastly, the interview material was coded using NVivo12, a software used to analyze qualitative data. The software is used as a tool to organize and manage the data while the analysis is conducted only by the researcher. When all text segments were coded, each theme of the coding scheme was put together to draw conclusions (Halperin & Heath, 2017).

Methodological reflection

This study is using a qualitative research approach through semi-structured interviews when looking at the single case study of the SAPBs. One of the main critics against qualitative research is the difficulties to replicate and generalize its results due to the use of case studies and limited sampling (Bryman, 2011). The social contexts being addressed in qualitative research are interpreted by the researcher and thereby tend to be more subjective than quantitative research. Another problem is the difficulty to "freeze" a social context that is being studied at a certain time hence making it hard to replicate it in the future (Bryman, 2011). Due to these qualities of qualitative research, looking at criteria such as validity and reliability is viewed as less relevant and important. Instead, the criteria of authenticity and trustworthiness are seen as fundamental when establishing and assessing the quality of qualitative research (Bryman, 2011).

Trustworthiness and authenticity in qualitative research

The trustworthiness of the research can be divided into the three different aspects of *credibility*, *transferability*, and *dependability*. This research is focusing on a single case study of the SAPBs by interviewing actors involved in both the production process and use approach of the SAPBs. This research design is useful

to find a deeper understanding of how certain challenges in the science-policy interface of the SAPBs come about and how they affect the production process and use approach of the SAPBs (Bryman, 2011).

Case studies aim to possess two important characteristics, 1. say something meaningful to the case study in question but also about the general political phenomena, and 2. engage with and reflect upon the wider academic debates (Halperin & Heath, 2017). However, one can argue that case studies are limited in their capability of testing a theory or being generalized as they don't include a larger number of cases (Halperin & Heath, 2017). With recognition of this argue, Flyvbjerg (2006) states that case studies can be valuable in the process of gaining more knowledge of a certain issue in a given field. The results from this case study could provide a more detailed and thick description particularly on the SAPBs but could also be valuable to improve the greater understanding of challenges connected to science-policy interfaces in general. However, generalizing the research findings is not the goal of qualitative research (Bryman, 2011).

Achieving full transferability in qualitative research is difficult as the research results are based on the subjectivity of the researcher and will likely produce a different outcome being conducted in a future context. To increase the study's transferability, the researcher aimed to be transparent in all the steps used to conduct this research, and why certain interview participants have been chosen. By doing so, it will be easier for others to assess the study's transferability to other contexts or similar cases (Bryman, 2011).

As the target audience and users of the SAPBs are both broad and, to an extent, unknown, only a limited selection of actors related to the use approach was possible to include within the time feasibility of this study. The researcher acknowledges that the limited selection of participants related to the target audience/users of the SAPBs, will affect the results and will not be representable for the perception of the full target audience. Including a larger extent of user groups such as policymakers/practitioners from developing countries would be of interest in further studies. To increase this study's credibility and quality, both data- and theory triangulation has been used in the research method. This means that several different sources of information/data have been used, both when selecting interview participants but also when developing the analytical framework, which strengthens the quality of the research findings (Guion, 2002). By including actors from several agencies/programmes hence showing both perspectives in the SPI, several approaches have been combined giving the study a more comprehensive picture of the issue being addressed, compared with using only one approach (Heale & Forbes, 2013).

Achieving objectivity is also a difficulty in qualitative research, as the research is based on the researcher's interpretation and perception of the collected data. To decrease the subjectiveness of the study, open questions have been asked where several follow up questions has been used to decrease the chance of

misinterpretation. The interviews were also recorded and transcribed which made it possible to both listen and read through the empirical material, and thereby make sure the social reality/context was rightfully interpreted and aligned with what the participant said.

Lastly the researcher has conducted this research in good faith with a reviewing point of view, and has to the possible extent, not let personal values interfere in the conduction of the research, which adds to this research's authenticity (Bryman, 2011).

Ethical considerations

This study included interview participant with members from the WASP, related to the production process of the SAPBs, and with policymakers/practitioner from NORAD and SIDA, actors related to the use approach of the SAPBs. Ethical principles have been considered regarding all participants involved in the research by looking at the four ethical requirements on *information, consent, confidentiality, and utilization* (Bryman, 2011).

All interviewees were contacted through email in which information about the study and its purpose was provided together with a Letter of consent, see appendix A.1. Through the letter of consent, the interviewee was informed that their participation was voluntary, and they had the right to withdraw at any time without giving any reason and without negative consequences. The interviewees were also informed about what was expected from their participation as well as possible advantages and disadvantages from participating. By providing a Letter of consent, the participants were giving the information needed to decide whether to participate or not. All participants confirmed their interest to participate by indicating a day and time when available. The interview requests were sent out several weeks before the interviewing stage, hence giving the participants time to reflect about participating. All participants gave either a written consent by filling out the form provided in the Letter of consent or through a verbal consent on the audio recording before the start of the interview, see Appendix A1.

To ensure the confidentiality of the participants, several measures was taken. Firstly, the recorded interviews were transcribed and coded in which only the researcher had access to a list of names and codes. The participants were anonymized by giving them a participant code which could only be related to a stakeholder group. Secondly, the analysis was written in a way in which the individual results would not be identifiable, by avoiding quotes that could reveal the agency or position and by drawing larger conclusion of each stakeholder group.

This research has been conducted working with the WASP secretariat, in which the results of the research may be used to provide insight on challenges connected to the SAPBs, hence provide suggestions on the future evolvement of

the SAPBs. It is of great importance that the research is conducted in an unbiased way. No compensation has been given to the author for conducting this research. The secretariat has provided a supporting role throughout the research and have provided suggestions on research topic and potential methods used. The secretariat has however not had any influence on the final selection and participation of interviewees in this research and have not tried to influence the results, instead letting the author conduct the research through own thoughts.

Analysis

The following chapter presents the analysis of the nine conducted interviews. The analysis is structured with subheadings/themes that are in accordance with the seven criteria found in the analytical framework, see table 1. Challenges and improvements connected to the production process and use approach are embedded and presented under each subheading/theme in the analysis chapter.

One new theme was identified during the analysis process through open coding and has been added as an eighth subheading/theme in the analysis chapter, see *Identified target audience*. The new theme was a frequently occurring topic in the interview material and was found to be an important aspect connected to an effective production process and use approach of the SAPBs.

Each subheading/theme in the analysis presents views and perspectives from both stakeholder groups i.e., actors related to the production process (WASP) and actors related to the use approach (SIDA and NORAD). As stated in the method, actors related to the use approach was sent the SAPB issue number four, see figure 2, as an example to discuss from. In the analysis, the two different stakeholder groups are referred to either as “actors related to the production process/production-side” (P1, P2, P3, P4, P5) or “actors related to the use approach/user-side” (U1, U2, U3, U4).

Some themes were found to be more frequently occurring than others when analyzing the interview material, resulting in longer or shorter analytical texts under each subheading/theme. However, this is not an aspect that will be weighed in or affect the analysis/results, rather an aspect possible to discuss. A list of elements found in the analysis to inform each criteria, related to the analytical framework, is presented under each theme (see table 5-12), which will be used to discuss the relevance of the framework in this study, see study limitations in the next chapter.

A summary of the findings in the analysis is presented in the beginning of the discussion, found in the next chapter of this report.

Credibility

The following theme analyzes the participants views on whether the scientific information is perceived as scientifically adequate and that the source is perceived to be trustworthy.

Two of the actors related to the use approach (U3, U4) expressed a sense of confidence and trust to the scientific information in the SAPB, as several well-known UN-agencies are involved the production process and presented on the briefs “When you see who the resources are and who actually put it together, these are trustworthy sources that we use and collaborate with. I do think these are highly relevant stakeholders” (U3, personal communication, March 29, 2022). Two actors on the user-side (U1, U4) highlighted the publication date as an important characteristic affecting whether the scientific information is perceived as credible.

Sometimes the data might be a bit outdated. If I'm looking for some information on the specific topic maybe a specific place, some research might have been done but it's maybe five years old, then I would be skeptical in using it or referring at least to data or information from such old research. (...) I think if it's older than 2020, then it's getting old/outdated probably. (U1, personal communication, 25 March, 2022)

Other aspects, mentioned by the actors on the user-side (U1, U2), affecting the credibility of the scientific information, was whether it's based on a peer reviewed process and produced by independent scientists. One of the actors on the user-side noted that the SAPB was not perceived to be very scientific in the sense that it didn't refer to many studies or was transparent about the methodology used to conduct the policy brief.

Several actors on the production-side (P1, P2, P3, P4) acknowledged that the scientific information in the policy briefs is a synthesis of already existing knowledge and are not intended to create new knowledge on the topic. Several actors on the production-side (P3, P4, P5) pointed out the wide range of actors involved in the production process of the SAPB, as a factor strengthening the SAPB credibility, especially the authors, who represents the academic field on climate adaptation, and the seven UN-agencies who are co-leading the WASP.

Table 5. List of elements found in the analysis

The table lists the elements found in the analysis to inform the criteria “credibility” in the analytical framework.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Credibility	<ul style="list-style-type: none">• Trustworthiness in authors and UN agencies• Date of publication / outdated science• Inclusion of diverse actors

Relevance

The following theme analyzes the participants views on whether the scientific information presented in the SAPB are found useful and matches the needs and problems of the policy process.

All actors related to the use approach (U1, U2, U3, U4) viewed science as an important and essential information tool to support policymaking on climate adaptation. Scientific information is used by the actors on the user-side when assessing and deciding what initiatives, related to climate adaptation, are the most sensible and relevant to financially support to increase resilience and reduce disaster risks in regions most vulnerable to climate change. Scientific information is also used to develop a fundamental understanding of climate adaptation issues, needs and solutions in preparation for dialogues with partners or authorities in developing countries.

Several actors on the user-side (U1, U3, U4) perceived the scientific information presented in the SAPB to be useful and to match current policy needs on climate adaptation. The information was seen as relevant in terms of presenting a holistic overview of the issue, characterizing and guiding what aspects are of most importance in relations to the issue, presenting what’s already being done by other initiatives supporting the issue and providing supplementary information on the issue. One of the actors stated:

In terms of prioritization, I think it's an important kind of tool, because there is so much information out there and when it comes to adaptation it's very context specific, so how can you design your programs and projects and deal with many things at the same time? (...) And the most important thing - how do you really address the most important thing? I think this could be like a tool to guide us. (U4, personal communication, April 5, 2022)

However, all the actors on the user-side (U1, U2, U3, U4) stated that the information in the policy brief wasn’t new to them and that they’ve already

encountered the topic and its content through other information sources, thereby limiting its relevance of being used by the actors. The amount of already existing and available knowledge on climate adaptation was seen, by several of the actors (U1, U2, U4), as a constraint to use the scientific information provided in the SAPB. Limited time was also pointed out as a constraint by two actors (U1, U4).

Actors on both the production-side and user-side (U3, P4) indicated that adding more translatable and direct-action points forward in the policy briefs could facilitate the usability of the information and improve the policy briefs. Most of the actors on the user-side (U1, U2, U3) also mentioned context specificness and the inclusiveness of interdisciplinary and cross-cutting aspects as important factors when looking at the relevance of scientific information in policy. The actors stated that policy needs on climate adaptation vary depending on the specific region or context in question, in which non-scientific aspects such as social, political, and economic challenges, are also of importance in policy decisions.

(...) climate change adaptation also very much depends on where you're working. You have different challenges whether it comes to physical challenges like different weather, climates, or climate change challenges. Then you also have various social challenges and economic challenges that might not be the same in a different country. You have all these things that you need to adapt as well. The mere scientific implementation part doesn't necessarily work everywhere. (U3, personal communication, March 29, 2022)

Several actors on the production-side (P1, P2, P3, P4) expressed similar constraints and challenges when producing and delivering a policy brief relevant to the user. The fact that the policy briefs synthesis already known knowledge and are competing with other sources producing similar information, was pointed out, by one of the actors, as a constraints to increase the briefs relevance to the user “They are competing in a very crowded space, there's so much documentation coming out every day on these things from all over the place so at the receiving end, it's just one of many things” (P4, personal communication, April 12, 2022).

Other challenges expressed by the actors on the production side was the broad target audience (P2, P3), the general information presented in the briefs (P3, P4) as well as delivering it to people with limited time and resources (P1). “That's the biggest challenge, to make sure that we have prioritized the right things in there and that we have produced recommendations that go beyond what is obvious.” (P4, personal communication, April 12, 2022).

The process of assessing relevant and current policy needs has varied throughout the production process of the five SAPB. Relevant topics on climate adaptation have openly been suggested by all members of the WASP in the beginning of the production process. The selection of relevant scientific topics and

content for the SAPB has, according to the actors on the production-side (P1, P2, P3, P4) been based on the interest, expertise, and experience of the members within the WASP. With a variety of backgrounds from different fields, the combined expertise and experiences from the WASP members covers both research/academia on climate adaptation as well as national/international policy and climate negotiations on climate adaptation. However, the responsibility of including and presenting scientific information that is responsive to the needs of the users/target audience has been on the scientists/authors and their expertise on the specific topic. General directions of future policy need on climate adaptation have also been assessed through interviews with the co-sponsoring UN agencies of the WASP, who is also viewed as a target audience of the SAPB.

In addition, several actors on the production-side (P1, P2, P3) stated or criticized the lack of thought and structure when assessing and deciding relevant policy needs in relation to the users as well as the limited involvement and feedback from actors/policymakers/practitioners who are using the briefs.

They may be quite useful for somebody who doesn't know the topic that well, to pick up and give it a skim through. But they might also get that just by Google Scholar or finding the right part of an IPCC report or any number of things that are out there. I think each of the briefs could have benefited from more planning rather than jumping straight to the writing, in terms of being able to be more specific about: who's is the intended audience for this piece? I think we've been quick to go "Oh yeah there's an interesting topic, let's just have a brief written. (P3, personal communication, April 8, 2022).

Another participant added that the production process of the first three SAPB were quickly established based on the necessity to have concrete products related to the WASPs research aim and that would add to the profiling of the WASP in an early stage "(...) it was necessary for WASP to have some products. Something that people could get hold of and say that this is something WASP has done" (P1, personal communication, March 29, 2022).

Table 6. List of elements found in the analysis

The table presents elements found in the analysis to inform the criteria "relevance" in the analytical framework.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Relevance	<ul style="list-style-type: none"> • Perceived usefulness of SABP content • Description of and limitation in production process • Consideration of user needs

Identified target audience

The following theme was identified throughout the analysis process and added as an additional theme in the analysis as it reoccurred to a larger extent in the interview material. This theme analyzes the participants views on whether the target audience of the policy briefs is clearly identified.

Majority of all actors (P1, P2, P3, U2, U3, U4) on both the production-side and user-side, expressed the importance of identifying the right target audience for each topic and policy brief to better respond to their needs and increase its usability in policymaking. However, several actors (P1, P3, U2, U4) questioned whether the WASP has been successful in defining and identifying the target audience of the policy briefs.

To be completely frank, I think WASP still needs to find: who is its audience? And that can be plural, but it strikes me that there's at least two that we're underserving by being very general, in the way that we define the audience for the briefs. (P3, personal communication, April 8, 2022).

Actors on the production-side (P1, P2, P3) thought that the target audience of the policy briefs was very broadly defined, to the extent that it complicates the policy brief's chance of being successful. According to actors on both the production- side and user-side (P1, P4, U3), the policy briefs targets and reaches actors who are probably already converted but also familiar with the information presented in the brief.

Actors on the user-side (U2, U3, U4) also questioned whether the policy briefs have been successful in reaching out to its target audience as well as assessing who are using the briefs "Maybe the organization should identify who's out there and target those people, because we're not so many people at (*mentions organization*) working on an environment and climate policy level. So how come that they didn't reach out to me?" (U4, personal communication, April 5, 2022). Identifying who are using the briefs and getting their feedback was seen as a weakness and an area of improvement, within the productions process and use approach of the SAPB, by several actors on the production-side (P2, P5) as well.

We need to do a lot more work on this, having conversations directly with the users, because so far, all they do is download the brief or share the brief but don't have concrete comments. Those are things we need to get better at, having communication with all these organizations and hearing about their feedback and knowing what they think or tracking the usage of the briefs. (P5, personal communication, April 26, 2022).

Table 7. List of elements found in the analysis

The table presents elements found in the analysis found to inform the criteria.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Identified target audience	<ul style="list-style-type: none">• Clear definition and identification of target audience• Outreach to target audience and users

Legitimacy

The following theme analyzes the participants views on whether the scientific information has been conducted in an unbiased way and with respect and fairness to different stakeholder's views and beliefs.

Actors related to the use approach of the briefs (U1, U3, U4) found the briefs to be legitimate based on seeing the several well-known UN-agencies involved in the WASP and the production of the policy briefs. The involvement of the UN-agencies as well as academia, was also emphasized as a strength by one of the actors on the production-side, in terms of branding the briefs legitimacy "...it has very strong branding. It has all these international agencies behind it, which is very unique. Not only is it perceived to be something endorsed by the broader UN system but also it is written by very prominent academics, so it has both" (P4, personal communication, April 12, 2022). Several of the actors on the production-side (P2, P3, P4, P5) also highlighted the several different stakeholders, mainly members within the WASP but also some external actors from academia, giving feedback and commenting the drafts of the policy briefs at the later stage of the production process.

Even though several actors highlighted the many UN-agencies strengthening the WASPs legitimacy, one of the actors on the production-side believed the WASP has been unsuccessful in establishing a reputation and demonstrating its value throughout the years, which the actor believes has affected the engagement of different stakeholder involved in the production process of the briefs "I think WASP has been a little bit unsuccessful in building a reputation, such that people would feel it was advantageous to be able to put on their CV that they contributed to the production of the science-for-policy briefs." (P1, personal communication, March 29, 2022). On the other hand, several actors on the user-side (U1, U3, U4) found the briefs to be useful for their work on climate adaptation, but several of them (U1, U4) had not heard of the WASP or the policy briefs before, which adds to the argument on whether the SAPB successfulness to establish itself and creating a broader recognition and reputation in the climate adaptation field.

One aspect constraining the policy brief’s legitimacy, brought up by one of the actors on the user-side, was the lack of views and beliefs from stakeholders across private and implementing sectors beside the UN-agencies.

One of the issues that I see in general is the lack of going across the sectors and maybe going down to including private sectors or including more direct implementers. It often turns out to be very policy based and very large and very institutionalized information. Sometimes it is connecting those issues and the research to actual implementable and accessible information from what is actually working on the ground, what happened, what empirical data on what worked what didn't. I do think that would be something that could strengthen it. (U3, personal communication, March 29, 2022)

Another actor related to the use approach expressed an interest to know more about how the information was put together by requesting more transparency on whether different opinions were expressed by the different members involved in the production process of the SAPB.

Table 8. List of elements found in the analysis

The table presents elements found in the analysis to inform the criteria “Legitimacy” in the analytical framework.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Legitimacy	<ul style="list-style-type: none"> • Inclusion of UN agencies and diverse actors • Reputation and branding of the SAPBs

Accessibility

The following theme analyzes the participants views on whether the information is perceived to be delivered in a way and format that is accessible and understandable to the target audience.

All actors on the production side (P1, P2, P3, P4, P5) stated that the policy briefs are launched to the target audience in connection to different international climate events. The first three briefs were launched at the UNFCCC research dialogue event, the fourth brief at the COP26 event in Glasgow and the fifth brief at the Gobeshona conference event hosted by ICCCAD. One of the actors on the production side stated that the launching of the SAPB is strategically timed with well-known climate events to reach the right people.

We might even have the brief ready, but we would wait for a great event to come up. We just look for the right event. (...) We want to do it right and launch it in the right moment with the right people who will understand, who will benefit from the brief and the topic in the brief, and who will help us disseminate and tell people about the WASP and the briefs. (P5, personal communication, April 26, 2022).

However, another actor on the production-side stated that the focus on delivering a policy brief at a certain event, has affected the production process, and questioned whether there could be a better way of delivering the brief to the target audience.

When we lay out “oh we would love to have these briefs ready for COP”, immediately that sets a clock and it starts ticking away fast, so you're rushing to get something ready for an event. As opposed to saying “what's the right way of moving this material into a policy interface? Is COP really the place? or is that already just a waypoint on a longer process? so I think the rush to get to a particular large event has affected the process. (P3, personal communication, 8 April, 2022).

In addition to the launching event, the SAPB are published and accessible at the WASP webpage, but also communicated in social media and at meetings where WASP is present.

Several actors on the production side (P1, P3, P4) found that the deliver and receipt of the SAPB to be challenging. One of the challenges brought up was the difficulty to attract and retain the attention of the target audience at big launching events where a wide range of scientific information is presented and competing for the audience attention. The target audience interest and receptiveness to the information was also seen as a crucial factor when presenting and disseminating the policy briefs. Other factors brought up were the ability to communicate and deliver scientific information in a short and easily digestible way to a non-expert, but also how to deliver information that can be translated into tangible policy actions by the reader: “the ability to write a short and concise, something that is easily digestible by a non-expert, is itself an art. I'm not sure that finding people who are the best academics, is the best way of finding the best authors.” (P3, personal communication, 8 April, 2022).

As to the views on the user-side, all the actors (U1, U2, U3, U4) found the information in the policy brief to be fully understandable. One of the actors added:

I think it's understandable for people who are in the field, because it uses a lot of terminology that we might understand. (...) There are a lot of acronyms used, which we are used to, but I think you need to be within this field to

understand the policy brief without having to look up some issues. (U1, personal communication, March 25, 2022).

Several of the actors (U1, U3, U4) stated an interest to use or share the briefs moving forward but also to keep receiving upcoming briefs in the future (U3, U4). However, these actors (U1, U3, U4) stated they had not come across or used the policy briefs before the interview in which some actors (U2, U3, U4) questioned whether the policy briefs have been successful in reaching out to its target audience. In addition, actors on the user-side thereby believed the briefs could be distributed to more stakeholders.

Most of the actors on the user-side (U2, U3, U4) think there is too much scientific information available and accessible, in general, to the extent where it's difficult to know what research to prioritize and how it all connects. One of the actors also expressed a need for more actors or communicators who can translate and communicate scientific information between the science and policy field.

Table 9. List of elements found in the analysis

The table presents elements found in the analysis to inform the criteria “accessability” in the analytical framework.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Accessibility	<ul style="list-style-type: none"> • Platforms for launch and access of SAPB • Ability to understand SAPB content • Perceived accessibility of SAPB

Timing

The following theme analyzes the participants views on the extent to which the research is aligned with the timescale of the policy development process.

Investigating emerging topics on climate adaptation at the current time and in the future as well as what could be accepted and usable in the policy field at the current time, was expressed by several of the actors on the productions-side (P2, P3, P4) as aspects considered in the production process. These considerations are emerged in the production process through the knowledge and experiences on international policy from members of the WASP. It has also been assessed in general for the WASP products and activities, through interviews with the WASP co-sponsoring organizations. Whether these considerations have been successfully integrated in the production process of the policy briefs was questioned by one of the actors on the production-side:

I think at the first instance, we aspired to, and I think we've been moderate in our success, to more generally have a sense of - what are the emerging topics? what are the research directions within adaptation science? So that landscaping, informing which topics need to be chosen and why those topics actually have a particular need now. (P3, personal communication, April 8, 2022).

None of the actors related to the use approach (U1, U2, U3, U4) expressed difficulties with finding various generic scientific information on a climate adaptation issue at a certain time in the policy process. In contrast, the actors (U1, U2, U3, U4) had already encountered much of the information in the policy briefs through other sources beforehand. Expressed challenges were more connected to finding scientific information and data on a specific contexts or countries, or information that wasn't perceived as being outdated, as discussed in the credibility theme. The timely aspects in outdated scientific information were also mentioned by an actor on the production side.

That is one of the problems with the science-for-policy briefs - they are time limited in their usefulness and I don't think WASP is given a great deal of thought to that. What do you do with them after 3-4 years? They need to be revisited. (P1, personal communication, March 29, 2022)

Table 10. List of elements found in the analysis

The table presents elements found in the analysis found to the criteria “timing” in the analytical framework.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Timing	<ul style="list-style-type: none"> • Timing considerations • Perceived availability of science at time • Date of publication / outdated science

Capability/mindset

The following theme analyzes to what extent the producer is able and willing to understand the needs of the user in the production process, as well as the extent to which the target audience/user is able and willing to understand and use the scientific information.

All actors stated the absence of an interface with the users/target audience of the briefs during the production process. However, given the construction of a diverse

stakeholder group in the WASP, the producers (P1, P2, P3, P4) argued that their own and combined interest and knowledge about scientific information on climate adaptation reflects and covers the needs of the user. Despite this argue, several actors (P1, P3) on the production-side indicated flaws in the production process on whether it has succeeded to identify and understand the users and their needs, with lack of a planned strategy. When asked to describe the production process of the briefs, one actor stated “If I had to put it into two words - it's ad hoc. Which is a just a fancy way of saying we've made it up as we go along.” (P3, personal communication, 8 April, 2022). The actor also expressed:

I think we've been a little bit quick to jump to: “yeah that sounds like an interesting topic” without as much as a publisher would do the diligence of: what is the audience for this? and can you distinguish it from other similar titles? (P3, personal communication, 8 April, 2022).

The policy briefs contain a synthesis of already existing knowledge and don't provide new knowledge on a topic, they are scientific rapid assessments of a climate adaptation issue. Several of the actors on the production-side (P1, P3, P4) viewed the policy briefs as being general in their content. The briefs general approach was viewed as a constraint by the actors on the production side (P1, P3, P4) in terms of limiting its ability to respond to users' needs and provide concrete policy prescriptions to act upon. Another constraint stated by the actors was the broadly defined audience for the briefs, which has restricted their ability to respond to their needs.

Several actors on the production-side (P1, P2, P3, P5) stated a need to better integrate and assemble users' needs in the production process of the briefs. Several actors (P1, P3, P4, P5) found limited financial and human resources to be a constraint in the production process of the briefs, hence affecting the brief's ability to evolve and have a more effective outcome in policy development.

To do a science-policy interface really well, it takes time and effort. If we are each individually spending an hour every week or two on it, it is perhaps under-resourced for its intent. (P3, personal communication, 8 April, 2022).

The Covid-19 pandemic was also mentioned as an aspect affecting the production process of the SAPB and the ability of the producers. This was presented as a constraint as it changed producers' availability to engage and contribute, but also slowed down and delayed the production process of the SAPB. One of the actors on the production-side stated: “With the pandemic, our briefs were delayed, because people, especially when the pandemic started, people had a lot of challenges. People got sick or they had family members who were sick or

hospitalized. So, everything went slower.” (P5, personal communication, 26 April, 2022).

All actors on the user-side (U1, U2, U3, U4) stated a full ability to understand the information in the brief, and several actors (U1, U3, U4) also stated an interest in using or sharing the information in the policy briefs. However, some actors (U1, U4) questioned their ability to read and use the scientific information given their limited time.

All actors on the user-side (U1, U2, U3, U4) expressed a positive view on using scientific information in general and described science as crucial and important when developing and agreeing on climate policies “Sciences is everything. Without scientific backing you can never agree on anything. It all has to be evidence based or science based obviously, otherwise we end up nowhere” (U2, personal communication, March 28, 2022). However, some actors were more critical to the information in the briefs and its usefulness than others. Several actors on the user-side (U2, U3) found the policy briefs generic and summarizing approach to limit its usefulness in policy as it doesn’t add much new information.

Table 11. List of elements found in the analysis

The table presents elements found in the analysis to inform the criteria “capability/mindset” in the analytical framework.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Capability/mindset	<ul style="list-style-type: none"> • Ability to understand user needs • Content limitations in SAPB • Financial and human constraints • Views on science and SAPB usefulness • Willingness to use SAPB • Ability to understand science

Relationship

The following theme analyzes the participants views on whether the science is produced through a two-way communication and interaction with the target audience.

The communication and interaction between the scientists and policymakers in general, was a well reoccurring theme during the interviews. All actors on the production-side (P1, P2, P3, P4, P5) stated that there is no interaction or involvement from the users/target audience of the briefs during the production process. One of the actors stated the following:

It's not just these science-for-policy briefs, it's all communications that are produced for climate change - is understanding what your target audience is and how to address it. Generally speaking, most communications I think are fairly unsuccessful. Now I'm not just talking about WASP, I'm talking about efforts by many organizations around the world. We don't do it very well. (P1, personal communication, 29 March, 2022)

Several of the actors on the production-side (P2, P3, P4) added that the dialogue occurring during the production process are made between the authors/scientists writing the briefs and the remaining members of the WASP. As the WASP includes members who represents the science sector, policy- and finance sector as well as people from the seven co-leading UN-agencies involved in international negotiations, several actors on the production side (P2, P3) argued the actors in the WASP could, in that sense, also be viewed as users. However, there is no interface between the producers and the target audience/users in any other sense. When discussing the first set of three briefs, one of the actors stated "They weren't the product of any kind of co-production process with practitioners or anything like that. They were a straightforward transmission of knowledge from the science to the policy community." (P1, personal communication, 29 March, 2022).

None of the actors on the production side (P1, P2, P3, P4, P5) have received any feedback on the briefs practical utility in policy and whether they are being used or not, indicating a lack of evaluation. Some actors on the production-side stated (P4, P5) that feedback from the target audience has only been expressed in immediate connection to the launching events of the briefs or through likes, shares, and retweets on social media, which has been perceived as positive. One of the actors added "People's attention span is very short nowadays. So, the initial positive reaction is not probably an indicator of subsequent impact in using the policy briefs." (P4, personal communication, April 12, 2022).

Actors from both the production-side and user-side (P2, P5, U2) expressed the importance of receiving feedback from the users to increase its usability "I think it would be great to have a better assessment of the different needs from practitioners and policymakers (...) maybe it would be better to have some feedback with users so it better fits with the use." (P2, personal communication, April 4, 2022). One actor from the user-side questioned the approach of international think tanks in general, implying they tend to have an introspect approach when producing scientific information. "Many organizations producing these kind of reports, briefs or documents, are maybe not asking that question enough, about what difference does this make? And asking the people that they want to influence; are you reading this" (U2, personal communication, March 28, 2022).

The actors on the production-side expressed that any feedback on the briefs from the target audience and interaction with the target audience is done at the launching events of the policy briefs, such as the UNFCCC research dialogue event,

COP26 and the Gobeshona conference. However, one of the actors from the production side questioned whether these events are the right way of communicating the briefs to the target audience/users.

(...) we speak about a science-policy interface. An interface is a dialogue, it's a two-way communication. What makes some briefs really work, is if you have that ahead of time and are able to bring the science into dialogue with particular policy need and community. Could we do that without having a brief? Or is that something you need to have alongside? So it may not be, we have a brief to present at a UN global conference, but to say: when can we use these particular moments to hold that interface, to convene that dialogue and bring knowledgeable people together with those who actually are thirsty to understand some of these issues? (P3, personal communication, 8 April, 2022).

Several of the actors on the user-side expressed that they are, in general, communicating and interacting with producers of science. However, all actors on the user-side (U1, U2, U3, U4) stated the need for and importance of a stronger communication system and strategy between science and policy to communicate what works or doesn't work in policy development and thereby adjust the course of action. "Usually, they say that after those 1400 scientists have produced the report, after that you need 1400 communicators to communicate the content. But we haven't seen that yet really." (U2, personal communication, March 28, 2022). One of the main challenges pointed out by actors on the user-side (U3, U4) was the difficulty to convert or translate the scientific information into something that is applicable for policymakers/practitioners. "I think it is, how to make it implementable. Sometimes you have the scientific research and you have the ideas, you know the needs, but then it's about operationalizing them." (U3, personal communication, March 29, 2022). Another actor stated "I think that's the main challenge - to speak the same language" (U4, personal communication, April 5, 2022).

Several actors related to the production process (P1, P2, P3, P5) also indicated a need for a stronger communication with the target audience and user to improve the outcome of the SAPB.

Table 12. List of elements found in the analysis

The table presents elements found in the analysis to inform the criteria “relationship” in the analytical framework.

<i>Criteria</i>	<i>Elements found to inform the criteria</i>
Relationship	<ul style="list-style-type: none">• Communication and interaction with users• Feedback from users• Communications needs between producer and user

Findings & discussion

This chapter includes a summary of the findings from the analysis followed by a discussion. The main findings of the analysis are discussed in relation to the theoretical framework and previous studies. Areas of improvement together with suggestions on moving forward is discussed in connection to the main challenges. The chapter ends with a short reflection on how the analytical framework and study method might have affected the findings, followed by suggestions on future research topics.

Findings from analysis

The analysis of the SAPB found several elements contributing to and limiting an effective production process and use approach. The SAPB was found effective in terms of involving a wide range of actors in the production process and use approach, referring to members within the WASP from the seven co-leading UN-agencies and scientists within the academic field. This was found to be a strength in terms of enhancing the brief's perceived trustworthiness and ability to respond to relevant policy needs in current policy development. However, financial and human resources was found to be an element hindering further engagements and efforts from the members. In addition, the production process and use approach has been challenged by the Covid-19 pandemic and the special circumstances it brought.

The production process and use approach of the SAPB was also found to be effective in its ability to mediate information in a format that is perceived understandable to actors related to the use approach. In addition, the SAPB were found to be effective in terms of presenting holistic information found relevant and useful to support arguments on climate adaptation needs in policy development. However, the SAPB was found less effective in delivering information that goes beyond what's already known to its target audience, but also that can be translated into concrete and implementable action points in policy. One aspect constraining the SAPB effectiveness was the lack of a strategy or structure in the production process when assessing relevant policy needs on climate adaptation in relation to the users.

One of the main elements hindering an effective production process and use approach was the lack of a clearly defined and identified target audience. This aspect was found to be of importance in terms achieving a more effective use approach with information representative to policy needs. Several actors on both the production-side and user-side didn't understand who the target audience is, in which the current broad definition of the target audience was seen as a limitation.

Another main element found in the analysis was the lack of a two-way communication and interaction between the producers of the SAPB and the target audience/users during the productions process or use approach, in which the producers have little knowledge about how the SAPB are perceived and whether or how they're being used in policy. Majority of the participants from both sides expressed a need for a stronger communication between knowledge producers and knowledge users during the production process and in the use approach.

Lastly, all actors on the user-side expressed a positive mindset on using scientific information in policy, in which several actors stated a continued interest in receiving and using/sharing the SAPB in the future. However, actors questioned whether the SAPBs have successfully reached out to its target audience.

Discussion of main findings

The new theme in the analysis, *identified target audience*, was found to be one of the main elements hindering an effective production process and use approach of the SAPB. The SAPB targets a broad audience of different actors, including researcher, policymakers, and practitioners, as stated in each of the five published briefs (WASP, n.d.a). Having a broadly defined target audience and delivering more general information could enable more people to take part of the information and elaborate it in whatever way they need. However, this also risk producing information that is already known and not usable to parts of the target audience as demonstrated in the analysis of the SAPB, where all actors related to the use approach was already familiar with the information. In addition, the SAPB targets people who already are converted and working within the adaptation field by launching the briefs at big climate events. As stated in the analysis, the SAPB are not meant to provide new knowledge but to synthesis already existing knowledge. However, this leaves the producers with a challenge of knowing how to add value through existing knowledge that goes beyond what is already known to a converted audience. As stated by one of the actors in the analysis: "That's the biggest challenge, to make sure that we have prioritized the right things in there and that we have produced recommendations that go beyond what is obvious." (P4, personal communication, April 12, 2022).

The target audience have been defined in a general term; however further refining of the definition is lacking, to the extent of which majority of all interview participants found it difficult to understand who the target audience is, but also understanding who are receiving the briefs and using them. This issue has, in comparison to previous recent studies, also been identified in other SPI cases at a national level (Arnott & Lemos, 2021). According to FAO (2011), identifying the target audience is one of the main objectives when strategically and effectively communicating scientific information to policymaking. This includes defining different audience groups and investigating their characteristics. (FAO, 2011).

Having a clearly identified target audience and planning the intervention against this group is essential to effectively reach the goal of the brief and have an impact on the intended audience (Balian et al., 2016; FAO, 2011; UNEP, 2017). As stated by Balian et al. (2016), having a dissemination strategy, that clearly states methods used to inform and share the information to key actors, gives the policy briefs a greater chance of having an effect (Balian et al., 2016). In addition, knowing your target audience and finding key users could enable the producer to evaluate the SAPBs relevance and outcome. With this in mind, an improved communication and dissemination strategy, in which a target audience is clearly assessed, is an area of improvement for the SAPBs. This aspect is also viewed as important, as it could allow a more effective distribution of the internal resources (FAO, 2011).

Another interesting aspect found in the analysis was the lack of a two-way communication and interaction between the producers and users of the SAPB during the production process. As one of the interview participants stated in the analysis: “They weren't the product of any kind of co-production process with practitioners or anything like that. They were a straightforward transmission of knowledge from the science to the policy community.” (P1, personal communication, 29 March, 2022). The analysis also shows a lack of a two-way communication and interaction in the use approach, in which none of the actors on the production-side have received any feedback on the SAPBs practical utility in policy, leaving the producers with no perception on whether or how the briefs are being used.

Identifying and integrating relevant users' needs have been done based on the expertise and experiences of the producers and what they believe and assess is relevant, with no involvement or interaction from the users. However, as argued by Lemos & Rood (2010), there could be a disconnect between what producers of knowledge find useful and what users of knowledge find usable. The lack of communication and interaction between the producers and users in the production process and use approach of the SAPB, indicates that the Two-communities Theory (Caplan, 1979) and a linear transfer model of science (UNEP, 2017) is, to a certain extent, still visible in this case. However, one can also argue that the SAPB are produced through a joint construction between science and policy, as the WASP is

built upon a wide range of actors: representing both the academia, policy sector as well as international negotiations. The WASP is, in that prospect, an example of how the two fields of science and policy has come together to decrease the knowledge-action gap. The involvement of different actors and stakeholders within the WASP was found to be one of the aspects contributing to the SAPB effectiveness. However, majority of the interview participant stated a need for a stronger relationship and communication between producers and users of knowledge in order to better understand and integrate knowledge needs and adjust the course of production more effectively. One of the actors stated, “I think that's the main challenge - to speak the same language” (U4, personal communication, April 5, 2022). As stated by previous studies, adapting a more collaborative approach and building a closer relationship is of great importance to increase the usability and impact of science in policy (Dunn, Bos & Brown, 2018; Sienkiewicz & Mair, 2020). Even though the relationships between science and policy are heading towards a broader range of broader range of actors, (UNEP, 2017) interactions (Newman et al. 2015) and more fluid boundaries (Wehrens, 2014), the findings of this study indicate there is a continued need to further integrate users of knowledge in the production process and use approach, as similarly stated by Balvanera et al. (2020).

Study limitations

The findings of this study are affected and limited by the characteristics of the research design and method. The analytical framework, used as an analytical lens throughout the research, was hypothetically constructed based on the theoretical framework, in which a limited number of criteria were selected for this study case. As stated by Heink et al. (2015) about the CRELE criteria; they can have different meanings depending on different contexts, who are interpreting it and at what stage in the production process/use approach they refer to. The seven criteria in this case study have shown to be relevant and helpful when investigating and assessing the effectiveness of the SAPB. However, the elements found in the analysis to inform the criteria, see table 5-12 in the analysis, did not cover the criteria description in the analytical framework to a full extent, in which some criteria covered the analytical framework more than others. Some criteria were also found less occurring in the analysis, which could reflect its relevance in this case study. However, the use of open coding helped to identify a new theme relevant to the study context, which added to the study's quality (Halperin & Heath, 2017). Further investigation of the participant's views and thoughts would enable a more extensive comparative research approach against the theoretical and analytical framework.

Another study limitation that might have affected the findings was the focus on the SAPB #4, on Early Warning Systems for Adaptation, in the interviews with actors related to the use approach. Several actors on the user-side referred to this specific brief when answering some of the interview questions and discussing their thoughts on the SAPB. However, this was the latest available SAPB-issue at the time of the interview, hence giving them the most updated information to refer to.

The SAPB is a relative new initiative by the WASP with a number of five policy briefs produced and published up until this writing moment. As stated by an actor on the production-side, the production process and use approach of the SAPB have been affected and limited by the Covid-19 pandemic and the constrictions it brought. With this in mind, all SAPB-issues have been published during the Covid-19 pandemic, starting from the first issue published in November 2020. However, this study's interview guide, see Appendix A.2, did not include specific questions on the effects of the Covid-19 pandemic, leaving the analysis with limited views and thoughts from the participants on how this aspect might have affected the effectiveness of the SAPB. This could be an aspect interesting to further investigate, as all actors probably has operated under very special circumstances during the pandemic.

Another aspects worth having in mind, in relation to the SAPB being a new initiative, is the effect of iteration in the SPI, as showed in a study by Dilling & Lemos (2011). This means that the production process and use approach needs to be repeated many times to evolve science into a form better customization to user needs in order to improve its usability and become more effective. Dilling & Lemos (2011) states that most cases of successful production and use of climate science has involved iteration between the knowledge producer and user. Being a new initiative, the effects of iteration could be an interesting aspect to pay attention to as the production process and use approach of the SAPB continues to evolve in the future.

Future research

Further research and case studies are much needed in order to improve the understanding of challenges connected to the SPI and how they can be improved. In addition, there is a scope for further research in usable science in the context of adaptation. Future research could focus on including a larger number of case studies producing policy-relevant science in the SPI context, in order to compare practical examples and learn from each other. Research could also compare SPIs and policy briefs to other forms of communication between science and policy. In the case of the SAPB, future research could include a larger variety of participants related to

the use approach, from different countries and sectors in order to get a more extensive representation of the target audience.

Conclusions

This study has investigated and assessed how effective the production and use of policy-relevant science is, in contributing to evidence-informed policymaking for climate adaptation, in the study context of the WASP's Science-for-Adaptation Policy Briefs (SAPBs). The findings show several elements both contributing to, and limiting, an effective production process and use approach of the SAPBs, indicating several areas of improvement moving forward.

The analysis showed that the SAPBs are effective in terms of including a wide range of actors in the production process, in a way that enhances the brief's perceived trustworthiness and ability to respond to relevant needs in the current policy development. The SAPBs were also found effective in communicating scientific information that is perceived as understandable and relevant to policy actors working within the field of climate adaptation. However, the SAPBs were less effective in delivering information that goes beyond what's already known to policy actors, limiting its perceived usefulness in policy. Limited human and financial resources were found to be an element constraining further engagement and action by the actors.

One of the main elements hindering the effectiveness was the lack of a clearly identified target audience and set of key users. This element was connected to the briefs ability to better respond to policy needs. The production process and use approach of the SAPBs is thereby in much need of an improved communication and dissemination strategy in which the characteristics of the target audience are clearly analyzed and identified.

Other elements found hindering the effectiveness of the SAPBs was the lack of communication and interaction in the SPI between the producers and users. The production process and use approach of the SAPBs could be improved by adapting a more collaborative approach with the intended audience and key users to allow for a two-way communication and interaction.

Given the importance of effective SPIs, in the urge to narrowing the gap between science and policy-action on climate adaptation, overcoming barriers in the production and use of policy-relevant science is much needed. With continued research and development of initiatives aiming to strengthen SPIs and creating usable science, like the SAPBs, we are one step closer to unraveling the challenges facing climate adaptation progress.

Acknowledgements

Firstly, I would like to express my deepest gratitude to my supervisors Emily Boyd and Alicia N'guetta for the support and guidance in the construction of this study. I would like to pay my special regards to Alicia N'guetta for your flexibility and engagement in the supervision of this thesis. Additionally, I would like to extend my gratitude to my external supervisor Maarten Kappelle who has, together with his colleagues at the WASP secretariat, supported me and given me an invaluable insight to the World Adaptation Science Programme. Lastly, thank you to my dearest family and friends for always being there and encouraging me.

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Appendix

A1. Letter of consent - Interview participation

This letter of consent provides information about the study being conducted by Ms. Mikaela Behrens at Lund University, Sweden, and what is expected from your participation. Before confirming your participation, please read through the following information. You are kindly invited to ask any questions that you feel will help you understand this information.

Presentation of the research

This research is being conducted as part of Mikaela Behrens master's project through the Centre for Environmental and Climate Science (CEC) at Lund University and through collaboration with the Secretariat of the UN-led World Adaptation Science Programme (WASP) hosted by UNEP, Nairobi. This research aims to investigate: (a) if the production and use of the WASP science-for-adaptation policy briefs (SAPBs), embedded in the broader scope of the science-policy interface (SPI) is sufficiently effective in contributing to evidence-informed policymaking for climate adaptation, (b) if there is a need for an improved production process and use approach that would allow for a more effective contribution to policymaking and adaptation action, and (c) how such a production process and use approach can be improved to become more effective. The purpose of this study is to assess and improve the understanding of challenges connected to the science-policy interface and identify elements that could hinder the effective exchange and use of science in policymaking as well as identify areas for improvement. The study will be conducted by looking at the World Adaptation Science Programme (WASP) as a case study, with a specific focus on the WASP policy briefs (SAPBs).

Information about the interview to be held

Your participation in this study will consist of one individual interview with Ms. Behrens, lasting approximately 30 - 45 minutes through an audio/video call via Zoom in March/April 2022. The interview will focus on questions regarding the effectiveness of the WASP policy briefs, for example its usability and applicability to policymaking.

Possible advantages and disadvantages of participation

The advantage of participating in this study is that you will have the opportunity to reflect on and discuss the ways in which scientific knowledge and information can influence policy and decision-making in the multilateral climate adaptation negotiation processes, as well as barriers/obstacles affecting the science-policy interface in the field of climate adaptation. In regard to disadvantages, the topic can be perceived as sensitive as it touches on the relationship between actors in the working field of the participants. If you wish to not answer a particular question or questions, you are free to simply decline.

Voluntary participation and right to withdraw

Your participation in this research project is voluntary and you are free to withdraw at any time without giving any reason and without there being any negative consequences. If you withdraw your participation, your comments will be destroyed and no quotation from you will be published, unless you give Ms. Behrens permission to use your comments for research purposes, despite your withdrawal.

Confidentiality

To ensure the confidentiality of the information provided by the participants, the researcher will take following measures:

- The recorded interviews will be transcribed and coded in which only the researcher will have access to a list of names and codes.
- Names of interviewees and individual results of the participants will not be linked to the research material and will not be identifiable in the report that results from this research. The results will refer to respondents either as actors/scientists involved in the production process of the WASP policy briefs, or actors/policymakers within the target audience/users of the WASP policy briefs.
- The research material will be kept on a password protected computer and only accessed by the researcher. The recordings and research materials will be destroyed five years after the end of the research i.e., in June 2027.
- The results of the research will be presented to the WASP and at Lund University as well as published in Lund University Publications Student Papers (LUP-SP).

Compensation

There is no financial compensation to interviewees for participating in this research.

Written acknowledgement of consent

Unless the assigned written acknowledgement of consent has been received before the interview, a verbal consent will be given on the audio recording, at the start of the interview.

Do you understand the project and the implications of your participation?

Response:.....

Do you agree to confirm that you consent to participate?

Response:.....

Do you agree to have this interview recorded as well?

Response:
.....

Acknowledgements

Thank you for your time and attention to your participation.

Additional information

If you have any thoughts or questions about the information provided above or want to withdraw from the research at any time, I invite you to contact me by using the contact details provided by email.

Name and signature of interviewee and date

Name:

Signature:

Date:

A2. Interview guide

Start the interview by introducing the thesis and go through the ethical consideration. Ask the participant for verbal consent if this wasn't provided in written form by the participant before the interview.

Question to user
Question to producer

Introductory questions

- Could you briefly tell me about yourself and your work role?
- For how long have you worked in this role?

Main questions

Criteria (from analytical framework)	Indicators (extracted from criteria description)	Interview questions	Information of interest
Credibility	Scientific adequacy Trust	What are your thoughts on using scientific information to support policy decisions on climate adaptation?	Perception/opinion of the WASP policy briefs from a scientific point of view.
		What is your perception on the WASP policy briefs as a scientific source to inform policy decisions on climate adaptation? How scientifically adequate and trustworthy do you believe the scientific information in the WASP policy to be?	
Relevance	Usability Policy needs Understandable	How does the production process of the WASP policy briefs look like?	Frequency, situation, and limitations to use of science/the WASP policy briefs Considerations of target audience /users' needs
		When and how do you use scientific information to address current policy needs on climate adaptation?	
		To what extent is the scientific information in the WASP policy briefs useful for you to address current policy needs on climate adaptation?	
		How are current policy needs of the target audience/users identified and to what extent are they integrated in the production of the briefs?	
		How are the WASP policy briefs disseminated to assure it reaches its target audience and is understandable for them?	

		What aspects are seen as important when producing the policy briefs to increase its usability in policymaking?	
Legitimacy	Unbiased/fairness Respect Inclusiveness	<p>What is your perception on the WASP policy briefs as a scientific source to inform policy decisions on climate adaptation?</p> <p>How does the production process of the WASP policy briefs look like?</p> <p>How are opinions of different stakeholders considered and included in the production process?</p>	Source of information, diversity/inclusiveness in stakeholder involvement
Accessibility	Usability Understandable	<p>How do you access scientific information on climate adaptation (or specifically the WASP policy briefs) and to what extent do you find the information understandable?</p> <p>How are the policy briefs disseminated to assure it reaches its target audience and is understandable for them?</p>	<p>Source and uptake of information by users</p> <p>Strategy/channels for dissemination</p>
Timing	Usability Policy needs Accessibility	<p>To what extent is the scientific information in the WASP policy briefs useful for you to address current policy needs on climate adaptation?</p> <p>How are current policy needs of the target audience/users identified and to what extent are they integrated in the production of the briefs?</p>	<p>Frequency of unavailable knowledge</p> <p>Implementation of aspects that considers policy needs.</p>
Capability/ Mindset	Ability Willingness/interest Understanding	<p>What advantages/disadvantages have you seen from using science to develop policies on climate adaptation?</p> <p>How interested are you in using the scientific information on climate adaptation provided in the WASP policy briefs to support policy decisions?</p> <p>How do you access scientific information on climate adaptation (or specifically the WASP policy briefs) and to what extent do you find the information understandable?</p> <p>To what extent is it possible to consider and include policy needs of the target audience/users in the production of the briefs?</p>	<p>Ability and interest to use the information.</p> <p>Implementation of aspects that considers policy needs.</p>
Relationship	Trust Communication Interaction	<p>What is your perception of the WASP as a scientific information producer on climate adaptation?</p> <p>What does your communication and interaction with producers of scientific information on</p>	Frequency and type of communication and interaction between producer and target audience/user.

climate adaptation (or specifically the WASP and the policy briefs) look like?

What does your communication and interaction with the user/target audience of the WASP policy briefs look like during the production process?

Closing questions

- What are the greatest challenges you encounter in the uptake and use of scientific information to inform policy on climate adaptation? What are the greatest challenges you encounter during the production of the WASP policy briefs?
- How do you think the WASP policy briefs could be improved to better support current policy needs on climate adaptation? How could the future production of the WASP policy briefs be improved to better support policy needs on climate adaptation?

End the interview by asking if the participant want to elaborate on any topics/questions that have been addressed during the interview. Ask if the participant have any questions on the research itself.



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