EBA

WORKING PAPER OCTOBER 2024

SWEDISH BILATERAL CLIMATE CHANGE ADAPTATION AID: COMPARING PRACTICE WITH EVIDENCE

Lennart Weitzel

Swedish Bilateral Climate Change Adaptation Aid: Comparing Practice with Evidence

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Working Paper October 2024

to

The Expert Group for Aid Studies (EBA)

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Please refer to the present report as: Weitzel, Lennart, Swedish Bilateral Climate Change Adaptation Aid: Comparing Practice with Evidence, Working Paper October 2024, The Expert Group for Aid Studies (EBA), Sweden.

This report can be downloaded free of charge at www.eba.se

Cover design by Julia Demchenko

Lennart Weitzel Lennart Weitzel has previously been employed within EBA's Secretariat as an associate programme manager, contributing to evaluation and research projects through data collection, data management and statistical analyses. He has a background in development studies from Lund University and holds experience in the non-profit sector contributing to projects addressing governance issues.

Acknowledgements

The author would like to express his heartfelt gratitude to Númi Östlund for his continuous support to the development and execution of this working paper. His insightful reflections and constructive feedback have been an important source of input for focussing the analysis and substantiating discussions through the paper.

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Foreword by EBA

The growing risks posed by climate change demand urgent and effective adaptation measures, particularly in vulnerable countries. International aid is crucial in supporting efforts to build resilience and mitigate climate-related impacts. Sweden's funding of climate change adaptation (CCA) has made up over five per cent of total Swedish aid since 2019.

In this working paper, the structure of the Swedish CCA portfolio is described in an Intervention Heat Map (IHM) that covers sectors supported, intervention types, and objectives. The mapping is then compared to an Evidence Gap Map (EGM), which describes existing academic evidence in the same framework. This allows for an assessment of the portfolio's alignment with existing research evidence.

The author suggests that Sweden may enhance the effectiveness of its CCA aid by shifting its focus towards interventions with a stronger evidence base. If not, the reasons for Sweden's current support could be articulated and motivated more clearly than today.

We hope that the insights provided in this report will inform policy makers, decision makers, and current practice to enhance the effectiveness of Swedish CCA aid.

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Stockholm, October 2024

Jan Pettersson, Managing Director

Summary

Climate change is predicted to intensify, even in the most optimistic IPCC models. This will have severe consequences for ecosystems, biodiversity and human societies. These developments have already and will continue to necessitate extensive climate change adaptation (CCA) measures in societies and communities around the globe. Many of the poorest and most marginalized countries are also the most vulnerable to climate change. Despite their need for extensive CCA measures, a significant funding gap persists.

International aid donors are well-positioned to address this gap. Swedish adaptation aid increased from about 1 percent of total annual aid to a relatively stable level between 5.5% and 6.5% since 2019. The purpose of this working paper is to analyse the structure of Swedish bilateral CCA aid and assess its alignment with current research evidence on the effectiveness of CCA measures. As such, its contributions are threefold.

- It identifies trends within the Swedish CCA portfolio and assesses the relevance of the selection of recipient countries.
- It introduces novel data and maps the portfolio according to CCA-related sectors, intervention types, and outcomes.
- It compares the portfolio to the evidence on CCA interventions from research literature.

Theoretical framework and approach

The research project uses a quantitative approach based on intervention-level data from a selected sample of Swedish bilateral CCA aid interventions. The sample was extracted from the OECD Creditor Reporting System (CRS) dataset from 2022 and includes 147 principal CCA interventions. Three data sources were utilised throughout the analysis process: the OECD CRS; indices of Notre Dame Global Adaptation Initiative; and a new dataset on the Swedish CCA portfolio. This new dataset was created by coding the interventions based on a framework from a previous study by Doswald et al. (2020). Swedish bilateral CCA aid was mapped by:

- Sectors where Swedish-funded interventions are located
- Types of intervention modalities commonly financed
- Ex-ante outcomes that Swedish-funded interventions aim to produce

Project descriptions were examined from various sources, including OECD CRS, project documentation, Open Aid, IATI's d-portal; brochures and websites. The Doswald et al. framework was then used to map the Swedish portfolio in an Intervention Heat Map (IHM).

Finally, Doswald et al.'s Evidence Gap Map (EGM), based on a systematic review of the research and grey literature, was compared to the Swedish IHM. This enables an assessment of the congruence between the two parts.

Results and conclusions

The analysed portfolio, all bilateral Swedish CCA aid funded in 2022, is comprised of 147 interventions. About half of Swedish aid is allocated bilaterally or regionally, leaving the remainder to unspecified bilateral distribution. Of the geographically specified aid, most is channelled to countries in Africa, particularly Sub-Saharan Africa (52.44%).

Recipient countries were analysed using indices of the Notre Dame Global Adaptation Initiative. The results show that the portfolio's recipient countries are largely proportional to their vulnerability and readiness to adapt to climate change. However, the analysis also suggest that the relevance could be further improved. There are countries both within and beyond the portfolio that demonstrate a greater need for CCA support than the top Swedish recipients.

Swedish CCA aid has primarily focused on reducing vulnerability in the enabling environment of recipient countries and communities. Socioeconomic and institutional systems have received almost half of Swedish CCA disbursements. About one quarter of funding was allocated to promoting the adoption of CCA measures, making it the second-largest pursued goal. Aid for improving adaptive capacities and reducing exposure and risks have received around a third of funding combined.

Sweden has financed only a few interventions using "physical" or "hard" intervention modalities, such as nature based or technological options, or infrastructural interventions. This is surprising considering that climate change directly impacts the physical environment of human and ecological systems. The results suggest that Swedish decisionmakers prioritise differently than other donors, such as the German Cooperation and the Green Climate Fund. It would be valuable for Swedish decisionmakers to clarify their reasoning and approach to selecting CCA interventions.

The portfolio shows limited congruence with research evidence. This suggests that Swedish CCA aid has largely been used in areas with limited research evidence about the effectiveness of interventions. More research is needed in the following areas of Swedish bilateral CCA aid:

- The effectiveness of informational/educational and institutional/ regulatory interventions
- How to effectively promote CCA through adjustments in the socioeconomic and institutional systems of recipients.

Swedish donors also have opportunities to expand their funding into evidence-rich areas of CCA interventions, such as:

- Interventions within the forestry, fishing and agricultural sectors
- Interventions utilising nature-based options, built infrastructure, or technological options
- Interventions promoting economic benefits as a form of adaptive capacity or the reduction of impacts and risks from climate change.

1 Introduction

Climate change is arguably the largest and most dire challenge facing humanity at a global scale. Even the most hopeful predictions, assuming the most drastic and timely measures, conclude an overall increase in global temperature by 1.4°C by 2081-2100, compared to 1850-1900. Alternative scenarios, in which greenhouse gas emissions remain at intermediate or very high levels predict a mean increase of 2.7°C or 4.4°C, respectively. These are the forecasts presented in the most recent assessment report (AR6) published by the Intergovernmental Panel on Climate Change (IPCC) in 2023. One of its primary conclusions is that "[g]lobal warming will continue to increase in the near term in nearly all considered scenarios and modelled pathways" (IPCC, 2023, p.68).

Changes on such an enormous scale in our physical environment will inevitably lead, and indeed have already led, to adverse effects on ecosystems, biodiversity, as well as on human societies (IPCC, 2022). In light of the prospective trajectories of climate change, the scope, severity and prevalence of such adverse effects can reasonably be assumed to only increase and expand. Such adverse effects are commonly referred to as climate hazards. They are defined as the "potential occurrence of a natural or human-induced physical event or trend" which causes damage to human systems, ecosystems or natural resources (IPCC, 2022, p.5). The European Environment Agency, synthesising the findings from the IPCC's sixth assessment report, lists 16 principal climate hazards related to climate change across six groups of hazard types (see figure 1). Any one of them can pose a risk for societies and communities worldwide.[1] For instance, for the near future, the IPCC identified the expectable hazards and risks at 1.5°C global warming. The list includes amongst other items:

- "Increased intensity and frequency of hot extremes and dangerous heat-humidity conditions, with increased human mortality, morbidity, and labour productivity loss"
- "More intense and frequent extreme rainfall and associated flooding in many regions including coastal and other low-lying cities […], and increased proportion of and peak wind speeds of intense tropical cyclones"

[1] According to the IPCC's framework, climate change-related risks emanate from the intersection of climate hazards, exposure to those hazards and the vulnerability which an exposed community or society would experience in terms of the propensity of the adverse consequences caused by the hazards (IPCC, 2014, p.3).

Figure 1: The 16 principal climate hazards, grouped

Notes: The category sizes are determined by the number of climate indices associated to them. The European Environment Agency uses the indices to measure the propensity of the climate hazards in Europe. The original figure includes all 32 indices which were excluded here due to their limited relevance to the working paper.
Source: European Environment Agency, 2024.

- "Continued sea level rise and increased frequency and magnitude of extreme sea level events encroaching on coastal human settlements and damaging coastal infrastructure […], committing low-lying coastal ecosystems to submergence and loss […], expanding land salinization […], with cascading to risks to livelihoods, health, well-being, cultural values, food and water security"
- "Climate change will significantly increase ill health and premature deaths from the near to long term […]. Further warming will increase climate-sensitive food-borne, water-borne, and vector-borne disease risks […], and mental health challenges including anxiety and stress" (IPCC, 2023, pp.98-99).

In the face of such drastic adverse effects, it is imperative for societies and communities to take the necessary measures to adapt to risks arising from climate hazards. With climate change intensifying, adaptation will become an ever more extensive and costly, yet important challenge (Watkiss et al., 2023; Magnan et al., 2023; UNDP, 2024). Therefore, the need for climate

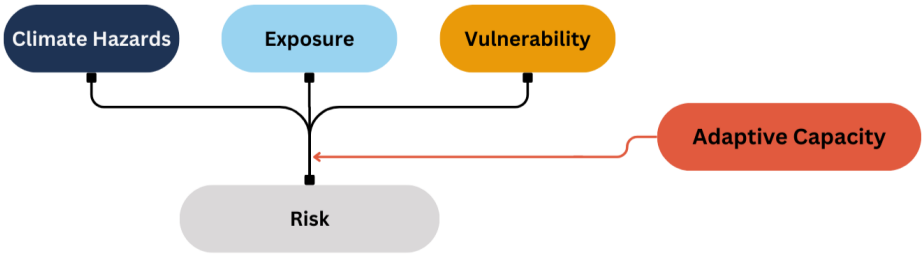
change adaptation (CCA) was formally recognised in a political commitment by the parties to the Paris Agreement (2015). In it, the signatory parties stipulated the following goal:

> Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2 (Article 7 §1).

1.1 The purpose of climate change adaptation

For a more nuanced understanding of the role and purpose of CCA, it is useful to consider the concept of risk. Figure 2 depicts a visual framework of the concept, as well as the leverage points of CCA. In it, risks are described as the potential for adverse effects on human or ecological systems which have a certain value and purpose for stakeholders and the context in which they are embedded.

Figure 2: Framework of climate change risks and the role of adaptive capacity



Source: Adapted from IPCC, 2022.

The severity of a risk arises out of the intersection of

- the magnitude of climate hazards,
- the degree of exposure of human or ecological systems to the former,
- the degree of vulnerability of the potentially affected systems.

Vulnerability, in this context, can be understood as the extent and severity of adverse effects caused by climate hazards (IPCC, 2022, p.5). Adaptive

capacity, in turn, describes the extent to which affected systems and groups can proactively and effectively adjust to adverse effects from climate hazards within their situated context which is characterised by a certain degree of exposure and vulnerability.

How does CCA come into play in this constellation? In general terms, the IPCC defines it

> …as the process of adjustment to actual or expected climate and its effects [in human systems] in order to moderate harm or take advantage of beneficial opportunities. In natural systems, adaptation is the process of adjustment to actual climate and its effects; human intervention may facilitate this (IPCC, 2022., p.5).

Hence, this means that CCA can target three leverage areas in order to reduce the climate change-related risks of targeted systems or groups:

- By reducing the level of exposure to climate hazards
- By reducing the vulnerability of human and ecological systems and
- By improving and expanding the adaptive capacity of human and ecological systems and their stakeholders.

Following this line of thought, a given measure or intervention can be said to facilitate CCA if its goals or produced outcomes fall within one or several of these three leverage areas.[2]

1.2 Climate change adaptation in foreign aid

What role can foreign development aid play in promoting CCA of recipient countries against the threat of climate hazards? The answer to this question can be found when considering the challenges pertained to

[2] The presented description of the purpose of adaptation is based on a single-intervention focus. As many scholars highlight, CCA is an iterative and long-term process which must be re-evaluated and revised in order to remain in the "adaptive space" of a targeted system (see, for example, Wise et al., 2014; Park et al., 2011). The importance of constant and repeated readjustment of CCA interventions is further underscored by the fact that many CCA interventions offer no long-term solutions (Magnan et al., 2023), thus necessitating the conception and implementation of new interventions based on novel problem-definitions. As such, it is useful to distinguish between continuous adaptation processes and singular CCA interventions. The latter are the unit of analysis in this working paper.

implementing and pursuing adequate and effective CCA measures. The UNDP (2024) highlights three main issues related to CCA, which clearly outline the types of support donors can provide:

- Challenges in availability and accessibility of CCA financing
- Informational and knowledge gaps about climate-related risks, risk monitoring, and the effectiveness of different CCA measures
- Constraints related to institutional and governance systems.

Whilst climate change causes repercussions on a planetary scale, the burden of climate change-induced risks, as well as the issues identified by the UNDP are not distributed evenly amongst countries and world regions. Lower-income countries are particularly vulnerable to the impact of climate change for a variety of reasons, such as geographical location, high natural resource dependence, and limited CCA capacity (e.g., UNDP, 2024; IPCC, 2023, p.61). Furthermore, beyond the country-level perspective, certain social groups or communities, such as women and young children, indigenous peoples, and ethnic minorities, display a particularly high vulnerability, requiring special consideration and attention in CCA efforts (UNDP, 2024).

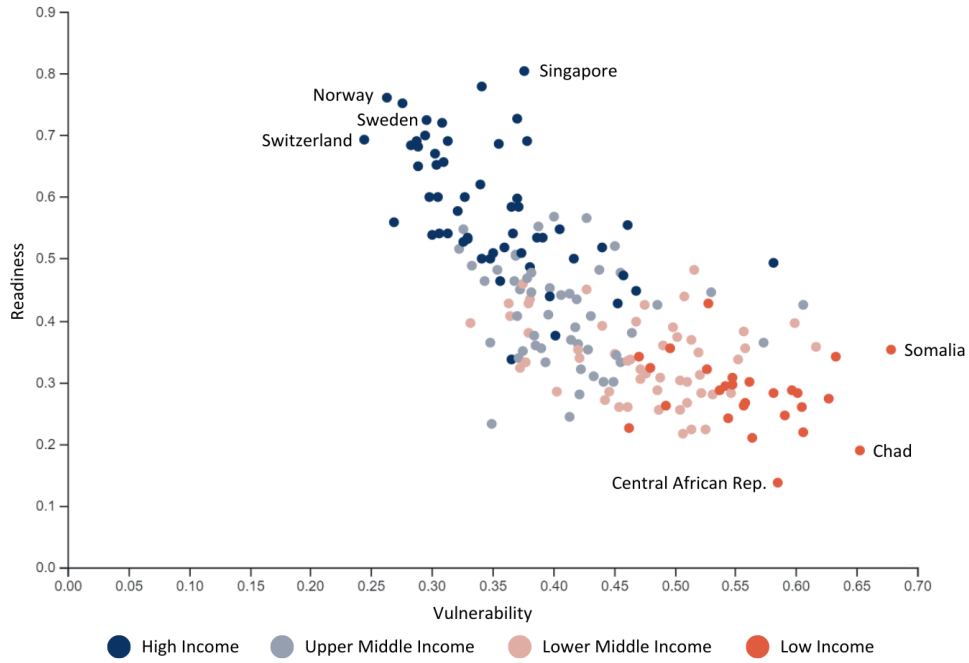
Additionally, financial constraints and subpar institutional and governance systems related to CCA continue to be more prevalent in less affluent countries or communities. The most recent Adaptation Gap Report of the United Nations Environment Programme from 2023 estimates the total adaptation costs for developing countries to range from USD 215 billion per year to USD 387 billion per year until 2030. These costs are 10 to 18 times greater than international public adaptation finance, highlighting the urgent need for additional and reliable financing (Watkiss et al., 2023). These challenges can severely hamper the possibilities for countries or communities to pursue necessary and effective CCA measures and thereby reduce their vulnerability to climate hazards (Hammill et al., 2023; Watkiss et al., 2023).

Figure 3 shows the correlation between national income and the level of vulnerability and ability to adapt to climate risks. It is based on the ND-GAIN-index, developed by the Notre Dame Global Adaptation Initiative. It builds on two component indices: vulnerability and readiness.[3] Each

[3] ND-GAIN defines vulnerability as the "[p]ropensity or predisposition of human societies to be negatively impacted by climate hazards" and readiness as the "[r]eadiness to make effective use of investments for adaptation actions thanks to a safe and efficient business environment"

data point plots the score of a country on these two dimensions. Countries are grouped based on the country income groups developed by the World Bank. The results indicate a clear linkage between gross national income and the levels of vulnerability and readiness of countries, with lower income countries displaying greater vulnerability and poorer readiness. In contrast, higher income countries are in general less vulnerable and better prepared.

Figure 3: Vulnerability & Readiness of countries by income groups (2021)



Notes: Venezuela was excluded due to the absence of income group scores since 2019 in the World Bank dataset. Andorra, Kiribati, Liechtenstein, Monaco, Saint Vincent and the Grenadines, San Marino and Tuvalu were excluded due to a missing Vulnerability score.
Sources: Notre Dame Global Adaptation Initiative; World Bank.

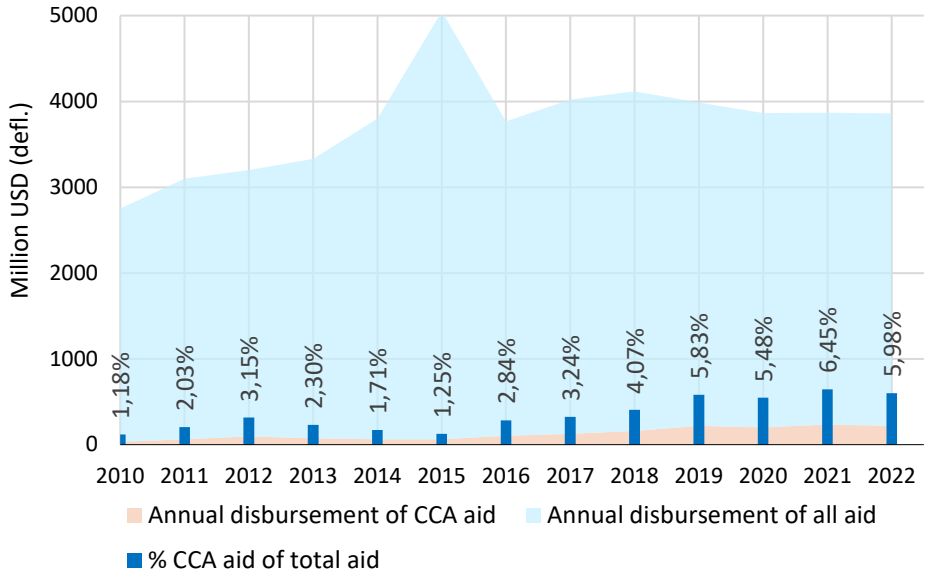
These findings support UNDP's assessment and lends support to the importance of foreign aid in the global strive for CCA. In other words, international development aid is an instrumental source of financing for CCA and for filling the adaptation finance gap (Watkiss et al., 2023). Development aid can assist lower-income countries and particularly vulnerable communities in their efforts to build up adequate and effective CCA systems. As argued by Ayers and Huq (2009), sustainable development, which is commonly the goal of official development assistance, and CCA are inherently intertwined. The effectiveness of either part is dependent on advances in the respective other. Indeed, the

(Chen et al., 2023, p.5). The higher the score on either scale corresponds with a higher level of vulnerability or readiness, respectively.

importance of support from the international community to the most vulnerable (lower income) countries is enshrined in Article 7 §6 of the Paris Agreement (2015).

CCA is a priority in Swedish development aid. As shown in figure 4, CCA aid increased from about 30 million USD in 2010 to over 200 million USD in 2022. In relative terms 1.18% of funding was directed towards CCA in 2010, whilst CCA has made up over 5% of all Swedish aid since 2019, reaching a relatively stable level.

Figure 4: Annual disbursement of Swedish aid and share of CCA



Note: CCA aid is defined as all disbursements coded with a Rio marker=2 for climate adaptation.
Source: OECD CRS.

The Strategy for Sweden's global development cooperation concerning the environment, climate and biodiversity, 2022-2026, sets an explicit goal for CCA.[4] Swedish aid should "strengthen the adaptive capacity and resilience against climate change and natural disasters" of recipient countries and regions through short- and long-term measures (Regeringen, 2022, p.2; translated from Swedish). The strategy has a budget of SEK 8 billion (about USD 754.56 million, in 2023 USD).

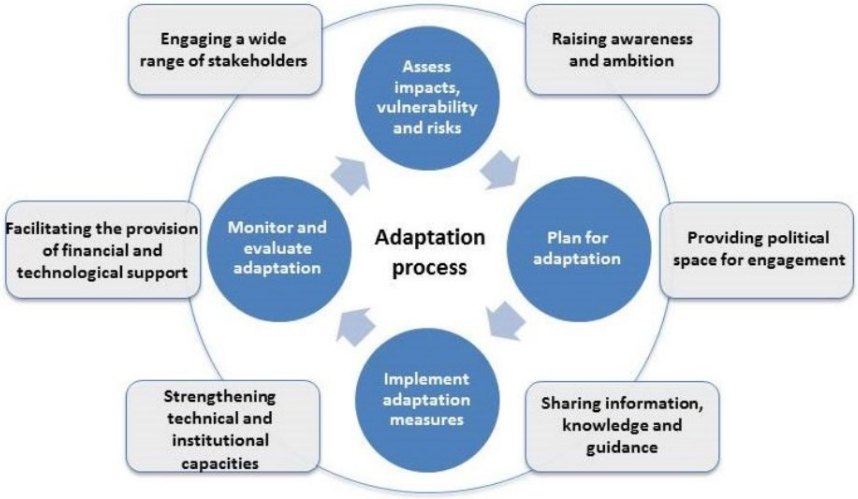
[4] The title has been translated from Swedish, which reads: "Strategi för Sveriges globala utvecklingssamarbete inom miljö, klimat och biologisk mångfald, 2022–2026".

2 Research Question and Purpose

Governments and donors have formally committed to providing and supporting effective and timely CCA measures domestically and internationally. But several challenges remain, emphasising the need to build upon the existing evidence on CCA in the research literature and evaluate the congruence of evidence and CCA efforts (Wise et al., 2014; Park et al., 2011).

As noted above, informational and knowledge gaps are one of the main challenges in facilitating adequate global adaptation. Repeated evaluation and research are therefore central elements in the conceptualised adaptation policy cycle, as defined under the UN Climate Change regime (see figure 5).

Figure 5: Adaptation policy cycle



Source: United Nations Climate Change, 2024.

This report seeks to contrast the portfolio of Swedish CCA aid interventions (henceforth the portfolio) with the existing research literature on the effectiveness of CCA measures. Additionally, attention will be paid to the overall structure of the portfolio. The project takes inspiration from a discussion paper written by Doswald et al. (2020) and published by the German Institute for Development Evaluation (DEval). The project seeks to answer the following research questions:

1. How is Swedish climate adaptation aid structured?
2. To what extent is Swedish climate adaptation aid supported by empirical evidence from research literature?

2.1 Delimitations

This report builds on an analysis of ongoing or recently concluded CCA interventions which have been financed or are implemented by Swedish governmental organisations. As the first research question stipulates, one of the main goals is to identify the structure of the portfolio. For this paper, structure refers to the distribution of Swedish interventions and intervention-level funding across common analytical dimensions. The dimensions are selected in such a fashion that they enable investigations of the questions in which contexts, how and to what ends Swedish CCA aid has been employed. In general, there are multiple possible conceptual approaches to analysing structure of a CCA portfolio. This paper uses the conceptual framework developed by Doswald et al. (2020), which will be introduced in section 3.

Ideally, the sample would consist of a large number of cases, covering a period of some 10 to 20 years in the recent past. However, given the scope of this project and the need for manual coding of all interventions, a smaller sample size was chosen. The proposed temporal limitation, as described in the sampling strategy, is an ideal delimiter for this purpose. In this way, cross-sectional heterogeneity of the portfolio is captured to the largest possible extent.

In the context of climate change measures, the distinction between climate mitigation and climate adaptation is commonly made. International development cooperation is no exception from this pattern. Notwithstanding the conceptual differentiation, the concepts are closely interrelated. One relevant argument is that climate mitigation will lower the need for climate adaptation. The hazards and risks pertaining to climate change, as well as the associated costs will decrease in severity and scope through effective mitigation. Hence, in this sense, climate mitigation efforts could be seen as a form of CCA. To maintain the conceptual clarity between mitigation and adaptation, only interventions which have CCA has their primary goal will be considered for inclusion.

Lastly, this report only considers Swedish bilateral aid. This means that its analysis includes support to projects and programmes from Swedish governmental actors. Multilateral aid, which is direct support to multilateral organisations, is excluded from the proceedings of this paper (Openaid, 2023). Note that some of the included interventions are marked as multi-bi, which is earmarked bilateral aid channelled through multilateral organisations (Mapsec, 2013).

2.2 Approach

The research project follows a quantitative design, using intervention-level data on a selected sample of Swedish CCA aid interventions. The research design, as well as its limitations, are discussed extensively in Annex 1.

The sampled list of interventions was derived from the OECD CRS dataset from 2022 – which was the latest available version at the time of writing this paper – by applying a list of parameters to include only principal CCA activities (see table A1 in Annex 1). In a next step, the dataset was restructured to suit the envisaged analysis and expanded to include all Swedish disbursements to the respective interventions prior to 2022.

The data collection process followed the steps described by Doswald et al. (2020) and centred around the constituent dimensions of their Evidence Gap (EGM) and Intervention Heat Map (IHM). The EGM and IHM will be introduced in the theoretical framework in the next section of this report.

The goal of the data collection was to code the listed interventions in accordance with the EGM/IHM framework. For the coding, project descriptions were inspected from various sources (OECD CRS; project documentation; Open Aid; IATI's d-portal; brochures and websites).[5] To ensure the highest possible level of code robustness, the data sources were triangulated.

At the end of the coding process, 147 out of an initial 155 interventions remained. 8 interventions were excluded for the analysis due to the lack of a CCA focus, insufficient data certainty or complete absence of project descriptions.

2.3 Structure of the report

The report will continue with the following structure. Section 3 introduces the theoretical framework in form of Doswald et al.'s EGM and IHM (2020) and discusses underlying key concepts. Furthermore, the method behind the authors' systematic review of literature on the effectiveness of

[5] IATI stands for the International Aid Transparency Initiative.

CCA measures is elaborated, before exploring and discussing the results of the review displayed in the EGM.

In section 4, the analytical results of the report are discussed in three sub-sections. First, the overall and geographic structure, as well as the CCA-related relevance of the Swedish CCA portfolio are explored in section 4.1. Second, the nucleus of the analysis is the IHM, which presents novel data on the structure of recent Swedish CCA aid. Section 4.2 introduces the IHM and discusses its findings in a granular fashion. The purpose of the analysis is to identify trends and areas of concentration in Swedish CCA aid. Lastly, in section 4.3, the Swedish IHM is compared to Doswald et al.'s EGM (2020). The comparison informs a discussion on the congruence between the portfolio and the evidence base from the research literature which are informative.

The fifth and final section provides a summary of the main findings and considers their implications for Swedish CCA aid. The geographic allocation of funds is discussed, providing recommendations to improve the relevance of Swedish CCA aid. Furthermore, a call for additional research into the most heavily funded areas of recent Swedish CCA aid is made. Conversely, the section also highlights opportunities for expansion based on the concentration of current research evidence in the EGM.

3 Theoretical framework

Doswald et al.'s paper (2020) serves as inspiration for the purpose and structure of this paper. In it, the authors present and discuss their results from a systematic review of research literature on the effectiveness of CCA measures, as well as a structured mapping of CCA interventions funded for German Cooperation (2010-2017) and by the Green Climate Fund (Until Oct 2019). In a final step, the results from the review and intervention mapping are compared. To ensure comparability, the results are presented in an EGM and IHM, respectively.

Both the EGM and IHM are based on the same three constituent dimensions and are displayed in matrices of the same structure. The main difference between them is the type of data which they display. The EGM displays the results of a systematic literature review, whereas the IHM maps a portfolio of aid-funded CCA interventions. Doswald et al.'s EGM and IHM framework (2020) lays the foundation for the data collection and subsequent analysis presented in this working paper. This section introduces and elaborates the mentioned constituent dimensions, as well as the structure and results of the EGM.

3.1 DEval's Evidence Gap Map

The purpose of an EGM is to map "completed and ongoing systematic reviews and impact evaluations" (Doswald et al., 2020, p.3) in a particular sector. The objective is to consolidate and structure the available thematic evidence on that sector. To develop an informative EGM for mapping the evidence on the effectiveness of CCA interventions it is imperative to select meaningful dimensions. These need to be relevant to the thematic area and help synthesize the empirical evidence from the research literature. The principal research question which guides Doswald et al.'s EGM development (2020) is as follows:

> What is the state of evidence on adaptation interventions, and what is their effectiveness in helping people in low- and middle-income countries adapt to climate change […] (p.4)?

The authors have selected three dimensions, which are relevant to the research question and, thus, by which their EGM is structured. The first

dimension considers the sectors wherein CCA interventions are commonly implemented. It is made up of four categories:

- Water
- Forestry, fishing, and agriculture
- Land-use and built environment
- Society, economy, and health.

Two arguments substantiate this decision. First, Doswald et al. (2020) reviewed lists of CCA-related sectors from four large multilateral organisations.[6] They concluded that the above sectors closely resemble the sectors listed by the organisations. Second, DEval's mandate is to conduct research and evaluations relevant to German development aid. The predominant sectors in this context are agriculture, environmental protection, and water (using OECD's definitions) (Noltze & Rauschenbach, 2019 in Doswald et al., 2020).

When inspecting the Swedish CCA portfolio used in this paper, the OECD-sectors General Environment Protection, Agriculture, Forestry, and Water Supply & Sanitation stand out, making up 86.14% of the total disbursements (see table 10 in section 4.1). Thus, as in the German case, the sectoral makeup of the Swedish CCA aid fits well with the sector-categories of the EGM matrix.

The second dimension of the EGM are intervention types for CCA, displayed and defined in table 1. The categories are adopted from a typology on CCA activities which was developed by Biagini et al. (2014). It is important to note that Doswald et al. (2020) only consider outcome-based interventions in their review, excluding process-based interventions, as the latter generally operate with a long timeframe and may produce no visible outcomes. Furthermore, process-based interventions are "too proximate in the causal chain to enable an examination of causal evidence" (Doswald et al., 2020, p.9). The intervention type dimension is subsumed under the sector dimension in order to enable a cross-sectoral comparison of CCA efforts.

[6] The reviewed organisations are the Adaptation Fund, OECD, Green Climate Fund, and the Global Environment Facility (Doswald et al., 2020, p.8).

Table 1: DEval's CCA-related intervention types

Intervention Type	Definition
Nature-based options	Activities that make use of ecosystems and biodiversity as well as sustainable management, conservation and restoration of ecosystems.
Built infrastructure/ structural	Activities that include structural components.
Technological options	Activities that include technology.
Informational/educational	Activities that aim to inform or educate.
Institutional/planning/policy/ laws/regulations	Activities that include policies, plans, standards or regulations.
Financial/market mechanisms	Activities that include financial transactions or are market driven.
Social/behavioural	Activities that include social support and change or behavioural change.

Source: Doswald et al., 2020.

Lastly, the explicit focus on the effectiveness of CCA interventions sets a focus on outcomes, which constitute the final dimension of the EGM. Doswald et al. (2020) draw from two IPCC frameworks on climate-change-induced vulnerability and risks, respectively, which closely resemble the conceptualisation on risks discussed above. The outcome categories correspond to key constituent concepts of these frameworks and are further sub-divided into sub-categories. The hierarchy and definitions can be found in table 2.

The category Shocks and stressors are related to the concept of exposure and is related to the ability of a targeted group to deal with the ad hoc experience of climate hazards. Second, Adaptive capacity, as stated above, refers to the extent to which interventions alter the ability of a targeted group to make pro-active and informed livelihood decisions concerning social and economic aspects. Third, interventions might improve resilience of the Enabling environment of a targeted context by facilitating systemic changes in environmental, socioeconomic and institutional systems. This would correspond to altering the vulnerability of human of ecological systems to climate hazards. Lastly, Doswald et al. (2020) add the category Uptake of adoption-related interventions, pointing out that promoting the pursuit and implementation of CCA also constitutes an important outcome for CCA interventions.

Table 2: Deval's CCA-related outcomes & sub-categories

Outcomes	Sub-categories	Definition
Uptake	Adoption	Outcomes facilitating the uptake of adoption-related interventions.
Shocks and stressors	Increased/decreased exposure Increased/decreased impacts/risks	Outcomes related to the ability of targeted groups to address shocks and stressors while minimizing permanent, negative effects on their longer-term livelihood security. These outcomes include those related to DRR and disaster risk management approaches.
Adaptive capacity	Social benefits Economic benefits	Outcomes related to the ability of targeted groups to make pro-active and informed decisions about alternative livelihood strategies based on an understanding of changing conditions.
Enabling environment	Environmental systems Socioeconomic systems Institutional systems	Outcomes include system-level changes in the environment, the socio-economic system and the institutional environment that enable more and lasting resilience.

Source: Doswald et al., 2020.

When reviewing evidence on CCA effectiveness, it is important to be aware of the challenges and issues related to the study of outcomes of CCA interventions. Showing great awareness of this fact, Doswald et al. (2020) highlight several difficulties. The absence of a commonly accepted definition of CCA blurs the lines of which interventions are adaptation and should be included in outcome-related studies. Furthermore, an inherent uncertainty about future trends and effects of climate change limits the extrapolation and inference of CCA effectiveness. As the authors put it, "an adaptation measure that is effective now may not be effective in the future" (p.7). Lastly, there is agreement among scholars that CCA processes are cyclical, rather than linear, in nature (e.g., Park et al., 2012; Wise et al., 2014; United Nations Climate Change, 2024). This is due to the uncertainty inherent in future climate change trajectories which necessitates a learning curve in CCA efforts. This, in turn, complicates the development of a theory of change for CCA interventions, as well as the identification of causal linkages between the causes of CCA change, interventions and observed outcomes (Maier et al., 2016).

In light of these challenges, Doswald et al. (2020) adopt the following definition of effectiveness in CCA:

> Effectiveness may be framed according to the specific objectives of CCA (Villanueva, 2011) – that is, reducing risk, building adaptive capacity or increasing resilience. However, effectiveness may also depend, for example, on the level of uncertainty involved. An "effective" adaptation, particularly for socioeconomic interventions, is one that is flexible to change in response to altered circumstances and is therefore robust against uncertainty (p.7).

For their data collection, the authors conduct a systematic literature review of articles from several databases (Web of Science, Scopus, 3ie database and CEE library), as well as for grey literature from several organisational websites, following a strict search protocol. The 13,121 retrieved articles were screened using a list of exclusionary criteria, arriving at a final number of 464 articles. These were then coded based on the constituent dimensions of the EGM, as well as several additional variables in order to substantiate their analysis. The nuances and specifications of the coding process, as well as its limitations are discussed in greater detail in Annex 2.

3.2 The final Evidence Gap Map: results from the review

The assembled EGM can be found in table 3 (page 21 below) and shows the number of articles which are associated to each respective combination of sector, intervention type, and outcome categories, corresponding to a single cell within the matrix. The results will be summarised and explored in this section.[7]

When inspecting the results on a sector level (see figure 6), Forestry, Fishing and Agriculture stands out with two-thirds of the evidence. Within this sector, the outcome categories Adaptive capacity and Uptake make up the largest groups. Society, Economy and Health follows as the second-largest sector, thereafter Land-use and Built Environment.

[7] Doswald et al. (2020) provide an extensive overview and exploration of their EGM, including analyses beyond the scope presented in this working paper (geographic distribution of articles; study design types).

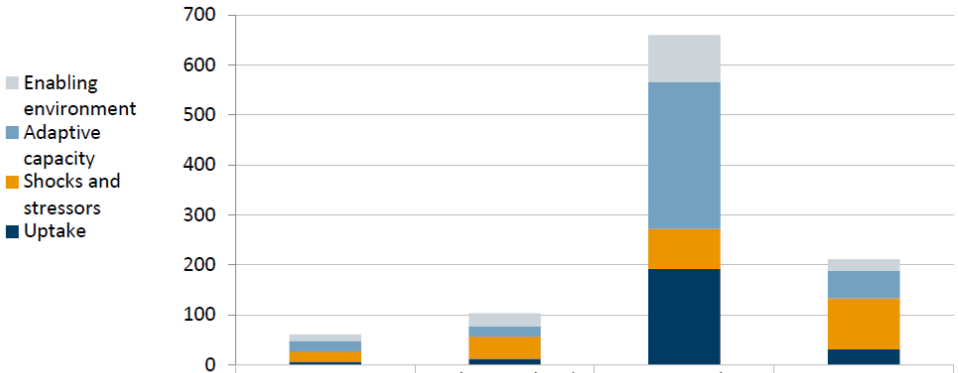
Table 3: Doswald et al.'s Evidence Gap Map (2020)

Evidence Gap Map		Uptake	Shocks and Stressors		Adaptive Capacity		Enabling Environment		
Sector	Outcome type / Intervention type	Adoption	Exposure	Impacts/Risks	Social Benefits	Economic Benefits	Environmental systems	Socioeconomic systems	Institutional systems
Water	Nature-Based Options				1	3	3		
	Built Infrastructure/Structural	1	1	10	2	9	3	2	
	Technological Options			1		1	1		
	Informational/Educational	2		3		1	1		
	Institutional/…/Regulations*	1		3	1	2			
	Financial/Market Mechanisms	1		1			2		
	Social/Behavioural	1		1	1	1	1		
Land-use and Built Environment	Nature-Based Options	1	14	4	1	3	2	1	
	Built Infrastructure/Structural	3	4	4		5	3	1	
	Technological Options			1			3		
	Informational/Educational	3		4	1		3		
	Institutional/…/Regulations*	2	3	2	1	4	4	2	2
	Financial/Market Mechanisms	2		2	1		2		
	Social/Behavioural	1	1	5	3	2	2	1	
Forestry, Fishing and Agriculture	Nature-Based Options	3	2	29	2	106	34	8	
	Built Infrastructure/Structural	11		5	1	9	1		
	Technological Options	7	2	19	2	100	17	5	
	Informational/Educational	77	1	7	9	19	5	5	
	Institutional/…/Regulations*	14		3	1	5		3	
	Financial/Market Mechanisms	44	1	6	4	14	4	5	
	Social/Behavioural	36		5	3	19	4	3	
Society, Economy and Health	Nature-Based Options	1		3	1				
	Built Infrastructure/Structural	1		9		3			
	Technological Options			8				1	
	Informational/Educational	9	2	10	8	2		1	
	Institutional/…/Regulations*	2	1	15		4		2	2
	Financial/Market Mechanisms	5	1	26	1	14	1	5	1
	Social/Behavioural	13	2	25	5	17	1	6	3

Notes: The table displays the number of evidence pieces from the research and grey literature for each cell in the EGM matrix. Each cell represents one particular type of CCA measure. A research finding is included if it relates to the effectiveness of the respective measure in promoting CCA. *Institutional/Planning/Policy/Laws/Regulations

Source: Doswald et al., 2020.

Figure 6: Number of pieces of evidence by sector and overall outcome



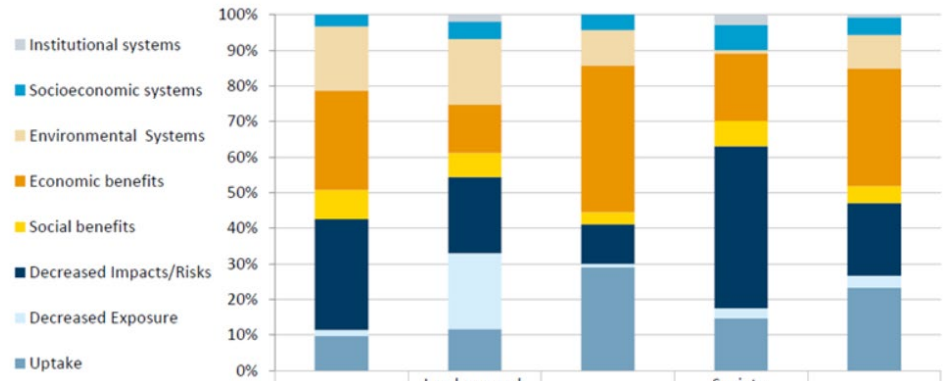
	Water	Land-use and Built Environment	Forestry, Fishing and Agriculture	Society, Economy and Health
Enabling environment	13	26	94	23
Adaptive capacity	22	21	294	55
Shocks and stressors	20	44	80	102
Uptake	6	12	192	31

Source: Doswald et al., 2020.

The least studied sector is the Water sector, indicating a need for more CCA research in this area. Shocks and stressors make up the first- or second-largest outcome category in all sectors except for the agricultural sector, in which it is the smallest group.

An inspection of the evidence distribution by outcome category (~~figure 7~~) reveals most evidence being concentrated in Adaptive capacity outcomes, followed by Shocks and stressors and Uptake.

Figure 7: Distribution of evidence by outcome category in each sector



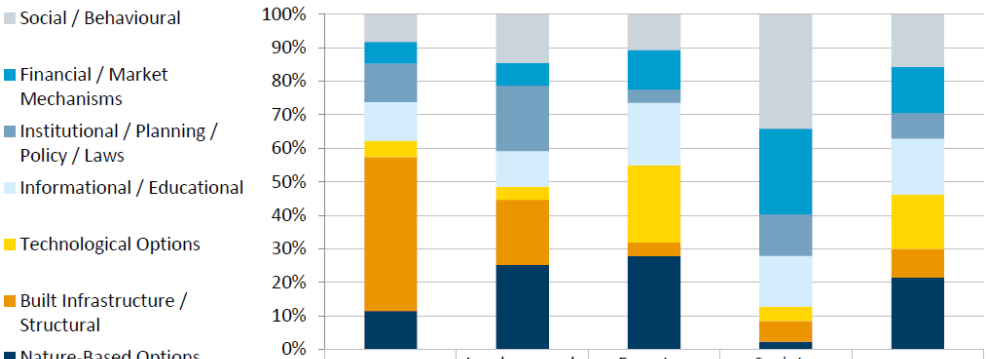
		Water	Land-use and Built Environment	Forestry, Fishing and Agriculture	Society, Economy and Health	Grand Total
Enabling Environment	Institutional systems		2		6	8
	Socioeconomic systems	2	5	29	15	51
	Environmental Systems	11	19	65	2	97
Adaptive Capacity	Economic benefits	17	14	272	40	343
	Social benefits	5	7	22	15	49
Shocks & Stressors	Decreased Impacts/Risks	19	22	74	96	211
	Decreased Exposure	1	22	6	6	35
Uptake	Uptake	6	12	192	31	241

Source: Doswald et al., 2020.

The outcome categories with the least amount of associated evidence are the Enabling environment. Its sub-category Institutional systems marks the greatest gap within the body of research considering aspects of outcome, particularly within the Water and Forestry, Fishing and Agriculture sectors. Whilst Shocks and stressors have received plenty of scholarly attention, it has been mostly directed at Decreased impacts/risks, leaving Decreased exposure as an understudied outcome. Lastly, the same imbalance is found amongst the sub-categories of Adaptive capacity to the disadvantage of Social benefits.

As for the final constituent dimension, figure 8 shows an uneven distribution of intervention types between the intervention types across the sectors. That is, what constitutes the most common intervention type is not uniform across sectors.

Figure 8: Distribution of evidence by intervention type in each sector



	Water	Land-use and Built Environment	Forestry, Fishing and Agriculture	Society, Economy and Health	Total
Social / Behavioural	5	15	70	72	162
Financial / Market Mechanisms	4	7	78	54	143
Institutional / Planning / Policy / Laws	7	20	26	26	79
Informational / Educational	7	11	123	32	173
Technological Options	3	4	152	9	168
Built Infrastructure / Structural	28	20	27	13	88
Nature-Based Options	7	26	184	5	222

Source: Doswald et al., 2020.

Overall, Nature-based options are most enriched with evidence. The least studied intervention types are Built infrastructure/structural and Institutional interventions. Interestingly, most of the evidence on the former are concentrated in the Water sector, making for the biggest sector-intervention type association of the EGM. The four categories showcase similar patterns with 13.82% to 16.71% of the evidence.

Two areas of the EGM matrix stand out in particular as having the highest concentration of evidence. First, studies of nature-based and technological interventions within the agricultural sector working with economic benefits are listed with 106 and 100 pieces of evidence, respectively. This makes them the cells with the highest scores in the matrix. The second area concerns adoption studies again within the agricultural sector which have, by and large, a considerably even distribution across the intervention types.

4 Results

This section presents the results from the two components of the analysis. In section 4.1, the overall analysis of the Swedish CCA portfolio, drawing from OECD CRS and ND-GAIN data, is discussed. The discussion considers longitudinal trends, geographical allocation of funds, the levels of vulnerability and preparedness of recipient countries, and prevalent OECD sectors. Section 4.2 presents the structure of the portfolio based on IHM and explores the findings in more detail. Lastly, the evidence from research literature and the Swedish CCA portfolio are compared in section 4.3 and an assessment of their congruence is made.

4.1 Basic composition of the Swedish CCA portfolio

The final sample of interventions, representing the Swedish CCA portfolio based on 2022, is summarised in table 4. It encompasses 147 interventions over the period from 2014 to 2032. Since the analysed data covers a period up until 2022, all the results present a momentary snapshot of the portfolio which is likely to change past the 2022 cut-off date.

Table 4: Summary statistics of the Swedish CCA portfolio

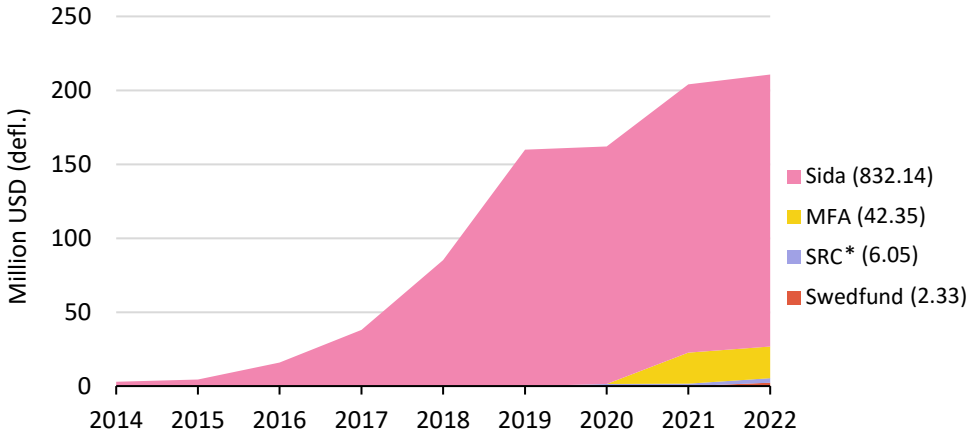
Variable	Summary statistics
Nr. of Interventions (Rio Marker 2)	155
Nr. of included Interventions	*147*
Nr. of excluded Interventions	*8*
Time period	2014-2032
Nr. of Swedish donor agencies	4
Total disbursements (million USD, defl.)	882.862
Disbursements (defl.) per Interventions, grouped	
< 1 million	*33.55%*
1 - 10 million	*46.45%*
10 - 20 million	*14.19%*
20 - 30 million	*3.87%*
30 - 50 million	*1.29%*
>= 50 million	*0.65%*

Note: All values, except for the first three rows, are based on the 147 included interventions.
Source: OECD CRS.

As of 2022, the Swedish disbursements totalled in USD 882.862 million - a number which likely to increase towards 2032, when the final

intervention will be finalised. The support provided through the portfolio has favoured smaller financial contributions across a broader array of interventions, with 80% of interventions having received below USD 10 million. Unsurprisingly, the annual volume of disbursements has been steadily increasing, reaching 210.7 million USD in 2022 (see figure 9). This steep growth was shortly interrupted in 2020, possibly due to the effects of the emerging COVID-19 pandemic.

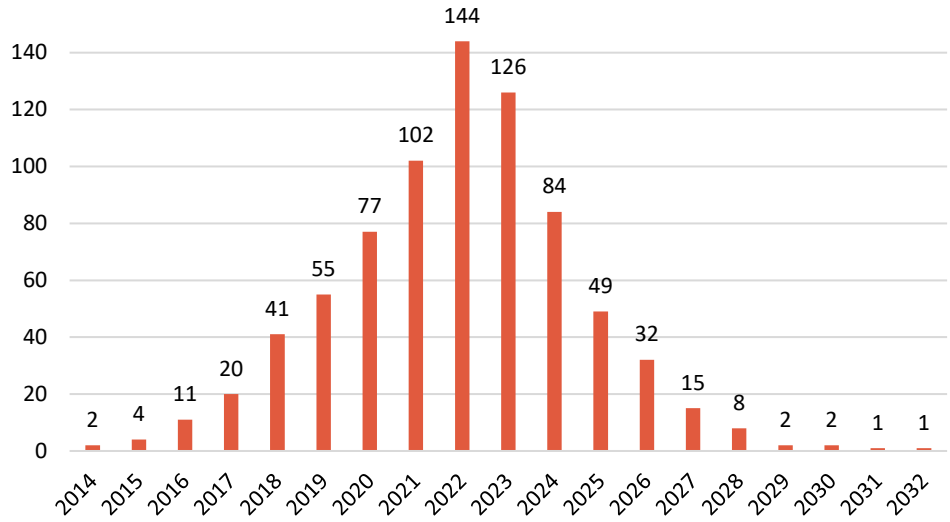
Figure 9: Annual CCA disbursements by agency



Notes: The total values of disbursements (million USD, defl.) by agency are displayed in brackets in the legend. *The Swedish Research Council.
Source: OECD CRS.

Similarly, the number of active interventions reached its peak in 2022, with 144 active interventions. Overall, the first interventions from the portfolio were commenced in 2014, whilst the final interventions will conclude in 2032. The frequency distribution in figure 10 assumes the form of a bell shape, which suggests a steady increase and decrease of interventions centring around the years 2022 and 2023.

Figure 10: Frequency distribution of active Interventions per Year



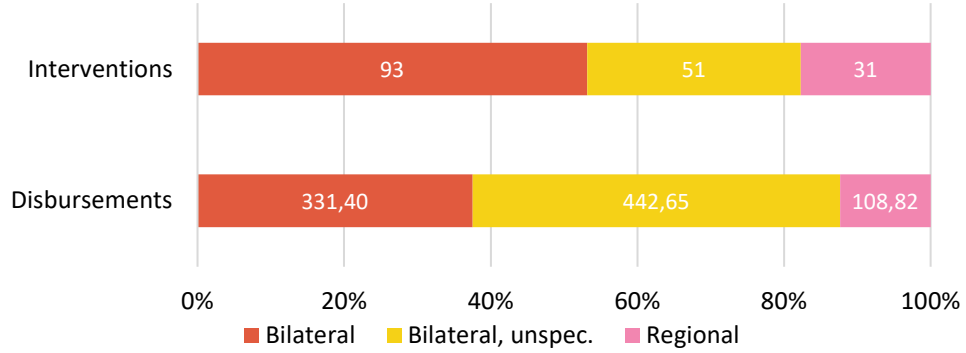
Note: An intervention is considered active for every year between and including its earliest recorded start year and its latest recorded end year.
Source: OECD CRS.

Four Swedish state actors were responsible for the provision of CAA funding, namely Sida, the Swedish Research Council, the Ministry of Foreign Affairs, and Swedfund. With USD 832.14 million, Sida has been the largest donor by a considerable margin, accounting for 94.3% of the total CCA aid, and the only donor which paid disbursements throughout the entire period (see figure 9 above). The volume of Sida's engagement is not surprising, given the central role which Sida is mandated within the context of Swedish development aid.

Geographical allocation of CCA aid

Turning towards the recipients of Swedish CCA aid, the scope of the interventions falls into three distinct categories, as shown in figure 11. The figure distinguishes between the number of interventions and the total amount of disbursements per scope category.

Figure 11: Distribution of interventions and disbursements (million USD, defl.) by intervention scope



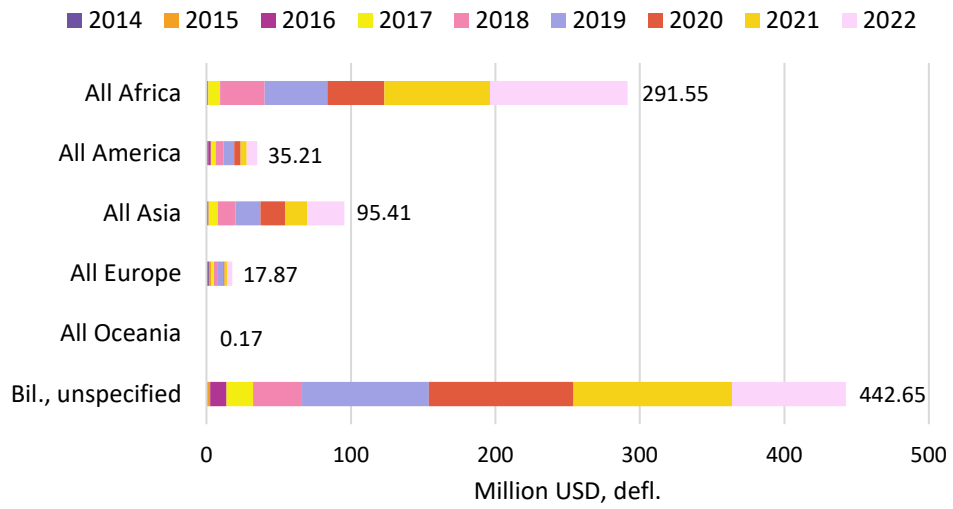
Source: OECD CRS.

Most interventions were financed with bilateral funding (53.14%), whilst unspecified bilateral funding was the second largest (29.14%) and regional funding the smallest category (17.71%).[8] This trend changes somewhat when disaggregating the scope-categories by disbursements. By this measure, roughly half of the funds were directed towards unspecified bilateral recipients (50.13%). Bilateral funding remains a large category with 37.54% of the funds, whereas regional funding remains small (12.32%).

Which world regions were the most reoccurring recipients of Swedish CCA portfolio? Figure 12 shows that, ignoring the bilaterally unspecified funds, Africa was the largest recipient with USD 291.55 million. At the second position, with roughly a third of Africa's volume, follows all of Asia (USD 95.41 million), thereafter the Americas (USD 35.21 million).

[8] The OECD CRS includes the recipient category "Bilateral, unspecified", which signifies all disbursements towards singular developing countries (as defined by the OECD) without a predetermined recipient. That is, at the point of recording of the disbursement, no concrete country or region was selected as a recipient.

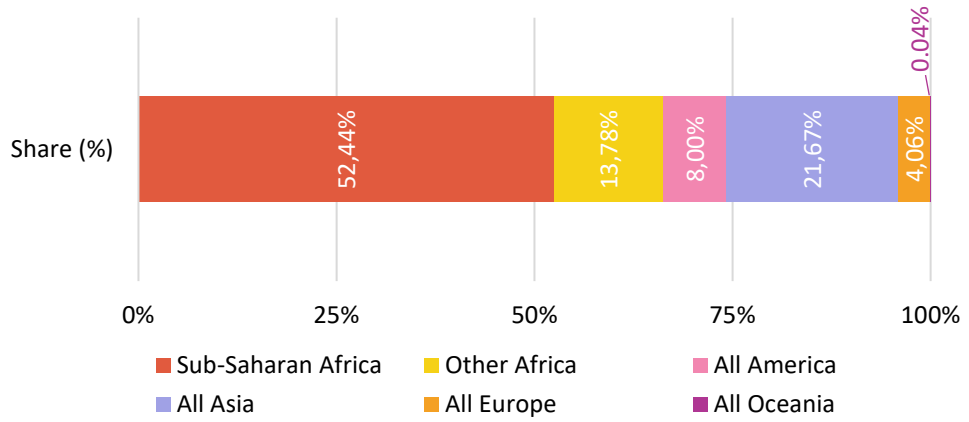
Figure 12: CCA Disbursements (million USD, defl.) by world region & year



Note: The world region categories encompass bilateral and regional disbursements.
Source: OECD CRS.

The dominance of Africa – and in particular countries from Sub-Saharan Africa – becomes clearer when calculating the share of disbursements by world region, thereby distinguishing between Sub-Saharan Africa and the rest of Africa. In doing so, figure 13 illustrates that 66.22% of disbursements were channelled towards Africa, and 52.44% reached Sub-Saharan Africa.

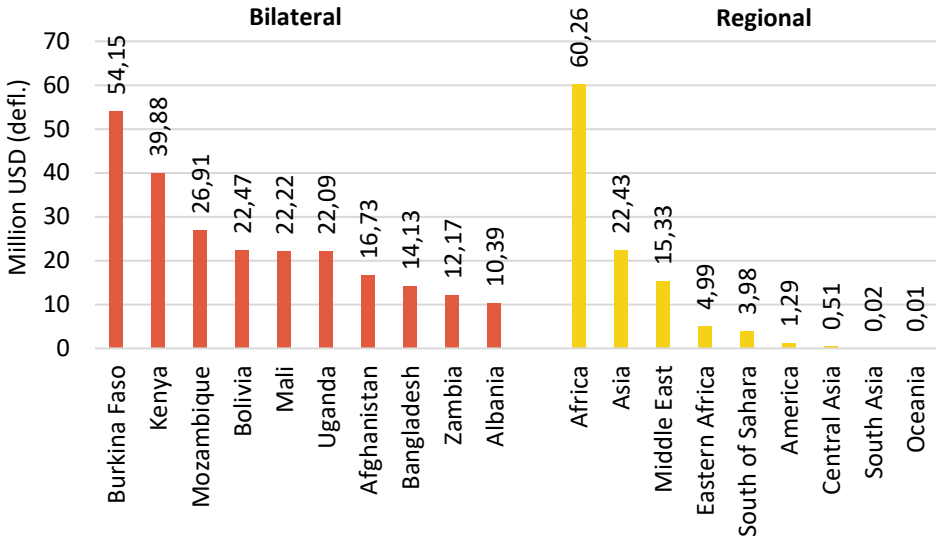
Figure 13: Share of bilateral and regional disbursements by world region



Note: Other Africa accounts for disbursements to countries north of Sahara, as well as regional disbursements to all of Africa.
Source: OECD CRS.

Unsurprisingly, six of the ten highest recipient countries of bilateral CCA aid are located in Sub-Saharan Africa, three of which residing at the first three positions (see figure 14).

Figure 14: Disbursements to Top 10 bilateral and regional recipients



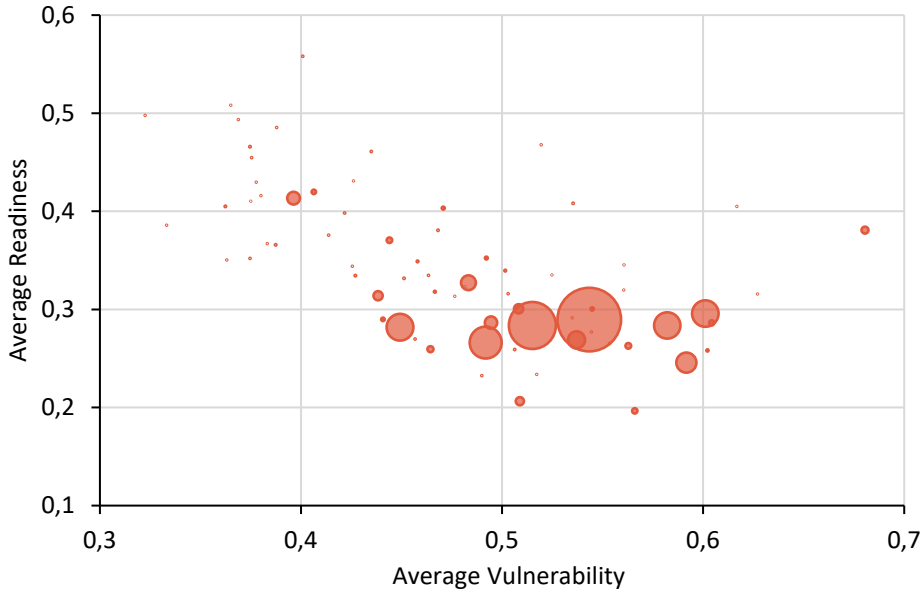
Source: OECD CRS.

Burkina Faso was the top receiver from the CCA portfolio with USD 54.15 million. That is, more than double the amount of disbursements compared to third-placed Mozambique (USD 26.91 million). With USD 39.88 million, Kenya has received the second largest amount. The regionally targeted disbursements confirm the geographical trend highlighted thus far. When adding up the funding towards all Africa and Asian regions, respectively, the former received USD 69.23 million and the latter USD 38.29 million.

The relevance of Swedish CCA aid

When analysing the geographic allocation of CCA funds, one question is imperative for assessing their relevance: does the CCA aid flow towards those countries which showcase the greatest need for it? The ND-GAIN Country Index, introduced in the introduction, helps to answer this question. Figure 15 displays countries in the portfolio and their respective vulnerability and readiness scores. Each dot represents a bilaterally recipient country from the portfolio, which the bubble around them indicating the volume of funds dispensed to the respective country.

Figure 15: Average Vulnerability & Readiness of recipient countries (2014-2022) and total bilateral disbursements



Notes: The orange bubbles indicate the volume of the Swedish CCA funding towards the respective recipient country. Kosovo is a recipient country of the Swedish CCA portfolio but excluded from the graph due to the absence of ND-GAIN scores.
Sources: Notre Dame Global Adaptation Initiative, OECD CRS.

The figure showcases the concentration of funds in a selection of countries. Most of the country dots have no visible bubble around them. This mean that disbursements towards these countries were limited, relative to the highest receiving countries, to the extent that the radii of the bubbles would not exceed the dot.

In theory, an ideal allocation of adaptation funds is proportionate to the countries' level of vulnerability and readiness (i.e., adaptive capacity). That is, the more vulnerable and the less prepared a country is to the effects of climate change, the more CCA aid it should receive, relative to countries with lower vulnerability and higher readiness levels. Applied to the graph, this would mean that fund allocation follows proportionately along the line from a vulnerability score of 1 and a readiness score of 0, to a vulnerability score of 0 and a readiness score of 1, where the recipients closer to the first score configuration receive proportionately more. This trend would typify allocation perfectly based on necessity and relevance.

It can be said that the allocation of bilateral funds within the portfolio roughly follows the described pattern. The countries receiving the most display the highest average vulnerability scores (ranging from 0.45 to 0.6), as well as the lowest readiness score (ranging from 0.25 to 0.33). For instance, Burkina Faso, as the highest bilateral receiver, has an average

vulnerability score of 0.54 and average readiness score of 0.29, respectively. Only Albania breaks the pattern somewhat within the top ten list, scoring considerably higher on both dimensions (average vulnerability: 0.4; average readiness: 0.41).

Interestingly, the countries with the lowest vulnerability scores in the portfolio – Somalia, Niger, Solomon Islands, Liberia, and Sudan – have received comparatively little support. Similarly, the four countries with the lowest readiness scores – Congo (DRC), Zimbabwe, Nigeria, and Haiti – indicate low levels of received funds. The overall pattern of the Swedish CCA aid suggest a negative association between the level of financial support, and recipient countries' vulnerability to and readiness towards adverse climate-induced effect, resembling the theorised trend described above.

Table 5 further supports the conclusion of needs-based allocation of CCA funds. It is based on ordinal groupings of the recipient countries for both dimensions and shows the total and share of disbursements per cell. The coloured areas indicate the extent to which is adequately equipped for CCA based on its vulnerability and readiness, matching the previously described theoretical relationship. The results show that 63.36% of funds went to countries with the highest necessity for additional CCA support (red area). 36.46% were allocated towards countries with lower vulnerability, though also low levels of readiness (yellow area, bottom left).

Table 5: Distribution of disbursements by the average Vulnerability and Readiness of recipient countries (2014-2022)

Average Readiness	Average Vulnerability					Total	
	Least vulnerable	Less vulnerable		More vulnerable	Most vulnerable		
Most ready							
More ready		0.61	*0.19%*			0.61	*0.19%*
Less ready		119.46	*36.35%*	180.88	*55.04%*	300.33	*91.39%*
Least ready		0.35	*0.11%*	27.34	*8.32%*	27.69	*8.42%*
Total		**120.41**	***36.64%***	**208.22**	***63.36%***	**328.63**	***100%***

Notes: The disbursements (left-sided columns) are recorded in million USD (defl.). The ND-GAIN scales are ratio in nature, ranging from 0 ("Not vulnerable/ready at all") to 1 ("Completely vulnerable/ready"). The respective ordinal groupings were conducted as follows: 0<x=<0.25 "Least vulnerable/ready"; 0.25<x=<0.5 "Less vulnerable/ready"; 0.5<x=<0.75 "More vulnerable/ready"; 0.75<x<1 "Most vulnerable/ready". Kosovo is a recipient country of the Swedish CCA portfolio but excluded from the graph due to the absence of ND-GAIN scores. Sources: Notre Dame Global Adaptation Initiative, OECD CRS.

Lastly, the lowest receiving group (0.19%) were less vulnerable and more ready countries (green area). Interestingly, no funds went to countries with higher levels of vulnerability and readiness. Though this might not be surprising, since this group of countries can be said to pursue an appropriate trajectory of enhancing CCA considering the predisposition and exposure to climate change-induced risks.

Overall, 99.81% of funds went to countries of lower levels of readiness, indicating that countries with greater need of improvements in their CCA measures have been supported almost exclusively. Thus, in sum, the results from this analysis suggest a high degree of relevance in the allocation of CCA aid within the portfolio, following the trends in necessity for CCA based on the countries' vulnerability and readiness to cope with the adverse effects of climate change.

The Portfolio by OECD sectors

The OECD CRS dataset also includes a variable on the sectors in which interventions are implemented in.[9] Table 6 summarises the portfolio accordingly, showing the total and share disbursements associated within each sector between 2014 and 2022. The emerging list of sectors shows remarkable similarities to the sectors included in the EGM/IHM matrices. This is encouraging, as it substantiates the results from the latter. For instance, the size of the sector General Environmental Protection (USD 343.34 million or 38.89%) is in line with expectations. The same argument can be made for all the other highest receiving sectors in the table.

However, there are several findings worth highlighting, which concern the sectors subsumed under the category Other sectors. The sector *VIII.3.* Disaster Prevention & Preparedness only received 0.39% of funds (USD 3.48 million). Similarly, the health-related sectors (I.2.a. Health, General and I.2.b. Basic Health) only account for 0.24% of funds (USD 2.057 million). These sectors have a high degree of relevance for CCA and, contrary to the empirical findings, could have reasonably been expected to have received considerable support from Swedish donors.

[9] Note that these sectors are categorised by the OECD DAC and not the same as the ones used in the EGM and IHM matrices.

Table 6: Distribution of disbursements in the Swedish CCA portfolio by sectors (OECD; total disbursements between 2014-2022)

Sector (OECD)	Disbursements (million USD, defl.)	Share (%)
IV.1. General Environment Protection	343.34	38.89%
III.1.a. Agriculture	158.02	17.90%
IV.2. Other Multisector	124.88	14.15%
III.1.b. Forestry	80.76	9.15%
I.4. Water Supply & Sanitation	56.69	6.42%
II.3.b. Energy generation, renewable sources	38.17	4.32%
II.4. Banking & Financial Services	18.24	2.07%
III.2.a. Industry	17.53	1.99%
I.5.a. Government & Civil Society-general	15.90	1.80%
Other sectors	20.20	2.29%
Unspecified/Administrative costs	9.13	1.03%
Total	**882.86**	**100.00%**

Notes: *Other sectors* encompasses the sectors III.1.c. Fishing, I.6. Other Social Infrastructure & Services, I.5.b. Conflict, Peace & Security, VIII.3. Disaster Prevention & Preparedness, I.2.b. Basic Health, II.3.a. Energy Policy & I.2.a. Health, General.
Source: OECD CRS.

4.2 Intervention Heat Map of the Swedish CCA portfolio

The previous analysis provided a good overview of the general portfolio structure and uncovered a high degree of relevance in the choice of recipient countries. This section is concerned with the question of what can be said about the makeup of recent Swedish CCA aid as it pertains to CCA-sensitive sectors, intervention modalities and the envisioned outcomes of interventions.

The IHM for the Swedish CCA portfolio (see table 7, next page) offers a unique mapping Swedish aid. It displays the number of interventions, and the total amount of disbursements associated to each cell in the IHM. For a more granular graphical analysis of the matrix, please refer to Annex 3.

Table 7: The Swedish Intervention Heat Map (green: number of interventions; blue: disbursements, million USD, defl.)

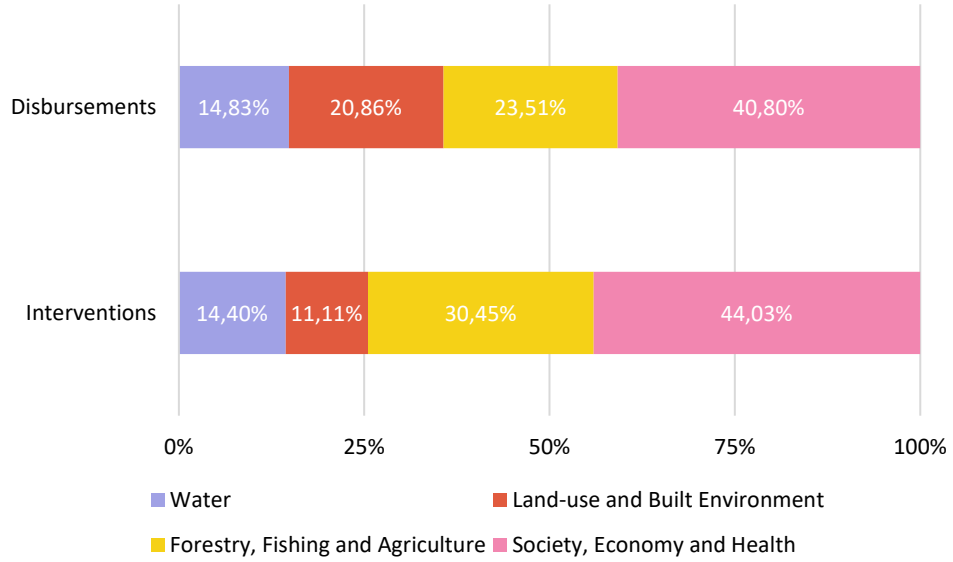
Intervention Heat Map		Uptake		Shocks and Stressors				Adaptive Capacity				Enabling Environment					
Sector	Outcome type / Intervention type	Adoption		Decreased Exposure		Decreased Impacts/Risks		Social Benefits		Economic Benefits		Environmental Systems		Socioeconomic Systems		Institutional Systems	
Water	Nature-Based Options			2	0.97											1	0.08
	Built Infrastructure/Structural			1	0.89												
	Technological Options			1	0.79									1	10.55		
	Informational/Educational	5	23.63	2	2.92	3	20.78							1	20.47	1	11.88
	Institutional/…/Regulations*	1	0.97	1	5.10	1	1.75			1	1.79			1	5.10	5	16.16
	Financial/Market Mechanisms									2	2.68			1	1.06		
	Social/Behavioural							1	0.12			1	0.63			1	2.59
Land-use and Built Environment	Nature-Based Options					1	4.67					1	0.62				
	Built Infrastructure/Structural													1	8.70		
	Technological Options							1	9.31			1	2.39	1	5.34		
	Informational/Educational			1	0.22			2	42.68			1	2.39			2	9.48
	Institutional/…/Regulations*	1	3.68			2	6.42	1	17.52			1	2.39			2	14.39
	Financial/Market Mechanisms					1	4.67	1	16.13					2	11.51		
	Social/Behavioural									2	11.01					1	10.70
Forestry, Fishing and Agriculture	Nature-Based Options	1	0.16	2	0.94	2	7.96	1	0.76	5	9.40						
	Built Infrastructure/Structural																
	Technological Options					4	9.47			9	8.79	3	0.75	3	0.69	1	1.35
	Informational/Educational	1	58.69	1	0.62	1	0.23	1	0.15	4	3.18	2	1.75	2	9.24	3	16.37
	Institutional/…/Regulations*			1	0.62							1	3.77	1	1.38	4	23.14
	Financial/Market Mechanisms					1	1.35			5	16.15			3	10.70	1	0.45
	Social/Behavioural	1	1.35			1	1.01	1	0.35	2	0.80	2	1.95	3	9.17	1	4.88
Society, Economy and Health	Nature-Based Options	1	0.82	1	1.24									1	0.54		
	Built Infrastructure/Structural	1	0.82											1	2.06		
	Technological Options	2	1.22					1	0.16	1	1.24			2	5.04		
	Informational/Educational	8	51.98	1	7.80	5	4.87	3	2.26					5	6.35	9	25.03
	Institutional/…/Regulations*	12	43.25	2	24.50	2	3.52					1	9.27	1	2.75	12	61.80
	Financial/Market Mechanisms	1	18.19			3	8.64							9	27.03		
	Social/Behavioural	2	4.37	1	16.71	2	0.99	3	5.48					4	10.13	9	12.16

Notes: The table displays the number of interventions (green) and the total disbursements (blue) which have been allocated to the respective cells of the IHM under the Swedish CCA portfolio. Each cell represents one particular type of CCA measure. *Institutional/Planning/Policy/Laws/Regulations

Source: Author's own calculations.

Overall, the largest sector in the Swedish portfolio is Society, Economy and Health, Forestry, Fishing and Agriculture being second. Based on received funding, Land-use is closely behind the former, which are distributed across a significantly smaller number of interventions. The smallest sector is Water (see figure 16). Thus, on an aggregate level, it becomes clear that the portfolio is skewed towards interventions within the first-mentioned sectors.

Figure 16: Distribution of interventions and disbursements by sector



Source: Author's own calculations.

Box 1 introduces an intervention from the most concentrated cell of the IHM, which is located in the largest sector. It characterises the qualities and purposes of this group of interventions well, which commonly aim to improve the capacities and possibilities of local stakeholders to participate in and benefit from CCA-related planning, policymaking, and the distribution of resources.

Box 1: Example of intervention from the portfolio: UNDP/UNCDF Local Government Initiative on Climate Change (LoGIC)

IHM Coding: Society, Economy and Health; Institutional/…/Regulations; Institutional systems

Swedish Disbursements: ~USD 12.88 million

Purpose: "The project will enhance the capacity of vulnerable communities, local government institutions and civil society organisations for planning and financing climate change adaptation solutions in selected climate vulnerable areas. By achieving the objectives and results, the project will contribute to the reduction of poverty and vulnerability in Bangladesh. This is expected to result in: Strengthened capacity of vulnerable people and local stakeholders for accountable planning and financing on Climate Change Adaptation/Disaster Risk Reduction actions for building resilience. Enhanced access of local government institutions and vulnerable households to climate funds have for climate resilient infrastructures and adaptive livelihoods. Established evidence-based advocacy for a mechanism for financing local resilience. The programme is designed to benefit roughly 200,000 most vulnerable households in 72 unions in seven districts."

Sources: OECD CRS; Open Aid.

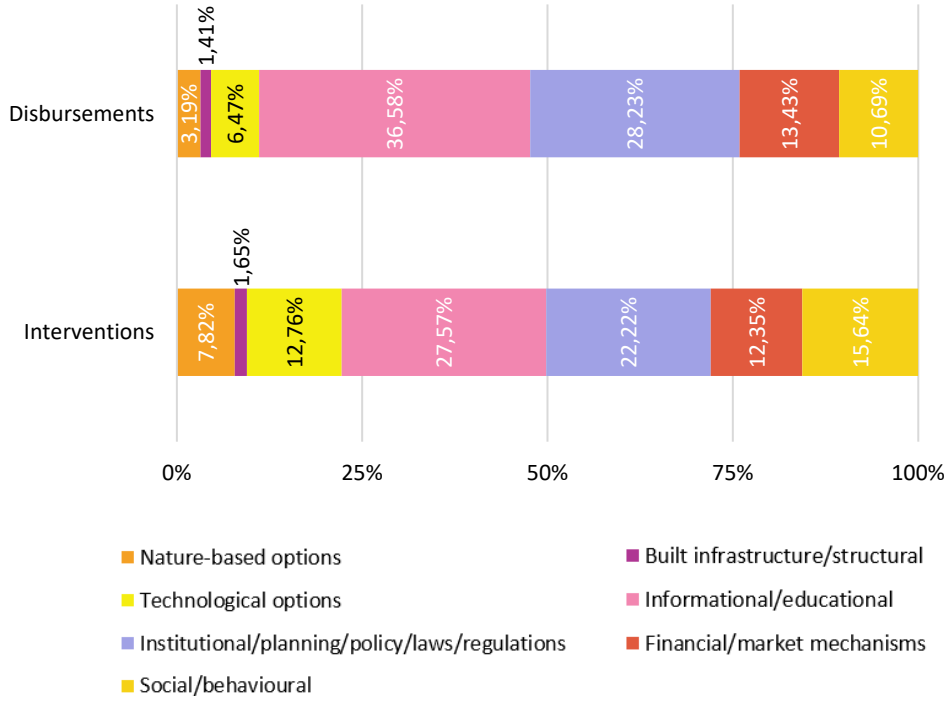
When disaggregating the data by intervention type (see figure 17), informational and educational interventions stand out as the largest group by both the share of interventions and disbursements, followed by Institutional and regulatory.

The most common intervention type, Informational/educational interventions were focused on facilitating CCA in the form of advocacy of Adoption, as well as improvements in the Enabling environment. Their cross-sectoral distribution is relatively even, although more prominent in Health, Economy and Society, as well as Forestry, Fishing and Agriculture.

Institutional/regulatory interventions showcase two areas of concentration. First, most of them are located in the Society, Economy and Health sector. Second, their predominantly intended outcomes are within the Enabling environment, especially the sub-category Institutional systems.

Financial/market mechanisms are distributed relatively evenly across sectors, with the Water sector being a clear exception. Unsurprisingly, most Swedish support of this type went towards Health, Economy and Society. Its primarily targeted outcome categories are the Enabling environment and Adaptive capacity of recipients. Virtually the same trend can be identified for Social/behavioural interventions.

Figure 17: Distribution of interventions and disbursements by intervention type



Source: Author's own calculations.

The more "physical" or "hard" intervention types (Nature-based & Technological options, Built infrastructure/structural) only received 11.07% of disbursements and comprised 22.22% of interventions. This is surprising considering that climate change principally produces physical consequences (see the listed climate hazards in figure 1), thereby inducing a need for adaptation within the physical environment in the form of nature-based or technological interventions or built infrastructure. All three highlighted intervention types are largely located within the Land-use and Forestry, Fishing and Agriculture sectors. As for Infrastructural interventions, it is noteworthy that there is no recorded case for this intervention type within the Forestry, Fishing and Agriculture sector, and only one in the Water and Land-use and Built Environment sectors, respectively. Box 2 provides a good example of one of the few infrastructural interventions.

Similarly, Nature-based options are scarce within the latter sectors as well. Furthermore, Infrastructural interventions are detectable in half of the outcome sub-categories, only exceeding USD 10 million in funding for Socioeconomic systems.

Box 2: Example of intervention from the portfolio: AfDB – Desert to Power

IHM Coding: Land-use and Built Environment; Built Infrastructure/Structural & Financial/Market Mechanisms; Socioeconomic systems

Swedish Disbursements: ~USD 17.41 million

Purpose: "Desert to Power is a flagship renewable energy and socio-economic development initiative led by the African Development Bank. Consistent with the first of the Bank's "High 5" priorities— "Light Up and Power Africa"—the initiative's objective is to light up and power the 11 countries of the Sahel region. It intends to do so by increasing solar generation capacity by 10 gigawatts via public and private projects, and by providing access to electricity for 250 million people via on-grid and off-grid solutions by 2030. The initial focus has been on: Burkina Faso, Chad, Mali, Mauritania, and Niger. Five priority areas: Expanding grid-connected solar power generation capacity; Strengthening and expanding national and regional grids; Deploying decentralized energy solutions; Improving the financial and operational capacity of the power utilities; And strengthening the enabling environment for increased private sector investments."

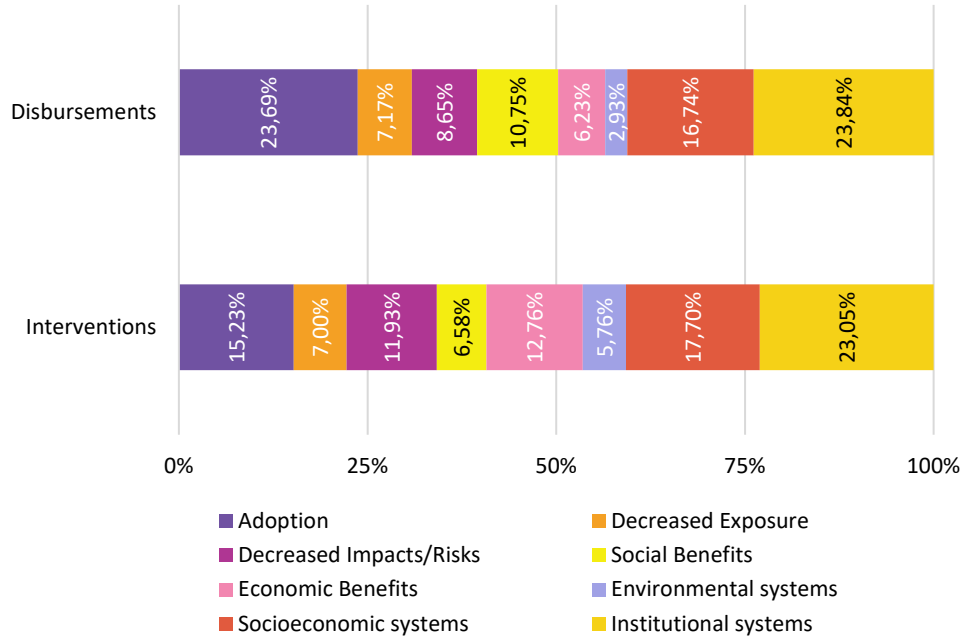
Sources: OECD CRS; Desert to Power Initiative - 2022 Annual Report.[10]

Turning towards the final constituent dimension (see figure 18), no outcome sub-category exceeds 25% of the Swedish funding. The most desired outcomes were in Institutional systems and promoting CCA Adoption. Goals concerning Socioeconomic systems received the third most funding. Thus, Swedish CCA aid has been focused primarily on improvements in the Enabling environment of its recipients with close to half of the interventions and disbursements. Adoption of CCA measures has been the second most common category.

A notable finding from table 7 in this context is that the Land-use sector stands out by recording the highest concentration of interventions and funds with the purpose of promoting social benefits compared to the other sectors, whilst including only two interventions promoting economic benefits. Nonetheless, Adaptive capacity-promoting interventions are predominantly nestled in the aforementioned sector, whilst being scarce in the sectors Water and Health, Economy and Society. Most funding for improving Adaptive capacities amongst aid recipients were Informational/educational and Financial interventions.

[10] The annual report can be found at https://www.afdb.org/en/documents/desert-power-initiative-2022-annual-report.

Figure 18: Distribution of interventions and disbursements by outcome sub-category



Source: Author's own calculations.

Adoption-promoting interventions are heavily concentrated within the Society, Economy and Health sector, all the while being almost entirely absent within Land-use and Built Environment, expect for one institutional/regulatory intervention.

Amongst the outcomes pertaining to the Enabling environment, the sub-category Environmental systems stand out as underrepresented within the Swedish portfolio with only 2.93% of funds, making it the smallest sub-category. This is remarkable considering the large shares of Socioeconomic and Institutional systems outcomes. Especially the Water sector demonstrates a scarcity in this department with only one intervention.

Adoption was primarily facilitated through two types of interventions: information/educational and institutional/regulatory. This appears to be an intuitive result considering the nature of the outcome. Advocating for the necessity and importance of CCA and integrating it into the planning and policy processes of recipients is arguably most effective through the mechanisms of these two intervention types. The intervention summarised in Box 3 exemplifies this point.

Box 3: Example of intervention from the portfolio: CGIAR 2019 – 2022

IHM Coding: Forestry, Fishing and Agriculture; Informational/Educational; Adoption

Swedish Disbursements: ~USD 58.69 million

Purpose: "CGIAR is a global partnership that unites organizations engaged in agricultural research, and its main activity is focused on increasing agricultural productivity in low-income countries. CGIAR will work specifically with: reducing poverty in rural areas, increasing food safety, improving nutrition and health and sustainable natural resource management. It is a priority task for CGIAR to develop knowledge and skills about biodiversity and how it changes in agricultural landscapes, forests and water systems. With new knowledge of biodiversity in agriculture, the scientific basis is built for a better understanding of the agricultural ecosystem and the best solutions to keep and protect biodiversity. In light of climate change, the need for new knowledge on biodiversity and ecosystems is increasing. The research is conducted by 15 international centers that are members of the CGIAR System Organization in close collaboration with 3000 partners, including national and regional research institutes, civil society organizations, academia, development organizations and the private sector. CGIAR manages 11 biobanks to ensure the availability of processing materials for their own and their partners' use."

Sources: OECD CRS; Open Aid.

Whilst being the smallest outcome category within the portfolio, Shocks and stressors demonstrates the most levelled distribution of interventions and funds across the four sectors. The most common intervention types for this outcome are institutional/regulatory and informational/ educational interventions.

4.3 Comparison of the Swedish Intervention Heat Map and the Evidence Gap Map

After investigating the structure of the Swedish CCA portfolio, the remaining question is how it relates to the results from the EGM. Table 8 (page 41) shows the IHM as the total amount of disbursements, overlaid with the EGM. The findings from both tables will be investigated in greater detail conjointly.

Table 8: The Swedish IHM (blue; disbursements, million USD, defl.) overlaid with DEval's Evidence Gap Map (orange)

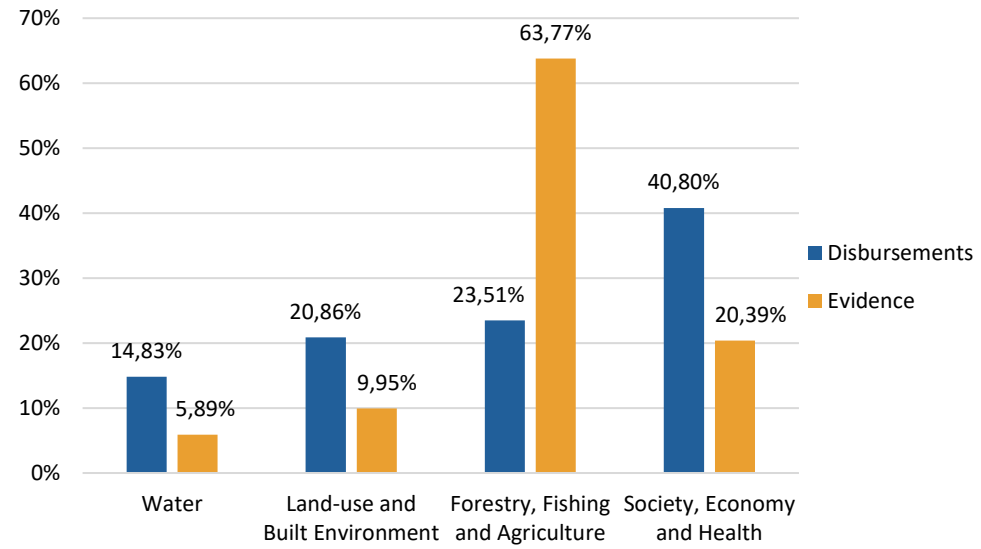
IHM, overlaid with the EGM		Uptake		Shocks and Stressors				Adaptive Capacity				Enabling Environment					
Sector	Outcome type / Intervention type	Adoption		Decreased Exposure		Decreased Impacts/Risks		Social Benefits		Economic Benefits		Environmental systems		Socioeconomic systems		Institutional systems	
Water	Nature-Based Options			0.97					1		3		3			0.08	
	Built Infrastructure/Structural		1	0.89	1		10		2		9		3		2		
	Technological Options			0.79			1				1		1	10.55			
	Informational/Educational	23.63	2	2.92		20.78	3				1		1	20.47		11.88	
	Institutional/.../Regulations*	0.97	1	5.10		1.75	3		1	1.79	2			5.10		16.16	
	Financial/Market Mechanisms		1				1			2.68			2	1.06			
	Social/Behavioural		1				1	0.12	1		1	0.63	1			2.59	
Land-use and Built Environment	Nature-Based Options		1		14	4.67	4		1		3	0.62	2		1		
	Built Infrastructure/Structural		3		4		4				5		3	8.70	1		
	Technological Options						1	9.31				2.39	3	5.34			
	Informational/Educational		3	0.22			4	42.68	1			2.39	3			9.48	
	Institutional/.../Regulations*	3.68	2		3	6.42	2	17.52	1		4	2.39	4		2	14.39	2
	Financial/Market Mechanisms		2			4.67	2	16.13	1				2	11.51			
	Social/Behavioural		1		1		5		3	11.01	2		2		1	10.70	
Forestry, Fishing and Agriculture	Nature-Based Options	0.16	3	0.94	2	7.96	29	0.76	2	9.40	106		34		8		
	Built Infrastructure/Structural		11				5		1		9		1				
	Technological Options		7		2	9.47	19		2	8.79	100	0.75	17	0.69	5	1.35	
	Informational/Educational	58.69	77	0.62	1	0.23	7	0.15	9	3.18	19	1.75	5	9.24	5	16.37	
	Institutional/.../Regulations*		14	0.62			3		1		5	3.77		1.38	3	23.14	
	Financial/Market Mechanisms		44		1	1.35	6		4	16.15	14		4	10.70	5	0.45	
	Social/Behavioural	1.35	36			1.01	5	0.35	3	0.80	19	1.95	4	9.17	3	4.88	
Society, Economy and Health	Nature-Based Options	0.82	1	1.24			3		1					0.54			
	Built Infrastructure/Structural	0.82	1				9				3			2.06			
	Technological Options	1.22					8	0.16		1.24				5.04	1		
	Informational/Educational	51.98	9	7.80	2	4.87	10	2.26	8		2			6.35	1	25.03	
	Institutional/.../Regulations*	43.25	2	24.50	1	3.52	15				4	9.27		2.75	2	61.80	2
	Financial/Market Mechanisms	18.19	5		1	8.64	26		1		14		1	27.03	5		1
	Social/Behavioural	4.37	13	16.71	2	0.99	25	5.48	5		17		1	10.13	6	12.16	3

Notes: The table displays two values: the total disbursements which have been allocated to the respective cells of the IHM under the Swedish CCA portfolio (blue); and the number of evidence pieces from the research and grey literature for each cell (orange). Each cell represents one particular type of CCA measure. A research finding is included if it relates to the effectiveness of the respective measure in promoting CCA. *Institutional/Planning/Policy/Laws/Regulations

Sources: Author's own calculations; Doswald et al., 2020.

Figure 19 compares the portfolio with the evidence from the EGM. It shows that for all sector but one (Forestry, Fishing and Agriculture) there is more funding than evidence, as shares of the totals. Almost two-thirds of the evidence are in the sector which is about three times the percentage points of the Swedish disbursements. For all other sectors, the Swedish disbursements records two to three times the percentage points of the evidence. However, besides the highlighted disparities, the portfolio matches the evidence based on a size-based ranking of the sectors.

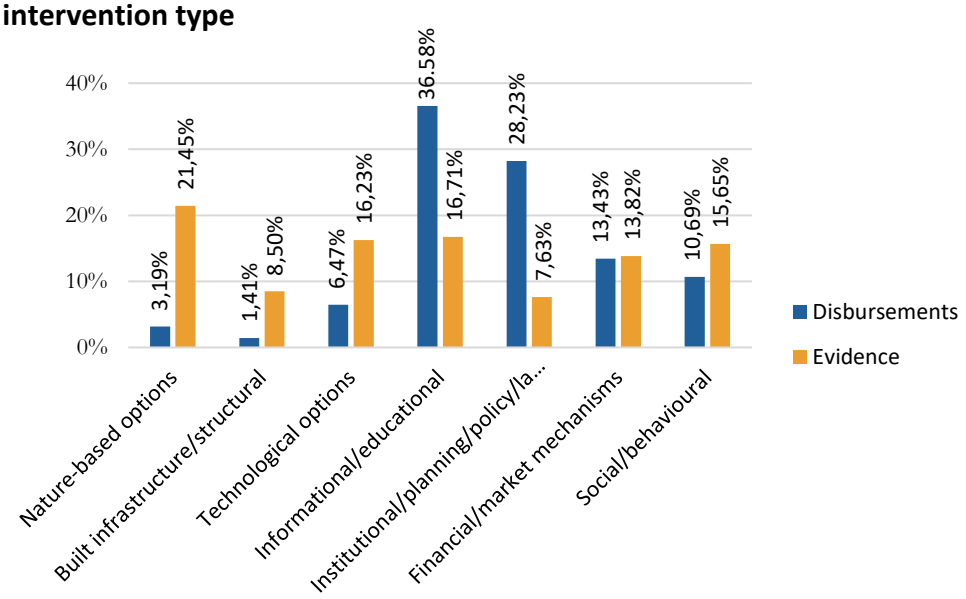
Figure 19: Distribution of CCA disbursements compared to the evidence by sector



Source: Author's own calculations.

As discussed above, the Swedish portfolio emphasises the Informational/educational and Institutional/regulatory intervention types and includes only little funding towards the "hard" types (Nature-based and Technological options, Build infrastructure). The research literature has paid considerable attention to these three intervention types, accounting for in sum 46.18% of the evidence on CCA effectiveness (see figure 20). Consequently, the Swedish CA portfolio diverges greatly from the evidence in these areas, with a total of 11.07% of disbursements being allocated to these three intervention types. In contrast, the emphasised intervention types are about twice and four times as large, respectively, compared to the evidence. Lastly, the share of financial/market mechanisms, as well as social/behavioural interventions are approximately even across the Swedish funding and the evidence.

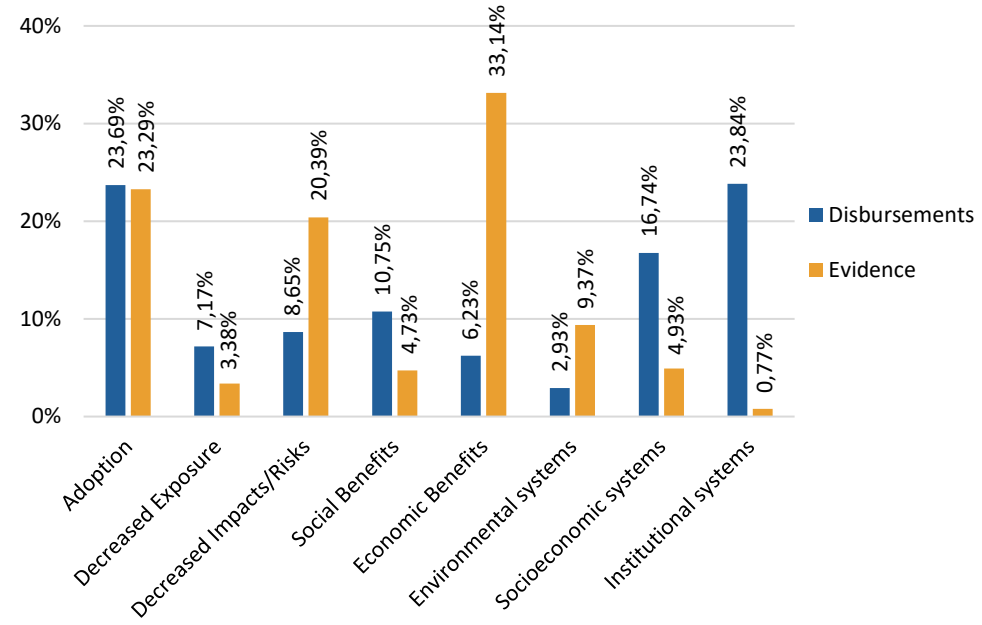
Figure 20: Share of CCA disbursements compared to the evidence by intervention type



Source: Author's own calculations.

When comparing the disbursements with the evidence based on their distribution across the outcome categories (see figure 21), the results indicate little congruence between the Swedish portfolio and the available evidence.

Figure 21: Distribution of CCA disbursements compared to the evidence by outcome sub-category



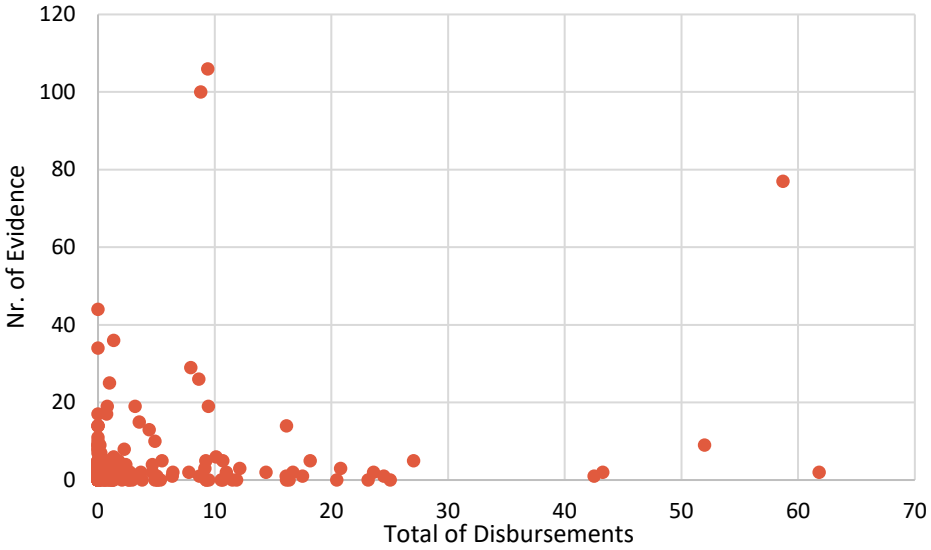
Source: Author's own calculations.

The only clear outlier from this trend are Adoption-focussed interventions with a remarkable similarity. Furthermore, one can argue for similar tendencies regarding the outcomes Decreased Exposure, Social Benefits, and Environmental systems. On the other end, several outcome categories showcase large disparity between the share of disbursements and evidence, with two outstanding cases. Economic benefits are marked by a 26.91 percentage-point gap skewed towards the evidence, whereas the discrepancy in Institutional systems leans towards the Swedish disbursements. Thus, these numbers support the conclusion of considerable discrepancy between the Swedish portfolio and the body of literature concerning CCA outcomes.

How congruent are the Swedish CCA portfolio and the evidence on the effectiveness of CCA interventions overall? The previous figures have indicated an overall low level of congruency, with punctual parity on some of the categories within the three constituent dimensions. This trend is supported on a general level when plotting the cells from the combined IHM and EGM based on the allocated disbursements and the attributed evidence. The result can be seen in figure 22 which also includes a trendline. Each point represents a cell from the combined IHM/EGM matrix.

Overall, the correlation between the Swedish CCA funding and the evidence is weak, as indicated by a statistically significant Pearson's correlation coefficient of 0.205 (p-value=0.002). The somewhat erratic distribution of data points across the scatter plot falls in line with this finding. In particular, there is a wide spread of data points with high values either in regard to the received disbursement or the number of evidence. This shows an uneven distribution between the Swedish portfolio as mapped using the IHM and the EGM.

Figure 22: Relationship between disbursements and evidence by IHM/EGM cell



Notes: Pearson's r=0.205 (p-value=0.002). Each dot represents one cell from the matrix in table 8.
Source: Author's own calculations.

Furthermore, most data points seem to be clustered close to either of the axes which further supports the claim of incongruence between the Swedish CCA funding and the evidence base.

For instance, Swedish donors have contributed USD 61.8 million to interventions within the Society, Economy, and Health sector, employing Institutional/regulatory approaches to administer changes within the Institutional systems of recipients. This makes it the largest area of spending in the portfolio. In contrast, only two instances of evidence were found for this configuration of the EGM. Similar discrepancies of sizeable Swedish funding and little evidence can be found within other cells, particularly pertaining to the intervention types Informational/educational and Institutional/regulatory (see table 8).

However, the reverse pattern can be found for interventions within the Forestry, Fishing and Agriculture sector, aimed at promoting CCA through Economic benefits. In this area, Nature-based options and Technological options showcase the largest number of evidence (106 and 100 references) within the entire EGM, yet low total disbursements (USD 9.4 and 8.78 million). Remarkably, interventions of one configuration (Forestry, Fishing and Agriculture; Financial/Market Mechanisms; Adoption) have received no Swedish funding, at the same time boasting the fourth-largest number of evidence (44). Only one cell (Forestry, Fishing and Agriculture; Informational/Educational; Adoption)

showcases a proportionate amount of disbursements (USD 58.69 million) and evidence (77).

In sum, the analysis supports the conclusion that the Swedish CCA portfolio and the evidence, as synthesised by Doswald et al. (2020), share little resemblance in its structure across the three investigated dimensions. These results and their implications will be discussed further below.

5 Discussion and conclusion

According to the models on climate change, the need and necessity for increased CCA measures will continue to increase globally, even in the most hopeful scenario. Often time, such measures are resource-intensive and require extensive expertise and commitment to implement them. This poses a problem considering that many of the poorest countries are also the most vulnerable countries with the lowest levels of preparation to the adverse effects of climate change. Within this context international aid can play a pivotal role in facilitating and advancing CCA expansion in the countries and communities who need it most. In line with this trend, Swedish CCA aid has been increasing steadily since 2010 in both relative and absolute terms. This working paper sought to uncover trends within the Swedish CCA portfolio, using 2022 as a reference year, and compare it to the evidence on CCA interventions from the research literature. Doswald et al.'s Evidence Gap Map (2020), which is based on a systematic review of the research and grey literature, served as the foundation for this comparison. The following are the most relevant findings from the analysis.

General characteristics of the portfolio

Overall, the analysed portfolio is comprised of USD 882.862 million across 147 interventions, covering a period from 2014 to 2032. Four Swedish actors have served as contributors, namely - from largest to smallest - Sida, the Swedish Research Council, the Ministry of Foreign Affairs, and Swedfund.

About half of Swedish aid is allocated bilaterally or regionally, leaving the remainder to unspecified bilateral distribution. Of the geographically specified aid, most is channelled to countries in Africa, specifically Sub-Saharan Africa which has received 52.44%. Six of the ten highest bilateral receivers are countries within that region. Furthermore, regional interventions are predominantly active in Africa, barring some variation in scope.

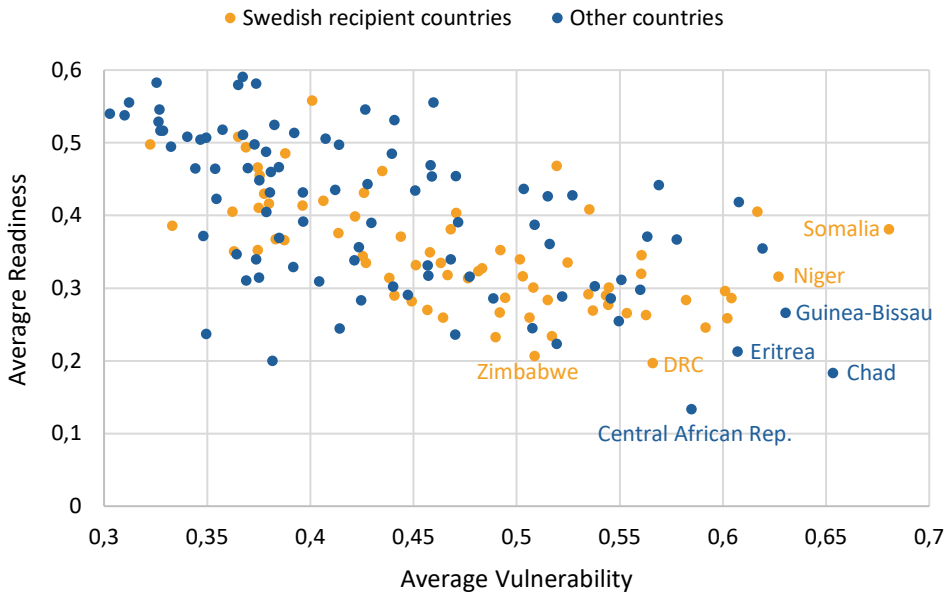
The portfolio's makeup of recipient countries is largely proportional to the vulnerability and readiness of these countries to adapt to climate change. Using the indices of the Notre Dame Global Adaptation Initiative, 63.36% of the bilateral funds went to more vulnerable countries with lower or the lowest levels of readiness. Additionally, countries with lower or the lowest

levels of readiness received 99.81% of funds, which further supports the conclusion that, by and large, the portfolio's selection of recipient countries is highly relevant.

However, the analysis also suggested that the relevance could be further improved by ensuring that sufficient support is provided to the countries displaying the highest degrees of climate change vulnerability and the lowest levels of readiness to address and deal with climate-induced risks. Amongst the list of bilaterally recipient countries in the portfolio at hand, the five most vulnerable countries, as well as the four least prepared countries received comparatively little funding.

Additionally, the ND-GAIN Country Index includes several countries with higher vulnerability and lower readiness levels, respectively, than the current Swedish recipients. Figure 23 plots all countries based on their average ND-GAIN scores from 2014 to 2022. Four countries outside of the Swedish portfolio stand out in particular as requiring additional and extensive CCA effort. Annex 4 provides a more detailed display of this data. It includes tables listing the scores of the twenty most vulnerable and least ready countries, respectively.

Figure 23: Average Vulnerability and Readiness scores (2014-2021) of Swedish recipient and other countries



Notes: The figure only includes countries with an average Vulnerability>=0.3 and average Readiness<=0.6. Andorra, Kiribati, Liechtenstein, Monaco, Saint Vincent and the Grenadines, San Marino and Tuvalu are excluded due to missing Vulnerability scores. Kosovo is a recipient country of the Swedish CCA portfolio but excluded from the graph due to the absence of ND-GAIN scores.
Source: Notre Dame Global Adaptation Initiative.

It is advisable for decisionmakers to consider in which countries their CCA aid would be most urgently required. As the results demonstrate, whilst the overall relevance of Swedish CCA aid is high, there is still room for improvement. The results suggest opportunities both within and outside of the portfolio to commence or increase CCA funding to countries with higher vulnerability and lower readiness levels than the top recipients as of 2022. Overall, by taking countries' levels of vulnerability and readiness in account more, Swedish CCA aid could become even more receptive to the predisposition and needs of recipient countries.

An important point to highlight in this discussion is that adaptation needs can occur at multiple levels of scale and to diverging extents. That is, community-level or local vulnerabilities or CCA needs might differ greatly from the overall vulnerability and readiness of the country in which they are situated in. Thus, while aggregated data such as the ND-GAIN index are a useful resource when choosing recipients of CCA aid, it is important to at the same time maintain awareness and sensitivity for sub-national needs and vulnerabilities in the face of climate change.

The structure of the Swedish CCA portfolio

The Swedish CCA portfolio focused a considerable share of its resources on interventions within the Society, Economy and Health, as well as the Forestry, Fishing and Agriculture sectors. These two sectors claim in sum about two-thirds of interventions and disbursements, respectively. As the labels suggest, these sectors are broad in scope and encompass a number of elements that could be considered sectors in their own right. Therefore, their relative sizes could have been subject to distorting effects due to their broad scopes. However, the distribution of aid by the OECD sector categories presented in section 4.1 corroborates these findings, thereby indicating a significant tendency in the portfolio towards the highlighted sectors.

The most financed types of interventions were informational or institutional in nature, both of which were predominantly utilised in the aforementioned sectors. Interestingly, Sweden has financed only few interventions using "physical" or "hard" intervention modalities. This is surprising considering that climate hazards produce a multitude of consequences for the physical environment of human and ecological systems. In particular infrastructural interventions are exiguous, being entirely absent from the Forestry, Fishing and Agriculture sector, as well as half of the outcome sub-categories.

When considering the desired outcomes of the Swedish CCA portfolio, it is useful to resort back to the conceptualisation of climate-induced risks, which was introduced in the introduction of this paper. Drawing from the concepts, it can be said that Swedish CCA aid has predominantly sought to facilitate CCA by reducing vulnerability in the enabling environment of recipient countries and communities. Thereby, Socioeconomic and Institutional systems were targeted in particular. Interventions with goals of this kind accounted for almost half of Swedish CCA disbursements. About one quarter of funding was intended for promoting the adoption of CCA measures within the recipient context, making it the second-largest pursued goal. Aid towards the improvement of adaptive capacities and reducing the exposure and risks of recipients have received roughly a third of funding combined.

Considering the three dimensions (sector, intervention type, and outcomes) conjointly, the portfolio displays five concentrated areas of funds, receiving each more than USD 40 million.

- Most CCA aid was channelled towards institutional interventions within the Society, Economy and Health sector with the goals of promoting uptake or strengthening Institutional systems.
- Uptake-promoting Informational interventions within the Societal sector, as well as the Forestry, Fishing and Agriculture sector make up additionally two largest recipients of Swedish aid.
- The final concentration is found amongst Informational interventions within the Land-use sector, with the purpose of enhancing Adaptive capacities through Social benefits.

Other donors have channelled a considerably larger share of their CCA aid towards "physical" or "hard" measures. For instance, Doswald et al.'s mappings of CCA funding (2020) from the German Cooperation (2010-2017) and the Green Climate Fund (until Oct 2019), respectively, reveal that both donors have allocated about 38% of their funds towards the "hard" intervention types. In contrast, the Swedish portfolio consists of 11.07% of disbursements to the same intervention types. Table A6 in Annex 5 contains an IHM combining the results for the Swedish portfolio and the aforementioned two donors. It illustrates this discrepancy in funding patterns between Swedish and the other donors.

This raises questions regarding underlying reasoning of Swedish decisionmakers of preferring "soft" and systemic interventions. As stated, in the first place, climate change produces physical effects consequences.

These, in a second stage, affect social and human systems. Clearly, Swedish actors opt for different approaches in their prioritisation and allocation of funds for CCA measures than other donors, such as the German Cooperation and the Green Climate Fund. It therefore would be valuable for Swedish decisionmakers to clarify their reasoning and approach to selecting CCA interventions.

The relation between the Swedish portfolio and the evidence on CCA

The portfolio showcases little congruence with the research evidence, as presented in Doswald et al.'s EGM (2020). By a large margin, the most studied sector in the EGM is the Forestry, Fishing and Agriculture sector. In contrast, Swedish CCA interventions have been predominantly located in the sector Society, Economy and Health. Little symmetry can be found in the distribution of intervention types, with only Financial/market and Social/behavioural mechanisms showing resembling trends between the Swedish portfolio and the research evidence. Beyond those cases, Swedish CCA has largely been concentrated in Informational/educational and Institutional/regulatory interventions. Nature-based and technological options, which many studies have focused on, have received 9.62% of funds. Lastly, as for the outcomes of interventions, once again, many discrepancies can be found, adoption-focused interventions being the exception. Within the Swedish portfolio, a significant part of funds has been allocated towards promoting CCA via changes in the Enabling environment (in particular, institutional and socioeconomic systems). In contrast, the research literature has paid considerable attention to promoting economic benefits and decreasing impacts and risks of climate change.

When interpreting the results from this comparison, it is important to be very clear about the specificities and limitations of the EGM.

Firstly, it produces a frequency distribution of points of evidence from the literature but does not indicate the existence of causal linkages between the constituent dimensions regarding the effectiveness of interventions. That is, a high number of evidence within a certain cell does not signify a high level of effectiveness of interventions associated to that cell in producing CCA results.

Secondly, for the systematic literature review, Doswald et al. (2020) predominantly considered evidence from quantitative or experimental

study designs which might not suit many interventions - especially in those for which it is difficult to define counterfactuals or identify concise outcome variables. This caveat is particularly relevant for the analysis of the Swedish portfolio, since – as the results demonstrate – most funding went to educational/informational and institutional intervention which can be difficult to evaluate in these ways.

Thus, the comparative results make no claim on the effectiveness of the Swedish CCA portfolio at large or on an intervention-level. Instead, they indicate that Swedish CCA aid has largely been utilised in areas of CCA facilitation which are marked by scholarly uncertainty regarding their effectiveness. There is a need for more research into the most prominent areas of Swedish bilateral CCA aid, most notably in two regards:

- The effectiveness of informational/educational and institutional/ regulatory interventions and
- How to effectively promote CCA through adjustments in the socioeconomic and institutional systems of recipients.

Furthermore, the results suggest that Swedish donors have possibilities to expand their funding into evidence-rich areas of CCA interventions. This accounts especially for the following areas

- Interventions within the Forestry, Fishing and Agricultura sector
- Interventions utilising nature-based options, built infrastructure, or technological options
- Interventions enhancing CCA through the promotion of economic benefits as a form of adaptive capacity or the reduction of impacts and risks from climate change.

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Annex 1: Methods

The methods used for this working paper are largely informed by the DEval Discussion Paper titled "Evidence Gap and Intervention Heat Maps of Climate Change Adaptation in Low- and Middle-Income Countries" written by Doswald et al. (2020). As such, this working paper will conceptually employ the same methods with the necessary adjustments to the Swedish portfolio. The following sections will shed further light on the individual components.

Sampling strategy & data collection of Swedish CCA interventions

This paper seeks to map the Swedish portfolio of implemented/funded interventions with the purpose of facilitating CCA in the respective recipient countries, territories, regions or groups. As such, the target population of cases is defined by the following parameters:

- Primary purpose is to promote and facilitate CCA in the recipient countries, territories, or regions
- Implemented and/or funded by Swedish public sector organisations.

Since this population is comprised of an enormous number of interventions, especially without a temporal limitation, a sensible sample of interventions ought to be selected. Therefore, the defining parameters, as presented above, need to be operationalised to that end. As the overall sample frame, the OECD Creditor Reporting System (CRS) was used, as it is the most comprehensive and applicable dataset of Swedish aid interventions for two reasons. First, a multitude of Swedish agencies and organisations report their data to it, including key aid-providing agencies (e.g., Sida, FBA, and Swedfund), various ministries (e.g., Ministry of Foreign Affairs), as well as other agencies, not primarily engaged in aid (e.g., Skatteverket and SCB). This allows for the capture of a broad array of Swedish donor organisations. Second, the dataset includes a large number of variables (N=95), amongst which are several variables providing key data for the exploration of CCA interventions.

In its raw form, the CRS dataset included data on many more interventions than the target population of this paper. Therefore, the defining

parameters specified above are operationalised as summarised in table A1, hence reducing the dataset to the desired cases. As for the parameters, the Rio Markers merit a more detailed introduction to fully explain the feasibility of their inclusion. They were collaboratively established by the OECD Development Assistance Committee (DAC) and the United Nations Framework Convention on Climate Change (UNFCCC) in 1998 to improve the monitoring of aid flows within the Convention's thematic area. The markers cover four thematic areas: biodiversity; desertification; and climate change mitigation. In 2009, the marker on climate change adaptation was added. They employ a three-point classification system, enabling donors to report the extent to which the objectives of an intervention are centred around either of the other markers. A CCA score of two, for instance, indicates that CCA is the principal objective of an intervention, meaning that its funding or implementation is primarily motivated by its focus on CCA. A score of one marks CCA as a significant objective; that is, an intervention is not designed to foremost address CCA but designed to also relate to it as a secondary goal. A zero score indicates no inclusion of CCA in the intervention design (OECD, 2011).

Table A1: Parameters used for the sampling strategy

Variable (CRS)	Score (CRS)	Explanation
Year	2022	Filters out the most recent and ongoing interventions. 2022 is the most recent year included in CRS.
Donor	Sweden	Limits the observations to Swedish funding.
Rio Marker "Climate Adaptation"	2	Filters out all interventions which are marked as having CCA as their principal objective.
Agency Name	All governmental agencies	Delimits the dataset to official development assistance (ODA).
Recipient Name	All entries	Any recipient country, territory, or region is interesting to the analysis.

Source: author's own considerations.

It is important to point out that the CRS dataset was expanded retrogressively, including data from all years in which the CCA interventions active in 2022 (i.e., marked with a Rio Marker in Climate Adaptation with a value of two) received funding from Swedish donors. This is to ensure a as complete capture as possible of the volume of Swedish support. Note that this implies an exclusion of all interventions from the CRS datasets prior to 2022 which were not included in the 2022 dataset.

Once all parameters were applied and the CRS dataset trimmed to the desired specifications, a dataset of observations corresponding to individual Swedish disbursements towards an array of CCA interventions is created. This dataset will henceforth be referred to as the CCA dataset.

The next step was to group the individual disbursements together based on the interventions which they were made to. First, the dataset provides a variable called *projectnumber*. Unfortunately, most of the Swedish donor agencies in the CCA dataset do not apply a transparent and applicable system of generating project numbers, thereby rendering the project numbers useless for this exercise. Sida is the exception from this pattern, as the digits in the positions 11 through 16 of their project number (which, in this case, functions as a disbursement-ID) indicate the overarching intervention-ID. Hence, by extracting the intervention-ID, Sida's disbursements can be grouped together by intervention. However, since different project phases of the same intervention might be marked with different project numbers, Sida's disbursements was also included in the following steps as a measure of quality assurance. Second, the dataset is sorted by donor agency (*agencyname*) and the short description (*shortdescription*) which includes titles of the interventions, to which the disbursements are made.[11] Many disbursements to the same intervention share the same or similar titles recorded in *shortdescription*. It is therefore possible to manually group the disbursements together according to their belonging intervention using *shortdescription*. Lastly, to enable an analysis on an intervention-level, a new numerical intervention-ID variable was generated as a formalisation and standardisation of the groupings commenced in the previous step. The intervention-IDs distinctly identify each individual intervention.

The resulting sample includes a total of 155 interventions, which have been implemented by or received funding from four Swedish donor organisations, the largest by a considerable margin being Sida (see table 7 in section 4.1). The structure and makeup of the portfolio in its entirety is explored in section 4.

There are several limitations pertained to the OECD CRS data and sampling strategy used in this working paper which are important to consider regarding the empirical capture and internal validity of the

[11] The CRS dataset also contains a variable called *projecttitle*, recording the same intervention titles as the variable *shortdescription*, barring differences in text formatting. However, for some observations, only the latter variable contains a title entry, which is why it is chosen over the other for the grouping exercise.

analysis presented below. First, given the Rio Marker's self-reporting nature, there might have been inconsistent applications of the CCA marker, relative to the conceptualisation of CCA of this working paper, within the Swedish portfolio. This implies a risk of two types of errors: interventions which should be included in the sample are not; or interventions which should not be included are included. Indeed, previous evaluations of the application of the Rio Markers have uncovered a widespread issue of invalid overreporting of, including also Swedish aid (e.g., Borst et al., 2023; Weikmans et al., 2017). Whilst efforts were made to counteract the latter error (leading to eight excluded interventions, as described below), the former error could not be mitigated in this paper.

Second, the utilisation of the 2022 CRS dataset as the sample frame might have led to the inadvertent exclusion of interventions which received Swedish contributions prior or after 2022 but simply received no funding in 2022 and therefore were not included in the CRS dataset in 2022. As such, the actual number of CCA interventions might have been higher than concluded here.

Lastly, the deductive grouping of disbursement observations under overarching interventions carries considerable risks for errors which might distort the number of interventions and the funding volume for the interventions. That is, if disbursement observations were falsely associated to the same – rather than distinct – intervention, the number of interventions would be smaller and the concentration of funds higher. Conversely, if disbursement observations were grouped under separate interventions, the opposite result would have occurred. However, with an awareness of this risk, the rigour of the grouping procedure should minimise any such distortions in the data.

Data collection and coding

The goal of the analysis in this working paper is to map the Swedish CCA portfolio based on the Intervention Heat Map and its dimensions, as developed by Doswald et al. (2020), and in a second step compare the resulting Swedish Intervention Heat Map to Doswald et al.'s Evidence Gap Map. In that way, it will be possible to assess how the Swedish portfolio performs vis-à-vis the evidence on CCA measures found in the research literature.

Naturally, the conceptualised IHM will determine what data needs to be collected. The purpose of this section is to elaborate the operationalisation and retrieval strategy for the various types of data. The IHM is comprised of three dimensions, each of which has clearly defined categories. Each intervention from the CCA dataset was coded according to the three dimensions. For this purpose, the codes illustrated in table A2 were used. It is important to highlight the exact understanding of an outcome in this context. Given the recency of the dataset and the fact that many interventions are still ongoing, an outcome is understood as the ex-ante goals of a respective intervention. In other words, the focus is on what an intervention is supposed, designed, and expected to achieve, as opposed to what it has achieved in reality.

Table A2: Codes for the constituent dimensions of the IHM matrix

Outcome	
Category	Code
Uptake	1
Shocks and stressors	2
Adaptive capacity	3
Enabling environment	4

Subcategory outcome	
Category	Code
Adoption	1
Decreased exposure	2
Decreased impacts/risks	3
Social benefits	4
Economic benefits	5
Environmental systems	6
Socioeconomic systems	7
Institutional systems	8

Sector	
Category	Code
Water	1
Built environment/ land use	2
Forestry, agriculture, fishing	3
Health, economy, society	4

Intervention type	
Category	Code
Nature-based options	1
Built infrastructure/structural	2
Technological options	3
Informational/educational	4
Institutional/planning/policy/laws/ regulations	5
Financial/market mechanisms	6
Social/behavioural	7

Source: Doswald et al., 2020.

Additionally, Doswald et al. (2020) recommend the inclusion of a quality control variable to assess and note the data certainty of the variables on intervention outcomes, sectors, and intervention type (p.53). This step will

also be replicated as a quality control measure. For this paper, data certainty will be coded as follows:

- High certainty (code: 1): The information on a respective intervention is clear and sufficient for coding the intervention according to the three dimensions of the IHM.
- Low certainty (code: 2): The information on a respective intervention is unclear or incomplete, therefore limiting the internal validity of the coding.
- No certainty (code: 3): There is no information available on a respective intervention, therefore no coding is possible.

A multitude of sources were consulted during the coding process of all 155 interventions. As Doswald et al. (2020) report from their coding process, brief project descriptions have often sufficed for this feat (p.52). Therefore, they were primarily consulted for this paper, too, and retrieved from five different sources: the *longdescription*-entries of the interventions in the OECD CRS dataset; project documentation; the intervention profiles on Open Aid; the intervention profiles on IATI's d-portal; and alternative intervention-related sources (brochures or websites). In the case of one intervention, an annual report by the funding organisation Swedfund was utilised. Project documentation was foremost retrieved from Open Aid and IATI's d-portal. Whenever the first source did not provide clear or conclusive information and, thus, rendering the annotated codes uncertain (i.e., having a low data certainty), additional data sources were consulted. This enabled the triangulation of data, which enabled the development of final codes with a high certainty.

Once the coding process was concluded, 147 interventions were marked with a high degree of certainty, whilst five interventions received a low certainty and three interventions a no certainty score, respectively. The latter two groups were excluded from the subsequent analysis. Their exclusion was motivated by the following reasons:

- Unclear relevance to CCA: the purpose of the intervention, as described in the intervention-related data sources, do not reflect a CCA focus
- Spurious intervention-related data: it was impossible to ascertain the characteristics of an intervention regarding the key dimensions of the EGM/IHM
- Lack of accessible data.

The Swedish CCA interventions vary in scope concerning their goals and design. This necessitated to associate some interventions with several categories of the constitutional dimensions, leading to a total of 243 lines of code in the constructed dataset. 78 interventions were coded as one line, and 69 interventions were coded on two to six lines.

The quality of the produced codes is highly dependent on the extent to which intervention-related information is available, as well as the quality of accessible information, as already noted. Thus, the validity of codes is mediated by the accuracy and detail of the underlying sources, which vary between the interventions. The interventions range from narrowly purposed and single-sector projects within a single location to broad multi-purpose and multi-sector programmes which are being implemented in several recipient countries and world regions with multiple components. For the latter group, it is difficult to assess the precise intervention design from the available programme descriptions, as it pertains to the codes in table A2. Ideally, a component-level coding process would have been employed. However, this would have exceeded the capacities of this working paper. Thus, applying these codes to such extensive programmes on the basis of short and context-contingently limited programme description can be quite reductionist in nature, which runs the risk of missing out on possibly CCA-relevant information. This, in turn, imply a reduced internal validity of the produced dataset, as well as the subsequent analysis.

Another limiting factor is a possible inconsistent application of the codebook throughout the coding process. Ideally, this step would have been conducted by two or more coders simultaneously and independently, in order to use the combined results as a basis for quality insurance of the produced codes. Due to the scope and available resources to this working paper, the decision was made to resort to a single coder. As such, inconsistencies are a possible undesired consequence.

Data analysis

The analysis component of this working paper consists of two elements. First, the overall composition of the CCA portfolio was examined through descriptive statistical analysis based on trends in the following aspects:

- Summary statistics
- Geographical allocation of disbursements by recipient country and world region
- Annual trends in disbursements and active interventions
- Allocation of disbursements by sector
- Assessment of the vulnerability and readiness of the recipient countries based on data from the Notre Dame Global Adaptation Initiative.

Second, as the primary area of interest, an IHM was constructed for the Swedish CCA aid, by mapping the coded intervention-data based on the conceptual framework displayed in table A3. The IHM was created in two versions. The first version juxtaposes the nominal distribution of interventions with the allocation of disbursements across the three IHM dimensions. The results from the matrix are further summarised in graphs, aggregating the number of interventions and total volume of disbursements by sector, intervention type, and outcome.

In a second version, the Swedish IHM is overlaid with the EGM displayed in table 3 in section 3.2. The purpose of this is to assess the congruence of the Swedish CCA portfolio with the evidence from the research literature, enabling inferences on whether the former is substantiated by the body of research in its current form. To that end, the graphical results of several descriptive quantitative analyses are presented to enable meaningful comparisons between the portfolio and the evidence.

Table A3: Conceptual Intervention Heat Map matrix

Intervention Heat Map		Uptake	Shocks and Stressors		Adaptive Capacity		Enabling Environment		
Sector	Outcome type / Intervention type	Adoption	Exposure	Impacts/Risks	Social Benefits	Economic Benefits	Environmental systems	Socioeconomic systems	Institutional systems
Water	Nature-Based Options								
	Built Infrastructure/Structural								
	Technological Options								
	Informational/Educational								
	Institutional/…/Regulations*								
	Financial/Market Mechanisms								
	Social/Behavioural								
Land-use and Built Environment	Nature-Based Options								
	Built Infrastructure/Structural								
	Technological Options								
	Informational/Educational								
	Institutional/…/Regulations*								
	Financial/Market Mechanisms								
	Social/Behavioural								
Forestry, Fishing and Agriculture	Nature-Based Options								
	Built Infrastructure/Structural								
	Technological Options								
	Informational/Educational								
	Institutional/…/Regulations*								
	Financial/Market Mechanisms								
	Social/Behavioural								
Society, Economy and Health	Nature-Based Options								
	Built Infrastructure/Structural								
	Technological Options								
	Informational/Educational								
	Institutional/…/Regulations*								
	Financial/Market Mechanisms								
	Social/Behavioural								

Note: *Institutional/Planning/Policy/Laws/Regulations
Source: Doswald et al., 2020.

Annex 2: Systematic review of the CCA literature

For their data collection, Doswald et al. (2020) searched for research articles on several databases (Web of Science, Scopus, 3ie database and CEE library), as well as for grey literature from several organisational websites, following a strict search protocol. The searches were performed with English keywords. However, articles written English, Spanish, French or German were included. Besides the linguistic aspect, the retrieved body of articles was screened separately by three reviewers following a substantive list of criteria for inclusion or exclusion from the review (see table A4). Once all three stages of screening for concluded, 464 articles remained of the initially 13,121 articles.

For the coding process, a dataset was created recoding the articles as observations by their categorisations on the key EGM dimensions, as well as several numerical and string variables which facilitate a more substantive gap-map analysis. The total list of variables is: World Bank region; country; population sub-group; sector; intervention type; intervention; outcome; outcome sub-group; outcome indicator; study design; and research methods. In some cases, single articles were coded for several categories of the constituent EGM dimension, if applicable.

Doswald et al. (2020) show good awareness of the limitations of their study which diminish the all-encompassing nature and generalisability of their results. One such aspect is the use of English keyword searches, which inadvertently excluded all articles written in any other language. The authors note that English is the dominant academic language and that it is common practice for non-English publications to include English abstracts or keywords, thus enabling the capture of some articles in other languages. However, the language barrier remained.

Furthermore, the construction of broad classifications of the constituent dimensions ensures a meaningful compression of data and comparability. At the same time, this also brought about a loss of nuance within the categories of the dimensions. The authors highlight that the Society, Economy and Health sector in particular could be seen as a combination of three separate sectors.

Table A4: Inclusion and exclusion criteria for research articles

Inclusion criteria	Exclusion criteria
Relevant subject (population) People in low- and middle-income countries as defined by OECD: human individuals, groups, institutions, systems, communities and economic sectors (water, transport, infrastructure, agriculture, forestry, etc.).	Irrelevant subject (for this EGM) Evidence not from an OECD low- and middle-income country. Studies where plants, animals and ecosystems are the focus, with no human element. Evidence that does not concern climate. Evidence that concerns climate change mitigation rather than adaptation. Evidence that focuses on impacts of climate change rather than adaptation to climate change.
Relevant interventions Those that aim to adjust, reduce, stop or use the benefits from changes in climate or a climatic hazard due to climate change in different sectors. (There needs to be a link to a climatic factor or hazard within the study, or reference to CCA.)	Irrelevant intervention (for this EGM) Any nature conservation adaptation intervention (e.g. to conserve particular species of conservation interest). (There has to be a link to human systems adaptation.) Any intervention that does not have a direct link to adjusting to a climatic stimulus.
Relevant comparator No adaptation intervention, different levels of intervention, and comparison between interventions.	Irrelevant comparator (for this EGM) Where no measure of success of the adaptation intervention was presented and compared with no adaptation intervention, or different levels of intervention.
Relevant outcome Those that address vulnerability, either through risk or exposure, adaptive capacity or enhancing the enabling environment.	Irrelevant outcome (for this EGM) Vulnerability assessments.
Relevant study Quantitative or mixed-methods studies. Systematic reviews. Correlation analyses (e.g. using cross-sectional data, panel data or time series). Impact evaluation (IE) approach, which assesses the impact of an intervention using counterfactual	Irrelevant study (for this EGM) Comparisons of modelling techniques. Process-based evaluation reports (i.e. evaluation reports based on milestone indicators, stakeholder-based evidence and qualitative information). Prospective and predictive analysis based on modelling. Cost-benefit analysis. Articles published before 2007 and after 2018.

Inclusion criteria	Exclusion criteria
analysis (experimental and quasi-experimental approaches). Articles published between 2007 and 2018. Language of article with English abstract: English, French, Spanish and German. Published peer-review articles and published grey literature (documents published by organizations).	Languages outside those in the inclusion criteria. Books or book sections.

Source: Doswald et al., 2020.

Lastly, there are several limitations which originate from the inherent qualities of the EGM and CCA as an area of research. Firstly, the EGM lists the frequency of evidence found for the cells. It does, however, not indicate any causal mechanisms between key factors and certain outcomes of CCA. Therefore, the EGM makes no claims on the success of interventions. Secondly, due to the high uncertainty inherent in CCA, the included evidence is highly case-, context-, and time-sensitive, which limits the extent to which generalisable inferences can be made from the results. Thirdly, Doswald et al.'s study (2020) predominantly considers evidence from quantitative or experimental study designs. Therefore, the authors highlight that many interventions might not suit this type of evaluation, especially in those cases where it is difficult to define counterfactuals or identify concise outcome variables.

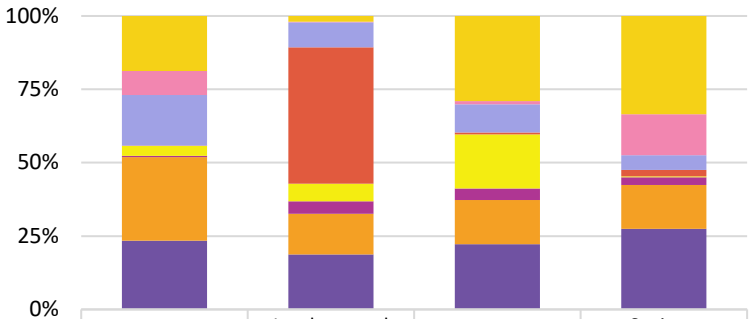
Annex 3: Granular graphical analysis of the Swedish IHM

Figure A1: Disb. (million USD, defl.) by intervention types across sector

	Water	Land-use and Built Environment	Forestry, Fishing and Agriculture	Society, Economy and Health
Nature-Based Options	1,05	5,29	19,21	2,61
Built Infrastructure/Structural	0,89	8,70	0,00	2,89
Technological Options	11,35	17,03	21,05	7,67
Informational/Educational	79,68	54,76	90,23	98,29
Institutional/.../Regulations	30,87	44,39	28,91	145,09
Financial/Market Mechanisms	3,74	32,30	28,64	53,86
Social/Behavioural	3,34	21,71	19,50	49,84

Source: Author's own calculations.

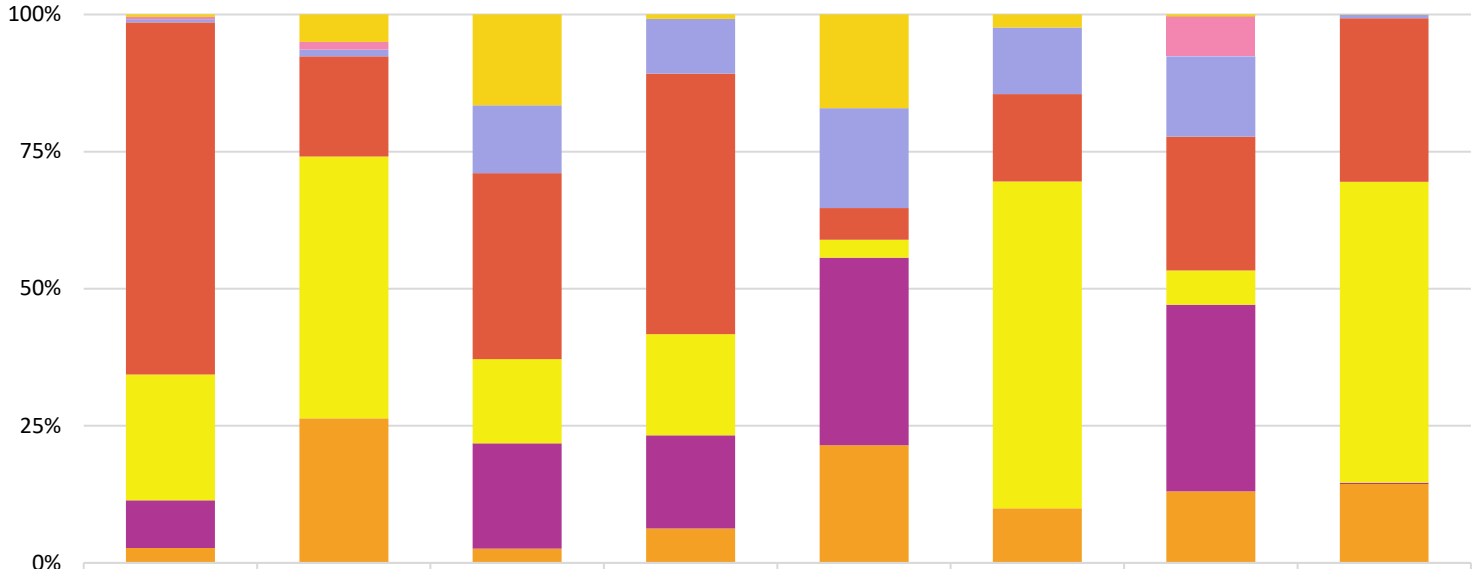
Figure A2: Disbursements (million USD, defl.) by outcome across sector



	Water	Land-use and Built Environment	Forestry, Fishing and Agriculture	Society, Economy and Health
Uptake	24,60	3,68	60,20	120,66
Decreased exposure	10,67	0,22	2,17	50,25
Decreased impacts/risks	22,53	15,75	20,02	18,02
Social benefits	0,12	85,63	1,25	7,89
Economic benefits	4,47	11,01	38,31	1,24
Environmental systems	0,63	7,78	8,21	9,27
Socioeconomic systems	37,18	25,55	31,18	53,90
Institutional systems	30,71	34,57	46,19	98,99

Source: Author's own calculations.

Figure A3: Disbursements (million USD, defl.) by intervention type across outcome categories



	Uptake	Decreased exposure	Decreased impacts/risks	Social benefits	Economic benefits	Environmental systems	Socioeconomic systems	Institutional systems
Nature-Based Options	0,98	3,15	12,63	0,76	9,40	0,62	0,54	0,08
Built Infrastructure/Structural	0,82	0,89	0,00	0,00	0,00	0,00	10,76	0,00
Technological Options	1,22	0,79	9,47	9,47	10,03	3,13	21,63	1,35
Informational/Educational	134,30	11,56	25,89	45,08	3,18	4,14	36,06	62,76
Institutional/.../Regulations	47,90	30,22	11,68	17,52	1,79	15,43	9,22	115,49
Financial/Market Mechanisms	18,19	0,00	14,66	16,13	18,83	0,00	50,30	0,45
Social/Behavioural	5,73	16,71	2,00	5,95	11,80	2,57	19,30	30,33

Source: Author's own calculations.

Annex 4: Top 20 most vulnerable and least ready countries (2014-2021)

Table A5: Top 20 most vulnerable countries

Rank	Country	Swedish bilateral recipient (2014-2022)	Average Vulnerability (2014-21)
1	Somalia	Yes	0.6805
2	Chad	No	0.6534
3	Guinea-Bissau	No	0.6304
4	Niger	Yes	0.6270
5	Micronesia	No	0.6192
6	Solomon Islands	Yes	0.6168
7	Tonga	No	0.6078
8	Eritrea	No	0.6071
9	Liberia	Yes	0.6043
10	Sudan	Yes	0.6021
11	Mali	Yes	0.6011
12	Afghanistan	Yes	0.5917
13	Central African Republic	No	0.5848
14	Uganda	Yes	0.5822
15	Marshall Islands	No	0.5777
16	Nauru	No	0.5690
17	Congo, DR	Yes	0.5660
18	Vanuatu	No	0.5634
19	Madagascar	Yes	0.5628
20	Mauritania	Yes	0.5606

Note: The average Vulnerability scores were calculated using the Vulnerability scores of countries between 2014 and 2021.
Source: Notre Dame Global Adaptation Initiative.

Table A6: Top 20 least ready countries

Rank	Country	Swedish bilateral recipient (2014-2022)	Average Readiness (2014-21)
1	Central African Republic	No	0.1333
2	Chad	No	0.1828
3	Congo, DR	Yes	0.1965
4	Venezuela	No	0.1996
5	Zimbabwe	Yes	0.2064
6	Eritrea	No	0.2128
7	Congo	No	0.2231
8	Nigeria	Yes	0.2325
9	Haiti	Yes	0.2338
10	Syrian Arab Republic	No	0.2361
11	Turkmenistan	No	0.2370
12	Equatorial Guinea	No	0.2443
13	Angola	No	0.2446
14	Afghanistan	Yes	0.2457
15	Yemen	No	0.2546
16	Sudan	Yes	0.2582
17	Myanmar	Yes	0.2591
18	Cameroon	Yes	0.2595
19	Madagascar	Yes	0.2628
20	Burundi	Yes	0.2654

Note: The average Readiness scores were calculated using the Readiness scores of countries between 2014 and 2021.
Source: Notre Dame Global Adaptation Initiative.

Annex 5: Combined Swedish, German and Green Climate Fund Intervention Heat Map

Table A7: Combined IHM of the Swedish Portfolio (blue), the German Cooperation (pink), and the Green Climate Fund (green)

Intervention Heat Map		Uptake			Shocks and Stressors						Adaptive Capacity						Enabling Environment								
Sector	Outcome type / Intervention type	Adoption			Exposure			Impacts/Risks			Social Benefits			Economic Benefits			Environmental systems			Socioeconomic systems			Institutional systems		
Water	Nature-Based Options				0.97	11.17	24.69		13.78			4.83			2.65			20.41	11.17		0.47		0.08	9.38	
	Built Infrastructure/Structural				0.89	0.11	217.38		32.45	135.45		42.88	77.52		79.5	44.64		7.89				32.79			
	Technological Options		4.82		0.79		5.75		6.87	6.74		3.17							1.42	10.55	0.42	7.83			
	Informational/Educational	23.63	0.01	2.89	2.92		7.04	20.78	5.83	7.95		5.93			4.9	3.29		8.72		20.47	0.42	9.47	11.88	33.36	21.67
	Institutional/…/Regulations*	0.97			5.10			1.75		4.15		19.3		1.79				0.53	0.23	5.10	0.72		16.16	22.81	4.54
	Financial/Market Mechanisms			9.3										2.68	0.47					1.06					
	Social/Behavioural								6.74		0.12		1.73				0.63				2.25	1.53	2.59		
Land-use and Built Environment	Nature-Based Options					12.59	21.64.	4.67	18.68	4.79		4.86			16.28		0.62	56.79	115.41		0.08			5.8	
	Built Infrastructure/Structural					1.27	25.62		2.15	66.36		24.66				2.67			241.96	8.70					
	Technological Options								4.83		9.31					14.99	2.39	1.96	59.07	5.34				0.02	1.51
	Informational/Educational		4.93	3.62	0.22				0.37		42.68	1.26					2.39	1.17			2.07	2.59	9.48	26.28	20.69
	Institutional/…/Regulations*	3.68	7.79	4.96		0.74		6.42		4.99	17.52	0.03			2.17		2.39	34.9	5.74		1.07		14.39	7.27	5.06
	Financial/Market Mechanisms		0.96	6.3				4.67			16.13					28.5		1.98		11.51	0.06				
	Social/Behavioural													11.01							0.22	0.65	10.70	0.04	
Forestry, Fishing and Agriculture	Nature-Based Options	0.16	0.21		0.94	3.65	3.5	7.96	35.71	6.54	0.76	36.53		9.40	89.6	65.91		14.97	33.39		3.86	1.58		2.96	
	Built Infrastructure/Structural									26.4		11.55			5.79	35.03									
	Technological Options		0.11			6.55		9.47		3.12		0.36		8.79	98.49	49.28	0.75			0.69	6.02	1.17	1.35		
	Informational/Educational	58.69	7.77	27.31	0.62			0.23	0.87	2.62	0.15	3.95		3.18	6.57	45.37	1.75	4.24		9.24	1.96	33.43	16.37	10.6	6.16
	Institutional/…/Regulations*				0.62							5.53			0.22	1	3.77			1.38	0.21		23.14	1.35	0.87
	Financial/Market Mechanisms		3.71			2.52		1.35	72.35	7.54				16.15	15.73	77.79				10.70	1.32		0.45		
	Social/Behavioural	1.35				0.73		1.01			0.35	6.63		0.80	3.5	7.77	1.95	3.55		9.17	12.58	2.46	4.88	6.96	

Intervention Heat Map		Uptake			Shocks and Stressors						Adaptive Capacity						Enabling Environment								
Sector	Outcome type / Intervention type	Adoption			Exposure			Impacts/Risks			Social Benefits			Economic Benefits			Environmental systems			Socioeconomic systems			Institutional systems		
Society, Economy and Health	Nature-Based Options	0.82			1.24	12.6						12			1.84			7.38		0.54	13.51				
	Built Infrastructure/Structural	0.82								28.33		0.45								2.06	0.31	5.06			2.35
	Technological Options	1.22	0.25				9.32		4.44	27.79	0.16			1.24	0.04	19.39			1.52	5.04	2.82	17.07		11.51	19.76
	Informational/Educational	51.98	8.98	8.74	7.80			4.87	9.54	30.49	2.26	7.79			0.08	0.61		8.9		6.35	20.47	62.71	25.03	71.64	132.64
	Institutional/…/Regulations*	43.25	4.02		24.50	0.71		3.52	13.3	2.45		19.17			4.82		9.27	8.59		2.75	26.11	16.71	61.80	38.02	1.02
	Financial/Market Mechanisms	18.19		231.95				8.64	305.8			10.34			0.05	12.22				27.03				0.02	
	Social/Behavioural	4.37			16.71	6.42		0.99	15.64		5.48	4.93			2.84	5.93		2.78		10.13	6.54	7.61	12.16	7.88	4.11

Notes: The table displays the funds allocated towards the respective cells of the IHM by three different donors/donor groups: Swedish governmental agencies (2014-2022; blue); the German Cooperation (2010-2017; pink); and the Green Climate Fund (until October 2019; green). The displayed financial data (USD million) is adjusted to inflation based on different reference years. Given the proximity of calculation (2022 in the Swedish, 2017 in the German, and 2019 in the case of the Green Climate Fund), a sufficient similarity in value is assumed, which allows for meaningful comparison. Each cell represents one particular type of CCA measure. *Institutional/Planning/Policy/Laws/Regulations

Sources: Author's own calculations; Doswald et al., 2020.