



EVALUATION OF INTERVENTIONS FOR CLIMATE CHANGE ADAPTATION

*Agriculture, water, environmental protection,
Nationally Determined Contributions and
National Adaptation Plans*

2023



DEval

GERMAN
INSTITUTE FOR
DEVELOPMENT
EVALUATION

This report is part of the modular DEval evaluation of interventions for climate change adaptation. The report aims to assess the effectiveness, impact and sustainability of German development cooperation adaptation interventions. The evaluation examines interventions in the agriculture, water and environmental protection sectors as well as support for Nationally Determined Contributions and National Adaptation Plans. For this purpose, DEval performed a synthesis of project evaluations, a systematic review of international studies, a geospatial impact evaluation and comparative case studies.

The evaluation has shown that German development cooperation partially achieves its adaptation objectives in responding to climate change-related shocks and stressors and in increasing adaptive capacities. In contrast, the objective of enhancing the enabling environment is barely achieved. Across all sectors, nature-based solutions and infrastructure interventions proved to be particularly effective. The evaluation rates the support for Nationally Determined Contributions and National Adaptation Plans as mostly effective.

To increase the effectiveness and impact of the German adaptation portfolio, the evaluation recommends expanding the implementation of nature-based solutions and infrastructure interventions, as well as interventions to directly support Nationally Determined Contributions and National Adaptation Plans, and strengthening an evidence-based adaptation policy.

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IMPRINT

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SUMMARY

Background

Climate change is one of the greatest global challenges in the history of mankind. The consequences of climate change jeopardise the preservation and development of natural and human systems and are already causing high ecological, social and economic costs today. The poorest countries are particularly affected by the negative impacts of climate change. At the same time, there are still opportunities to strengthen sustainability and resilience for both people and the environment. When it comes to dealing with the impacts of climate change, adaptation plays a special role.

German development cooperation (DC) supports developing and emerging countries in adapting to climate change. The adaptation-relevant official development assistance (ODA) from (bilateral and multilateral) budget funds that the Federal Government reported to the Organisation for Economic Co-operation and Development (OECD) for 2020 amounted to around USD 2.15 billion. Between 2011 and 2020, 62 percent of German adaptation financing was implemented in the three major adaptation-relevant sectors of environmental protection (USD 3.4 billion), agriculture (USD 2.5 billion) and water (USD 2 billion).

But to what extent do German adaptation interventions achieve their objectives and make a sustainable contribution to strengthening climate resilience in the partner countries? The present evaluation aims to answer this question with regard to the effectiveness, impact and sustainability of adaptation interventions in the agriculture and water sectors and in coastal protection – an area of the environmental sector. It examines three global objectives of adaptation interventions (see Doswald et al., 2020): “better responses to shocks and stressors”, “increased adaptive capacities” and “enhanced enabling environment”. The evaluation groups the interventions into nature-based solutions, built infrastructure/structural interventions, technological options, informational/educational interventions, institutional/planning/policy/law/regulatory interventions, financial/market mechanisms and social/behavioural interventions. It also aims to assess how effectively German DC provides cross-sectoral support for the Nationally Determined Contributions (NDCs) in conjunction with implementing the Paris Agreement and the processes involved in the National Adaptation Plans (NAPs).

This report forms the second evaluation module in the modular evaluation of German DC adaptation interventions performed by the German Institute for Development Evaluation (DEval). It supplements the findings of the portfolio and allocation analysis (“Evaluation module 1”) by Noltze and Rauschenbach (2019), the evaluation of instruments for managing residual climate risks (“Evaluation module 3”) by Leppert et al. (2021) and the synthesis report on the evaluation by Noltze et al. (2023).

The purpose of the evaluation is to support the future alignment and impact-oriented further development of the German DC adaptation portfolio. The conclusions and recommendations of the evaluation are aimed at the Federal Ministry for Economic Cooperation and Development (BMZ) and the Funding Programme of the International Climate Initiative (IKI), which the Federal Ministry for Economic Affairs and Climate Action (BMWK) has been implementing since 2022 in close cooperation with the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the Federal Foreign Office (AA). They are also aimed at the governmental implementing organisations KfW Development Bank (KfW) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

Methodology

The effectiveness is assessed based on a synthesis of project evaluations of German adaptation interventions and a systematic review of studies and evaluations of international adaptation interventions. The evaluation synthesis provides evidence of the existence and direction of the effectiveness and impact of German interventions. The systematic review adds findings relating to the direction and strength of international evidence. Moreover, to answer the question about the contributions towards strengthening climate resilience, the evaluation draws on a rigorous geospatial impact evaluation of irrigation infrastructure interventions in Mali. It assesses to what extent the interventions contribute towards economic, social and

ecological resilience, help to strengthen the livelihoods of rural communities and mitigate the negative effects of climate change in the long term. Finally, the analysis is supplemented by comparative case studies on cross-sectoral interventions to support NDCs and NAP processes. In the case studies, the evaluation assesses the extent to which objectives are achieved and the contribution of the interventions.

Results, conclusions and recommendations

Effectiveness, impact and sustainability of adaptation interventions in the agriculture and water sectors and in the area of coastal protection

The results of the evaluation synthesis reveal that only 16 percent of German DC adaptation interventions evaluated in the agriculture and water sectors and in the area of coastal protection demonstrate an achievement of objectives. For the vast majority of the interventions, it is therefore not apparent to what extent they 1) are implemented in a climate vulnerability context, 2) have adaptation-related objectives and 3) are designed to deal with climate risks. Overall, only 20 percent of the adaptation commitments in the agriculture, water and environmental protection sectors go to countries with a high to very high climate risk, whereas around 60 percent go to countries with a low to very low risk. The remaining 20 percent of the funding goes to countries with a medium risk. The portfolio and allocation analysis of the evaluation by Noltze and Rauschenbach (2019) also shows that, although Germany tends to allocate adaptation funds to climate-vulnerable countries, the degree of vulnerability has no impact on the level of funding.

However, comparing these results with the results of the systematic review indicates that the achievement of the objectives of German adaptation interventions is underestimated. According to the systematic review, the achievement of objectives can be observed for around 56 percent of international interventions. However, German DC sets different priorities in comparison to international interventions, so the findings are only transferable to a limited extent. German DC concentrates primarily on the objective of enhancing the enabling environment. Accordingly, it focuses mainly on interventions to improve the institutional and regulatory framework conditions. According to the results of the systematic review, this objective plays a much smaller role in international adaptation interventions, which means that there is also less evidence here with regard to the achievement of objectives. Evidence from international studies and evaluations indicates a higher level of achievement only for the following objectives: “better responses to shocks and stressors” in the area of coastal protection and “increased adaptive capacities” in the agriculture and water sectors. Overall, therefore, German DC adaptation interventions partially fulfil the benchmark with regard to achieving the objectives of better responding to shocks and stressors and increasing adaptive capacities. Due to a lack of impact evidence from studies and evaluations, the benchmark regarding the objective of enhancing the enabling environment is subject to a higher degree of uncertainty and is thus rated as barely fulfilled.

Nature-based solutions, infrastructure interventions and informational/educational interventions prove to be particularly effective for achieving the objectives of German DC in better responding to shocks and stressors and increasing adaptive capacities. The German adaptation interventions prove to be less effective overall with regard to the objective of enhancing the enabling environment. The particularly effective area of nature-based solutions constitutes the focus of German DC in the agriculture/water sectors and coastal protection area. In the water sector and in the area of coastal protection, German DC focuses on effective infrastructure interventions. In the water sector, informational and educational interventions also prove to be effective. Overall, this evaluation illustrates that adaptation interventions fulfil their benchmarks for the achievement of objectives if they a) take place in a climate vulnerability context, b) set themselves adaptation-related objectives and c) are based on a theory of change geared towards dealing with climate risks.

Changes in terms of strengthening climate resilience are apparent or foreseeable only in a few cases on the basis of the evaluation synthesis. There is hardly any evidence here that the German interventions have an impact. The systematic review, too, shows that the contributions of interventions decrease from outcomes (interventions’ direct objectives) to impacts (interventions’ contribution to higher-level development changes). The greatest positive impacts are seen in the water and agriculture sectors. In contrast, some

negative impacts are seen at this level in the area of coastal protection, for instance when a resettlement intervention involves negative social changes. Adaptation interventions partially fulfil their benchmarks with regard to contributions towards strengthening climate resilience in the agriculture and water sectors, but barely do so in the area of coastal protection.

The innovative geospatial impact evaluation of irrigation infrastructure interventions in Mali shows that German DC contributions to strengthen climate resilience can be evaluated rigorously and comprehensively. The analysis shows that the irrigation interventions increase agricultural production, thereby improving food security and child health among the target group. Further contributions entail increasing household income and ensuring gender equality. There is additional potential in peacebuilding and ecological impacts. The evaluation shows that the climate vulnerability of the Malian population in the project regions has decreased and therefore their resilience has increased. Moreover, the analysis of effects over time showed that the positive impacts can be preserved over a period of at least ten years. After a certain time, however, unintended effects also arise – such as a displacement of the potential for conflict or a reduction in food security in communities living further away. This specific individual case suggests that irrigation infrastructure interventions by German DC in fragile and climate-vulnerable contexts in the African Sahel region have the potential to fulfil the benchmark for adaptation interventions with regard to contributions to increase climate resilience, to generate positive co-benefits and to avoid maladaptation.

Based on this assessment and taking account of the results of the portfolio and allocation analysis (Noltze and Rauschenbach, 2019) and the evaluation of instruments for managing residual climate risks (Leppert et al., 2021), the modular adaptation evaluation makes the following recommendation in its synthesis report:

“The BMZ and the IKI Funding Programme should expand the funding for nature-based solutions and infrastructure interventions

- *to help deal with shocks and stressors more effectively in particularly climate-vulnerable contexts*
- *and help increase adaptive capacities in countries where this capacity is low.”*

In terms of putting the recommendation into practice, there would be additional impact potential in combining various interventions if they also include informational and educational interventions. Interventions with the objective of enhancing the enabling environment, in particular, could be examined using specific theories of change and indicators to establish their effectiveness and impact. The funding could also be expanded in particular in cooperation with other donors and (multilateral) organisations.

(Noltze et al., 2023, page x).

Effectiveness of adaptation interventions in supporting NDCs and NAP processes

In the context of the comparative case study analyses, it is apparent that the objective of integrating climate adaptation into the national policies of partner countries is largely achieved. The interventions contribute towards the achievement of objectives by providing demand-oriented services. Participatory and cooperative elements increase the ownership of the partner countries. Thanks to its long-standing expertise and support for international initiatives such as the NDC Partnership (NDCP) and the NAP Global Network (NAP GN), German DC is recognised as a relevant cooperation partner and knowledge provider. As a result of changes in the context of the interventions, however, the objectives of German DC are only partially achieved in the form originally planned and are barely achieved within the intended time frames. Accordingly, potential outcomes are delayed or do not arise in the planned form. Adaptation interventions with the objective of directly supporting NDCs and NAP processes mostly fulfil the benchmark of integrating adaptation into the national policies of partner countries.

With a view to the implementation of the Paris Agreement, the Federal Government also sees a great need for action in the partner countries of German DC. The BMZ has set itself the goal of expanding its engagement to support NDCs and NAP processes in the partner countries of German DC. The least developed countries (LDCs) in particular should benefit from support in this area in future. In light of the findings of this evaluation regarding the achievement of objectives and the contributions of German DC, it appears reasonable to extend the existing engagement to support NDCs and NAP processes. At the same time, there has been a lack of instruments of financial cooperation up to now. This evaluation sees potential in policy-based financing with incentive-promoting funding volumes, with a view to strengthening ownership and further increasing ambitions. The evaluation therefore gives rise to the following recommendations:

Recommendation 1: The BMZ should review the use of policy-based financing to promote NDCs and NAP processes and – taking account of the results of the review – make greater use of it in order to

- achieve the objective of expanding direct support for NDCs and NAP processes
- and contribute to increasing ambitions in the partner countries in the context of the Paris Agreement.

In terms of putting “recommendation 1” into practice, the BMZ could take up G7 discussions of policy-based financing by incorporating the discussion results into the internal decision-making process regarding direct support for NDCs and NAP processes. In conjunction with designing the instrument to meet needs and accommodate specific contexts, the BMZ could draw on recent experience with the reform financing instrument, as a form of policy-based financing, and further expand such financing forms – in line with the aspiration of the BMZ’s Africa strategy. In addition, the BMZ could look into the possibility of strategically promoting policy-based financing – in connection with technical support and knowledge management – via the NDCP and NAP GN.

Recommendation 2: The BMZ should increase the financing for bilateral interventions in LDCs and incorporate the bilateral partner countries into the exchange of knowledge and experience of the global NDCP and NAP GN initiatives in order to

- achieve the objective of expanding direct support for NDCs and NAP processes
- and thus promote comprehensive interventions to deal with climate risks.

In terms of putting “recommendation 2” into practice, the BMZ could work in cooperation with the IKI Funding Programme to address the needs of LDC partner countries that go beyond support from global initiatives, sector programmes and global projects, and review the options regarding bilateral interventions. Considering the shared departmental responsibility of the IKI (BMWK, BMUV and AA), the BMZ could advocate interdepartmental exchange and promote joint management of the interdepartmental portfolio to support NDC and NAP processes in LDCs.

Strengthening the evidence-based programming of the adaptation portfolio

The evaluation synthesis has examined evaluations of German adaptation interventions. As a result of inadequate references to climate adaptation, the learning and accountability function of the project evaluations proves to be limited. Although 30 to 50 percent of all completed GIZ and KfW interventions are evaluated five years after the end of the project at the latest, there is currently only sporadic evidence of the effectiveness of German adaptation interventions. Compared with the share of adaptation interventions, which account for around 17 percent of all German DC interventions (2011–2019), the share of related evaluations seems to be too low (less than ten percent of all GIZ and KfW project evaluations). By drawing on international evidence, this evaluation could partly close this gap. However, it was not completely possible as a result of the particular priority areas of German DC, for instance with regard to the objective of enhancing the enabling environment.

Based on this assessment and taking account of the results of the portfolio and allocation analysis (Noltze and Rauschenbach, 2019) and the evaluation of instruments for managing residual climate risks (Leppert et al., 2021), the modular adaptation evaluation makes the following recommendation in its synthesis report:

The BMZ and the IKI Funding Programme should strengthen the evidence-based programming of the adaptation portfolio

- *in order to make the German adaptation portfolio more effective*
- *and thus contribute to strengthening climate resilience in the partner countries.*

In terms of putting the recommendation into practice, the BMZ and the IKI Funding Programme could compel the implementing organisations to make adaptation interventions easier to evaluate and increase the quality of evaluation – by systematically including the vulnerability context and using adaptation-related theories of change, objectives and indicators. The evaluations of the implementing organisations could also address unintended effects and the risk of maladaptation better than they have done up to now. To supplement evidence from project evaluations, rigorous (accompanying) evaluations could be promoted, especially in “evidence-scarce” areas of the portfolio. Together with the implementing organisations, the BMZ and the IKI Funding Programme could improve the framework conditions for systematic learning – also through cross-sectional analyses.”

(Noltze et al., 2023, page ix)

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ABBREVIATIONS AND ACRONYMS

AA	Federal Foreign Office
BMUV	German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection
BMWK	German Federal Ministry for Economic Affairs and Climate Action
BMZ	German Federal Ministry for Economic Cooperation and Development
COP	Conference of the Parties
CRS	Creditor Reporting System
EGM	Evidence Gap Map
DC	Development cooperation
EU	European Union
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IHM	Intervention Heat Map
IKI	International Climate Initiative
IPCC	Intergovernmental Panel on Climate Change
KfW	KfW Development Bank
CLA	Rio marker for climate change adaptation
LDCs	Least developed countries
LICs	Low income countries
LMICs	Lower middle income countries
MADCTs	More advanced developing countries and territories
NAP GN	NAP Global Network
NAPs	National Adaptation Plans
NDCP	NDC Partnership
NDCs	Nationally Determined Contributions
NDVI	Normalised Difference Vegetation Index
NDWI	Normalised Difference Water Index
ODA	Official development assistance
OECD	Organisation for Economic Co-operation and Development
OECD DAC	OECD Development Assistance Committee
SDGs	Sustainable Development Goals
UMICs	Upper middle income countries and territories
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar

1. INTRODUCTION

1.1 Background

Climate change poses one of the greatest global challenges for the preservation and development of natural and human systems (IPCC, 2021, 2022). Already today, climate risks are jeopardising the achievement of the universal Sustainable Development Goals (SDGs) in the 2030 Agenda (UN, 2015). They arise from climate-related hazards and from the exposure of human and natural systems and their vulnerability towards the consequences of climate change (IPCC, 2014). To avert uncontrollable consequences of climate change and make use of new development opportunities, the international community has agreed to implement the Paris Agreement in response to climate risks (UNFCCC, 2015). The goal of the agreement is to limit global warming to 1.5 degrees Celsius in comparison to the pre-industrial age and adapt to climate change.

The countries of the Global South are particularly affected by climate change. The increased risk is due to not only the great climate-related hazards, but also the exposure and vulnerability of the environmental, economic and social systems in developing and emerging countries (IPCC, 2022). In view of the effects that climate change is already having, not only the global efforts to decrease greenhouse gas emissions, but also the issue of climate adaptation in the countries of the Global South is extremely important.

Climate adaptation comprises all processes of adjustment to actual or expected climate and its effects (IPCC, 2018). The aim is to deal with existing and future risks, in particular to moderate or avoid harm and exploit beneficial opportunities (IPCC, 2018). Climate change adaptation interventions should contribute towards reducing exposure and vulnerability, and thereby to reducing the climate risk and mitigating damage (IPCC, 2014).

The German Federal Government supports developing and emerging countries in adapting to climate change and, in this context, also helps them achieve the necessary social, economic and environmental transformation to implement the Paris Agreement and the 2030 Agenda (BMZ, 2021). One way in which this is achieved is by strengthening climate resilience and increasing adaptive capacities. Germany is thus making climate policy objectives the main focus of development policy. The international climate policy engagement (climate change mitigation and adaptation) aims to contribute towards promoting, achieving and ensuring development successes in other areas such as nutrition, health or poverty reduction.

The relevance of adaptation objectives for development policy is underpinned by corresponding funds. Based on the figures that the Federal Government has reported to the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD), Germany committed over USD 17.5 billion for climate adaptation-relevant official development assistance (ODA) between 2011 and 2020. Together with the commitments for reducing greenhouse gas emissions, the Federal Government's climate-relevant official development assistance amounts to USD 45.4 billion (2011–2020) and thus to around one quarter of all ODA. The average annual budget funds for bilateral and multilateral adaptation interventions more than doubled from the period of 2011–2013 (USD 816 million) to the period of 2017–2019 (USD 1.8 billion), amounting to USD 2.15 billion in 2020. In the period from 2011 to 2020, 62 percent of these funds were implemented in the sectors¹ of environmental protection (USD 3.4 billion), agriculture (USD 2.5 billion) and water (USD 2 billion). That makes Germany a leading international donor of adaptation financing.

Considering the enormous challenges resulting from climate change, the increasing relevance of adaptation interventions in development policy calls for an impact-oriented further development of the portfolio. At the same time, many of the fairly recent adaptation interventions have not been tested thoroughly in practice. There is great uncertainty internationally with regard to their effectiveness and impact (Berrang-Ford et al., 2021). The German DC adaptation portfolio was not evaluated comprehensively before the beginning of this evaluation either (Noltze and Rauschenbach, 2019). Although the number of studies and evaluations on

¹ The sectoral analysis uses the OECD classification system. In the context of reporting to the OECD DAC, all interventions are classified sectorally based on a five-character purpose code. Cross-sectoral activities receive either a cross-sectoral code or the sector code for the largest component of an intervention.

adaptation interventions is increasing on an international scale, knowledge is initially concentrated on individual sectors and interventions. For example, an “Evidence Gap Map” commissioned by DEval and the Green Climate Fund finds a concentration of scientific evidence of the effectiveness and impact of adaptation interventions in the sector of agriculture and for the intervention type of nature-based solutions. However, there is much less evidence in the water sector and for interventions related to dealing with increased exposure to climate-related hazards (Doswald et al., 2020). Likewise, a broad study conducted by Berrang-Ford et al. (2021) confirms the international fragmentation of adaptation knowledge and pinpoints gaps in evidence with regard to the contributions of adaptation interventions towards strengthening climate resilience.

This uneven distribution of knowledge regarding the individual sectors and interventions hinders the evidence-based programming of adaptation interventions. For example, Doswald et al. (2020) and Noltze and Rauschenbach (2019) show that a large number of German DC adaptation interventions are implemented in evidence-scarce areas of the international adaptation portfolio. This also includes German DC priority areas such as increased adaptive capacities or an enhanced enabling environment. This is also due to an evaluation gap at the level of project evaluations. As the interventions are often fairly new and not really “ready” for evaluation yet, only around ten percent of all German adaptation interventions have been evaluated up to now. This is especially true of interventions to directly support relevant instruments of the United Nations Framework Convention on Climate Change (UNFCCC) such as promoting the Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs). In addition, at the time of this evaluation, German DC had no instrument for evaluating DC programmes² (Amine et al., 2021), which makes it even harder to close the evidence gap. German DC is internationally visible thanks to its promotion of global initiatives such as the NDC Partnership (NDCP) and the NAP Global Network (NAP GN). Up to the time of this evaluation, however, it had no systematic method of assessing the success of its increasing engagement.

1.2 Objective and purpose

This evaluation aims to assess the effectiveness, impact and sustainability of German DC adaptation interventions. This objective is derived from the growing relevance of adaptation interventions in German development policy, the increasing engagement of German DC in a large number of partner countries and a substantial evaluation gap with regard to the effectiveness and impact of adaptation interventions, which are often fairly new.

The purpose of the evaluation is to support the future alignment and impact-oriented further development of the German DC adaptation portfolio. The conclusions and recommendations of the evaluation are aimed at the Federal Ministry for Economic Cooperation and Development (BMZ) and the Funding Programme of the International Climate Initiative (IKI), which the Federal Ministry for Economic Affairs and Climate Action (BMWK) has been implementing since 2022 in close cooperation with the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the Federal Foreign Office (AA). They are also aimed at the governmental implementing organisations KfW Development Bank (KfW) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

² German bilateral development cooperation is steered using a three-pronged approach of country strategy, DC programmes and modules. DC programmes should pool the modules of implementing organisations and form the key steering level for cooperation within a priority area.

1.3 Subject

The subject of the evaluation is the international climate policy interventions of the Federal Government to adapt to climate change. This comprises all adaptation-relevant ODA interventions with a “Rio marker for climate change adaptation” (CLA), including principal (CLA-2) and significant objectives (CLA-1). As the Rio marker was added to the OECD DAC Creditor Reporting System (CRS) in 2010, the period for the evaluation starts with the year 2011.

The evaluation concentrates on the three major adaptation-relevant sectors of environmental protection, agriculture and water as well as on cross-sectoral adaptation interventions to support NDCs and NAP processes through German DC. Due to a particular information requirement of the ministries responsible, the thematic focus in the environmental sector is on the area of “coastal protection”: In addition to the IKI Funding Programme, the BMZ has for several years also been engaged in the area of adaptation-relevant coastal protection interventions and is looking into strategically expanding this engagement through the increased implementation of nature-based solutions. The evaluation places an emphasis on bilateral cooperation, via which more than 60 percent of all adaptation funds were implemented at the time of the evaluation (OECD-DAC, 2022).

1.4 Evaluation questions

This report addresses three evaluation questions and operationalises them through relevant evaluation dimensions based on the BMZ guidelines (BMZ, 2020) for dealing with the international evaluation criteria of the OECD DAC (OECD-DAC, 2019). Based on the information requirement, the report assesses the effectiveness, the impact and the sustainability of German DC adaptation interventions. The procedure of the assessment and the rating scale are presented in Section 8.1 of the Annex.

Evaluation question 1: To what extent are German DC interventions for climate change adaptation effective?

Evaluation dimensions along the evaluation criterion of effectiveness: 1) achievement of the objectives, 2) contribution of the interventions to the achievement of objectives and 3) examination of possible unintended effects.

Evaluation question 2: To what extent are German DC interventions for climate change adaptation impactful?

Evaluation dimensions along the evaluation criterion of impact: 1) extent to which (intended) higher-level development changes can be detected or foreseen, 2) contribution of the intervention to detectable or foreseeable development changes and 3) examination of possible unintended development changes.

Evaluation question 3: To what extent are German DC interventions for climate change adaptation sustainable?

Evaluation dimensions along the evaluation criterion of sustainability: 1) capacities of those involved and affected to preserve positive outcomes and impacts over time, 2) contribution of the interventions to support the sustainable capacities and 3) extent to which the sustainability of outcomes and impacts over time can be detected or foreseen.

The portfolio and allocation analysis of the evaluation by Noltze and Rauschenbach (2019) supplements this assessment of success, adding the evaluation criteria of relevance and coherence. The evaluation module on managing residual climate risks by Leppert et al. (2021) provides further findings with regard to the relevance, effectiveness and impact of the portfolio. The final assessment can be found in the synthesis report of the modular adaptation evaluation (see Noltze et al., 2023).

1.5 Structure of the report

The report is structured as follows: Following the introduction (Section 1), Section 2 describes the evaluation's conceptual framework. Section 3 then presents the methodology. Section 4 contains the results of the portfolio analysis. Section 5 contains the findings regarding the effectiveness of the adaptation interventions (Section 5.1), their impact (Section 5.2) and their sustainability (Section 5.3). The findings section ends with a summary of the findings regarding effectiveness, impact and sustainability, broken down by the agriculture/water sectors and coastal protection area (Section 5.4). The conclusions and recommendations of the evaluation can be found in Section 6. The Annex (Section 8) contains the rating scale, the evaluation matrix, further tables and illustrations, and the schedule. It also presents the evaluation team and others involved in the evaluation.

2. CONCEPTUAL FRAMEWORK

In order to answer the evaluation questions at the overarching strategic level, it is necessary to conceptualise types of adaptation interventions and relevant adaptation-related objectives in a way that is internationally compatible. In line with Doswald et al. (2020), Noltze and Rauschenbach (2019), Leppert et al. (2021) and Noltze et al. (2023), the evaluation uses the typology of Biagini et al. (2014), distinguishing between seven types of adaptation interventions (see Table 1).

Table 1 Types of adaptation interventions

Type	Definition	Examples of interventions
Nature-based solutions	Activities that make use of ecosystems and biodiversity as well as sustainable management, conservation and restoration of ecosystems. ³	Restoration of forests, wetlands and mangroves, conservation agriculture, agroforestry, sustainable forestry, restoration of rivers, forestation of water catchment areas, protective planting of vegetation on mountainsides
Infrastructure interventions	Activities with structural components	Dams, dykes, irrigation and drainage systems, wells, sea walls
Technological options	Technological activities	Drought-tolerant seeds, irrigation technologies, fertilisers, desalination technologies
Informational/ educational interventions	Informational and educational activities	Training courses, capacity development, flood information
Institutional and regulatory framework	Activities to support laws, plans, standards and other regulatory interventions	Politics, regulations, laws, zoning, land use plans, improved transparency, involvement, combating corruption
Financial and market mechanisms	Financial transactions and market-driven activities	Climate risk insurance, loans, subsidies
Social/behavioural interventions	Activities relating to social security, social change and changed behaviour	Diversification of livelihoods, migration

Source: Doswald et al., 2020

In addition, in line with the Intergovernmental Panel on Climate Change (IPCC, 2014, 2018), the evaluation distinguishes between three fundamental objectives (at the outcome level) and further subcategories (see Table 2, see also Doswald et al., 2020; Leppert et al., 2021; Noltze et al., 2023; Noltze and Rauschenbach, 2019). The achievement of these objectives forms the basis for assessing effectiveness (evaluation question 1). This assessment takes account of the contributions of the different types of adaptation interventions.

³ The definitions used are those in Doswald et al. (2020). Some more detailed definitions have been presented since this publication, for example concerning nature-based solutions in the United Nations Environment Programme: “Nature-based solutions are actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits” (UNEP, 2022). This more detailed definition contains additional aspects such as the types of ecosystems and the direct, higher-level objectives. However, its concept is compatible with that of the shorter definition from Doswald et al. (2020).

Table 2 Objectives of adaptation interventions

Objectives	Subcategory	Definition
Better responses to shocks and stressors	Reduced exposure Reduced risk	Objectives relating to the ability of target groups to respond to shocks and stressors while reducing permanent negative effects on long-term livelihoods
Increased adaptive capacities	Social benefits Economic benefits	Objectives relating to the ability of target groups to deal with alternative lifestyles in an informed and proactive way, conscious of changing conditions
Enhanced enabling environment	Environmental systems Socio-economic systems Institutional systems	Systematic changes in environmental, socio-economic and institutional systems to strengthen resilience

Source: Doswald et al., 2020

According to the theory of change in this evaluation, the objectives of adaptation interventions (outcome level) – better responding to shocks and stressors, increasing adaptive capacities, enhancing the enabling environment – contribute towards strengthening climate resilience (impact level). Climate resilience refers to the ability of human and natural systems to learn, adapt and change in response to risks that are caused or intensified as a result of climatic fluctuations and changes (IPCC, 2022).

Climate risks are a function of the interactions between environmental hazards caused by climatic fluctuations and climate change, the exposure of human and natural systems to these hazards and the vulnerability of the systems (IPCC, 2022). Climate resilience is part of the broader concept of resilience. For example, climate-resilient societies are also more resistant to other types of risks such as economic risks or health risks (OECD, 2021). The definition of climate resilience as per the IPCC lays the foundation for assessing the impact (evaluation question 2) and sustainability (evaluation question 3) of the German adaptation portfolio.

3. METHODOLOGY

3.1 Evaluation design

The focus of interest of the evaluation is on causal questions relating to the effectiveness and impact of German DC adaptation interventions. Taking the evaluation questions as a basis and considering the characteristics of the evaluation subject, the evaluation uses a combination of statistical and theory-based evaluation procedures (see Stern, 2015). To answer the evaluation questions regarding the effectiveness (evaluation question 1) and impact (evaluation question 2) of adaptation interventions, it uses a synthesis of German DC project evaluations (see Section 3.3) and a systematic review of international evaluations and studies (see Section 3.4). The assessment of effectiveness (evaluation question 1) is supplemented by comparative case studies on the promotion of NDCs and NAP processes by German DC (see Section 3.5), while the impact assessment (evaluation question 2) is supplemented by a geospatial impact evaluation of irrigation infrastructure interventions in Mali (see Section 3.6). Finally, the evaluation addresses the assessment of the sustainability (evaluation question 3) of adaptation interventions. The theory-based analysis of sustainability revolves around the examination of the capacity to preserve adaptation outcomes and impacts over time. The development policy classification of the findings is supported by a portfolio analysis (see Section 3.2).

The design of this evaluation is part of a method-integrated evaluation design of the modular adaptation evaluation. The evaluation as a whole uses various methodical components – sequential and parallel, cross-case and within-case, qualitative and quantitative (see the synthesis report of the modular evaluation by Noltze et al., 2023).

3.2 Portfolio analysis

The portfolio analysis is a macro-quantitative analysis of the Federal Government's reporting to the OECD regarding German climate-relevant or adaptation-relevant ODA (see also Noltze and Rauschenbach, 2019). The OECD CRS data includes not only Germany's contractually agreed commitments to individual partner countries (bilateral DC), but also earmarked contributions to individual countries via multilateral organisations (multi-bilateral DC, also referred to in the evaluation as bilateral in accordance with the OECD) and core contributions to multilateral organisations (multilateral DC).

Supplementing the portfolio analyses by Noltze and Rauschenbach (2019), Leppert et al. (2021) and Noltze et al. (2023), this portfolio analysis focuses on the distribution of adaptation financing by sectors and types of adaptation interventions. As described in Section 1.3 on the evaluation subject, the evaluation considers adaptation interventions to be interventions that have climate adaptation (CLA) as their principal objective (CLA-2) or significant objective (CLA-1). The analysis for CLA-1 markers is based on discounted funds (see Betzold and Weiler, 2018). It counts funds for CLA-2 (principal objective) completely and funds for CLA-1 (significant objective) at 50 percent and combines them in a single variable.

When it comes to calculating the climate-/adaptation-relevant ODA, grant equivalents of KfW development loans have been included in the analysis since the 2017 reporting year (OECD DAC, 2021). Grant equivalents indicate the degree of concessionality of the development loans in relation to the market conditions. They are calculated using the respective grant element (percentage that specifies the concessionality of the loan), the amount of the market funds and the Rio markers of the respective projects.

In addition to reporting climate-relevant/adaptation-relevant ODA, the Federal Government also reports its international climate financing to the UNFCCC and the European Union (EU). The UNFCCC and EU reporting entails political commitments that have usually not been formalised through contracts and also have systematic differences for different donors (Roberts and Weikmans, 2017). As a result of the different reporting cycles, the reporting to the UNFCCC goes up to the year 2018, while that to the EU goes up to 2019.

3.3 Evaluation synthesis

The evaluation synthesis constitutes a systematic procedure for aggregating evidence from evaluations (Noltze et al., 2018a; Orth et al., 2017). The synthesis aims to demonstrate the occurrence of outcomes and impacts and their direction. Based on its conceptual framework, this evaluation performs a structured analysis of the population of all project evaluations available at the time of evaluation regarding the adaptation interventions of the two implementing organisations (GIZ and KfW) in the agriculture/water sectors and coastal protection area.

The data comes from 79 project evaluations of a total of 118 adaptation interventions in the period from 2011 to 2020, of which 52 were in the agricultural sector, 54 in the water sector and 12 in the area of coastal protection. The BMZ funded 74 projects, while the IKI funded an additional five. GIZ performed and evaluated 90 percent of the interventions, KfW 10 percent.⁴ In addition to bilateral interventions and regional projects, the data basis also includes sector programmes and global projects. In total, 27 percent of the evaluated interventions feature climate adaptation as a principal objective (CLA-2) and 73 percent as a significant objective (CLA-1). The evaluations are theory-based qualitative procedures that aim to verify the plausibility of causal relationships based on the theory of change of the interventions. The interventions in the 79 project evaluations considered were completed between 2012 and 2019.

The coding of the evaluation reports follows the qualitative content analysis as per Mayring (2010, 2014) and a procedure for determining the intercoder reliability as per Creswell (2012). As the interventions and target systems differ substantially from one sector to another in some cases, an individual with corresponding sector expertise was responsible for the coding in each case in the main analysis.

3.4 Systematic review

For this evaluation, DEval performed a systematic review summarising the information regarding the effectiveness of adaptation interventions (direction and magnitude of impact) in international literature in a structured form (Higgins and Thomas, 2020; White and Waddington, 2012). Like the evaluation synthesis, the systematic review also follows the conceptual framework presented in Section 2.

The data used for the systematic review comes from the Evidence Gap Map (EGM) by Doswald et al. (2020) covering over 463 systematically collected academic studies and grey literature on the effectiveness and impact of adaptation interventions in low- and middle-income countries, published between 2007 and 2018. Along various inclusion and exclusion criteria, the EGM is based on an original population of 13,121 studies. From the EGM data, this evaluation obtains the subset of a total of 118 studies on adaptation interventions in the agriculture and water sectors and in the area of coastal protection (see Figure 1 and Table 3 in the Annex). The data primarily entails quasi-experimental procedures and multivariate analyses. There are also several field experiments. As shown in the PRISMA flowchart⁵ (see Figure 1), 84 studies were used in the agricultural sector, 15 in the water sector and 19 in the area of coastal protection. The data basis in the agricultural sector additionally includes 11 review studies (primarily in the areas of nature-based solutions and technological options) and 73 primary studies (in the other five intervention types). For the review studies on nature-based solutions and technological options in the agricultural sector, the evaluation team performed a review of reviews – based on the assumption that review studies provide a robust data basis. Primary studies with interventions in the two areas named were therefore excluded for the agriculture sector. Thus, a distinction is made again in the agricultural sector between a review of reviews and a review of the primary studies.

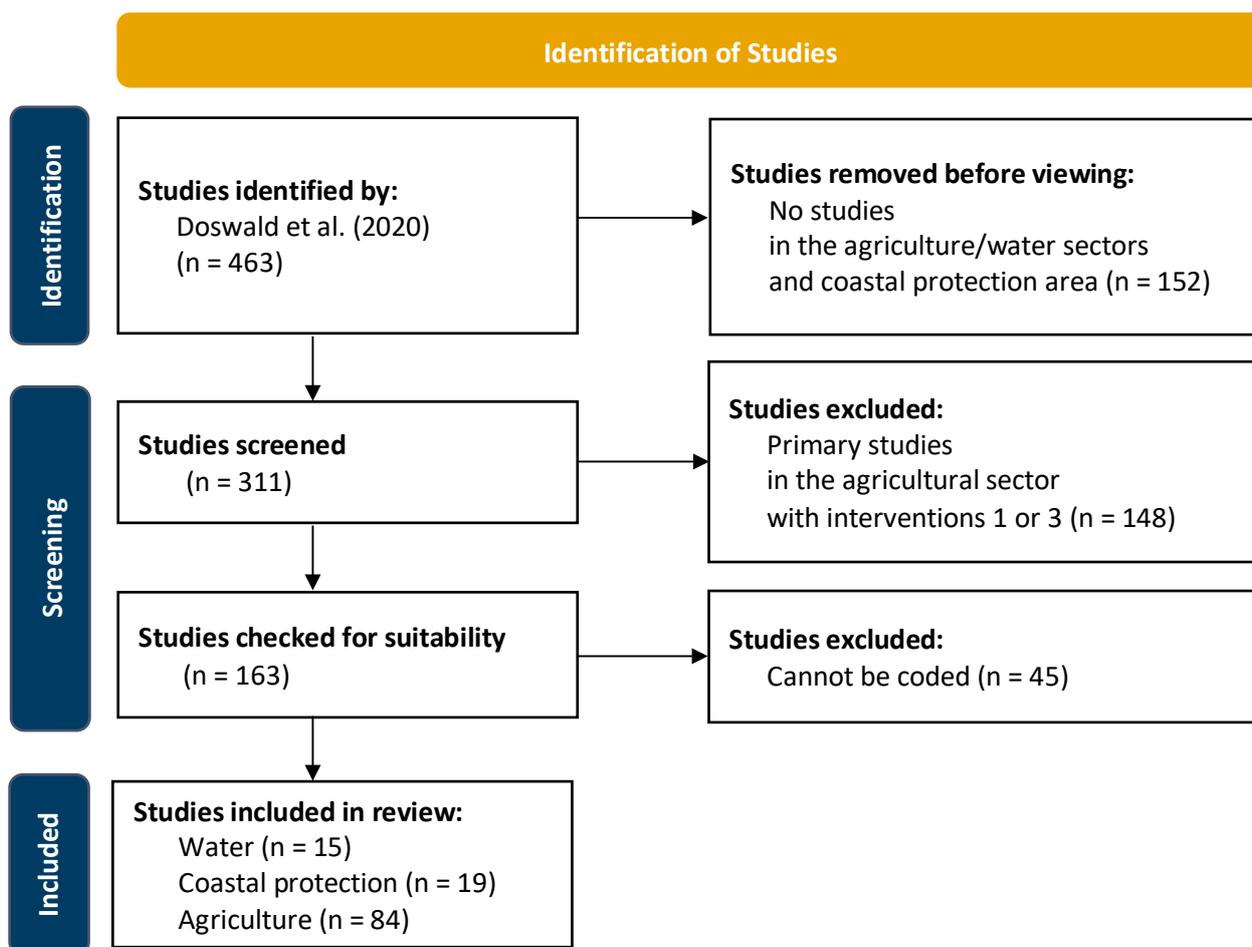
⁴ The low share of evaluated KfW interventions is due to KfW's ex-post evaluation format, which is only applied three to five years after the projects are completed. Many of the adaptation interventions that have begun recently have not yet reached the status of "ready for evaluation".

⁵ PRISMA = Preferred Reporting Items for Systematic Reviews and Meta Analyses. The PRISMA flowchart presents the flow of information through the different phases of a systematic review. It shows the quantity of identified, included and excluded data, and the reasons for exclusions.

In the analysis, this evaluation considers the results of the statistical analyses (for example by comparing average values, medians, proportions and the like between intervention and control groups or performing before/after comparisons) and the causal conclusions of the study authors (see Lipsey and Wilson, 2001). The aggregated analysis of the magnitude of impact is performed categorically by using the specified threshold values.⁶

A detailed description of the system used to collect the data basis can be found in Doswald et al. (2020). The methodical procedure for determining the direction and magnitude of impact is presented in Villamayor-Tomas et al. (forthcoming). An overview of the studies included per sector can be found in the Annex.

Figure 1 PRISMA flowchart of the systematic review



Source: DEval, own visualisation

As part of the analysis, DEval compared the aggregated effect findings of the systematic review with the German adaptation portfolio. This comparison is presented using an “Intervention Heat Map” (IHM), shown in Doswald et al. (2020). The IHM is a graphical illustration of the frequencies of adaptation interventions with regard to their objectives. In conjunction with the EGM, high-evidence and evidence-scarce areas of the portfolio can additionally be highlighted visually using different colours (usually red, green and yellow; see also Doswald et al., 2020). In this way, the IHM makes it possible to incorporate the German adaptation portfolio into the evaluation’s conceptual framework. Moreover, it allows an extended comparison with the

⁶ Several studies do not specify threshold values, but instead point to positive or negative effects. In these cases, the evaluation assumes a small to medium magnitude of impact. Observations where the metric value is very small (beta regression coefficients <0.1; mean value differences, average effects and percentage changes <5%) form an exception to this rule.

direction and magnitude of impact determined in the systematic review through visual interpretation (green = significantly positive impact, yellow = insignificant impact, red = significantly negative impact, grey = no international evidence available).

3.5 Comparative case studies

The effectiveness of the support for NDCs and NAP processes by German DC adaptation interventions was evaluated as part of a comparative case study analysis. A contribution analysis was used for this (Stern, 2015). The contribution analysis performs a sequence of steps to develop and test a theory. The first step involves developing a cross-intervention theory of change (“theory building”). The data comes from the project reporting on the population of all interventions that have been implemented up to now (N=28, see Table 4 in the Annex)⁷ to directly support NDCs and NAP processes of German DC. Based on the theory of change, the evaluation assesses the extent to which objectives are achieved, the contribution of the interventions towards achieving objectives and further influencing factors (“theory testing”) in the context of in-depth case studies. In determining causality, the evaluation follows the causality concept of plausible association. It then compares and aggregates the results from the individual in-depth case studies.

Altogether, twelve projects in six case study countries were evaluated in conjunction with the in-depth studies. For three countries (Vietnam, Jordan and Colombia), the focus was on supporting NDCs. For three other countries (Tanzania, Benin and Thailand), it was on supporting NAP processes. The country case studies are the result of a systematic case selection. A comparably extensive German DC engagement in promoting the respective processes, a term of at least two years at the time of data collection and regional diversity between the country cases were taken as selection criteria. Moreover, the selection included two of the least developed countries (LDCs), namely Benin and Tanzania. The data basis used for the case analyses comprised not only the project documentation, but also 22 interviews with 43 representatives of the commissioning ministries, the commissioning/implementing parties and their development partners.

3.6 Geospatial impact evaluation

The aggregated analyses of evaluatory-scientific evidence as part of the evaluation synthesis and the systematic review make it possible to develop higher-level conclusions regarding the effectiveness and impact of the German adaptation portfolio. This ensures a high degree of external validity. However, the comparably rigorous procedures of the studies in the systematic review lack direct connections to German DC. In contrast, the project evaluations of the evaluation synthesis are not sufficiently rigorous (see the limitations in Section 3.7). To assess effectiveness and impact, therefore, DEval drew on a further in-depth case study that also investigated the mechanisms for increasing the climate resilience of societies.

This supplementary case study examined the impact of infrastructure interventions on climate resilience in the nexus of the water and agriculture sectors in a region particularly threatened by climate change. This was intended to close an existing evaluation gap. In the systematic case selection, irrigation infrastructure interventions of German DC in Mali’s Sahel region were chosen – a “typical case” of German adaptation interventions.⁸ In addition to being considered particularly climate-vulnerable, the region is also characterised by multiple vulnerabilities as a result of conflicts, some of which have been prevalent for many years.

⁷ To establish the population, DEval began by asking KfW and GIZ to name all adaptation interventions (CLA-2 and -1) for supporting NDCs and NAP processes. Interventions relate to NDCs and NAP processes if they support the preparation and development of strategies and policies for adaptation or if they support framework conditions for implementing, financing or monitoring strategies and policies. The list of all interventions named (50 interventions) was further restricted by means of a qualitative examination of the brief descriptions regarding the objectives, activities and services of the interventions. Following reflection with those involved in the evaluation, the final population amounted to N=28.

⁸ The irrigation projects examined are in the nexus of the “water” and “agriculture” sectors. These are the sectors – alongside “environmental protection” – that receive the most adaptation-relevant German DC funds. Another typical feature of the interventions is that they are infrastructure interventions – a frequent type of German adaptation intervention (see Doswald et al., 2020).

Based on the context of conflict and the additional restrictions resulting from the ongoing COVID-19 pandemic, and also in view of the technological progress in using remote sensing information, a geospatial impact evaluation was used (BenYishay et al., 2021; Bingham, 2018). In areas affected by conflict, in particular, using geographical data can be an objective and cost-effective addition or even alternative to collecting data locally (Nawrotzki, 2019). However, many of the evaluations that incorporate geographical information still tend to be restricted to measuring simple result indicators, such as the increase in agricultural production, and are not suitable for assessing more complex concepts such as climate resilience (BenYishay et al., 2023). On top of this, there are further challenges involved in evaluating the impact of interventions to strengthen climate resilience. This includes the assignment of complex cause-effect correlations, shifting baselines and the consideration of long time periods required for outcomes and impacts to unfold (Noltze et al, 2021).

This geospatial impact evaluation is a difference-in-differences analysis with fixed effects and a visual interpretation of high-resolution areal views. The analysis used both panel data and repeated cross-sectional data. The data basis comprised geocoded project locations, remote sensing data, geocoded survey data and focus group discussions. In both cases, the intervention and control groups come from the areas themselves or are formed by individuals who live in the areas around the project locations. The control group consists of observations of the areas prior to the implementation of the infrastructure intervention, while the intervention group consists of observations of these areas following the completion of the intervention. By introducing the interventions in stages and observing them repeatedly over a period of 20 years, the evaluation was able to compare the results before and after the irrigation of the sites and check for confounding factors. With a view to the multidimensional concept of climate resilience, the evaluation measured the impact of the interventions on food security, income, child health, the decision-making power of women, social cohesion (based on the risk and intensity of conflict) and environmental impacts.

A detailed description of the methodical procedure and the detailed technical results can be found in the accompanying DEval Discussion Paper by BenYishay et al. (2023).

3.7 Limitations

Despite relatively large sampling plans for all projects from the two implementing organisations⁹ to be evaluated each year, GIZ and KfW had only evaluated a small share of the German adaptation portfolio (79 evaluation reports) at the time of this evaluation. Compared with the share of adaptation interventions, which account for around 17 percent of the entire DC portfolio (2011–2019), the share of evaluated adaptation interventions amounting to less than 10 percent of all project evaluations (GIZ and KfW) seems to be too low. This limitation applies in particular to the area of financial cooperation. As KfW performs ex-post evaluations, only around 8 percent of all adaptation interventions have been evaluated to date. To make this evaluation more representative with regard to analysing the achievement of objectives, further data from the IHM has been added to the evaluation synthesis of project evaluations (see Section 3.4). The great statistical heterogeneity and small number of studies per sector in the systemic review leads to a statistical aggregation of the magnitudes of impact, thus limiting their informative value. The evaluation therefore applied an alternative valid synthesis method, namely a frequency analysis of the directions of impact (Higgins and Thomas, 2020): Thanks to the large agreement in terms of the distribution of types of adaptation interventions and the respective objectives between the interventions evaluated, combined with the broader portfolio on the basis of the IHM, the results of the evaluation synthesis can be assumed to have an appropriate degree of external validity with regard to the German adaptation portfolio. The evaluation synthesis involves further limitations with regard to the methodical quality of the project evaluations (see

⁹ As part of its central project evaluation programme, GIZ takes an annual sample of around 30 to 50 percent of all interventions ready for evaluation by regions. All interventions that are completed in the year the sample is established are considered ready for evaluation. Final evaluations are used here. As part of its ex-post evaluation programme, KfW takes an annual sample of at least 50 percent of all interventions ready for evaluation by sectors. All interventions that were completed three to five years before the sample is established are considered ready for evaluation. In the case of KfW, the evaluations involve ex-post evaluations.

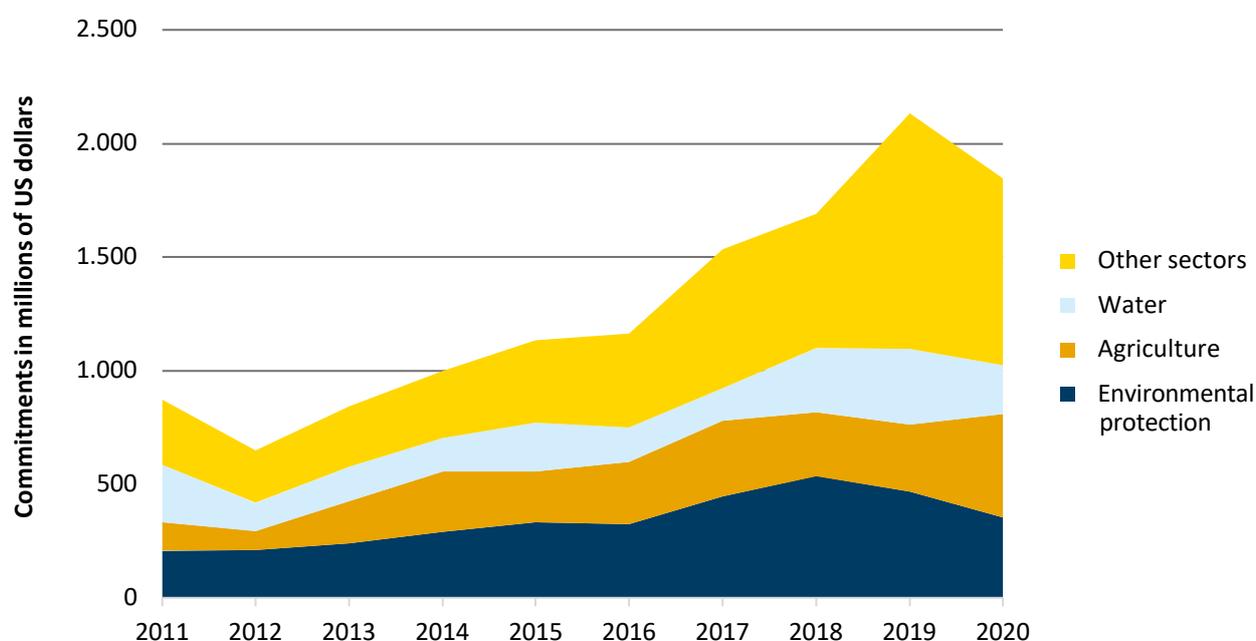
Noltze et al., 2018b), and the lower level of direct adaptation connections compared to the data basis for the systematic review. The latter is primarily due to the high share of interventions with adaptation as a significant objective (CLA-1). In this case, adaptation-specific activities and objectives are less important and therefore also play a smaller role in the evaluations. The evaluation deals with these limitations by integrating the scientific-evaluatory knowledge from the evaluation synthesis and systematic review. It compares the advantages and disadvantages of the evaluation synthesis (direct connection to German DC, but no sole focus on adaptation outcomes and impacts and lower methodical reliability of the impact findings) with the corresponding characteristics of the systematic review (genuine focus of studies on adaptation outcomes and impacts, highly rigorous impact analyses, but lack of connections to German DC). The evaluation deals with the limited methodical quality of the project evaluations by identifying the “evaluation gap” between the described cause-effect correlations; in addition, it codes non-verifiable impact findings as a “non-impact”.

4. PORTFOLIO

The Federal Government's adaptation-relevant ODA has been constantly increasing since the introduction of the Rio marker (see also Noltze and Rauschenbach, 2019); in the period from 2010 to 2020 it totalled almost USD 13 billion from public budget funds¹⁰. This growth accompanies an increase in all development funds. The share of adaptation-relevant ODA in the total ODA, at around 8 percent, remained constant over time. Around 30 percent of the funds were spent on interventions with adaptation as a principal objective (CLA-2), and 70 percent on interventions with adaptation as a significant objective (CLA-1). The ratio between principal and significant objective interventions also remained fairly constant over time.

German adaptation-relevant ODA exhibits sectoral priority areas. 62 percent of German adaptation financing goes to the sectors of environmental protection (USD 3.4 billion), agriculture (USD 2.5 billion) and water (USD 2 billion, see also Figure 2). All sectors have seen increases since 2012, followed by a slight decrease only in 2020. Compared to all other sectors (such as population policy, health care, transport and storage, refugee aid), the share of financing for the sectors of environmental protection, agriculture and water has not increased significantly recently. At 74 percent, the water sector has the largest share of interventions with adaptation as a significant objective. In the environmental protection and agriculture sections, this share is only slightly above 60 percent in each case.

Figure 2 Adaptation commitments by sector (in millions of US dollars)



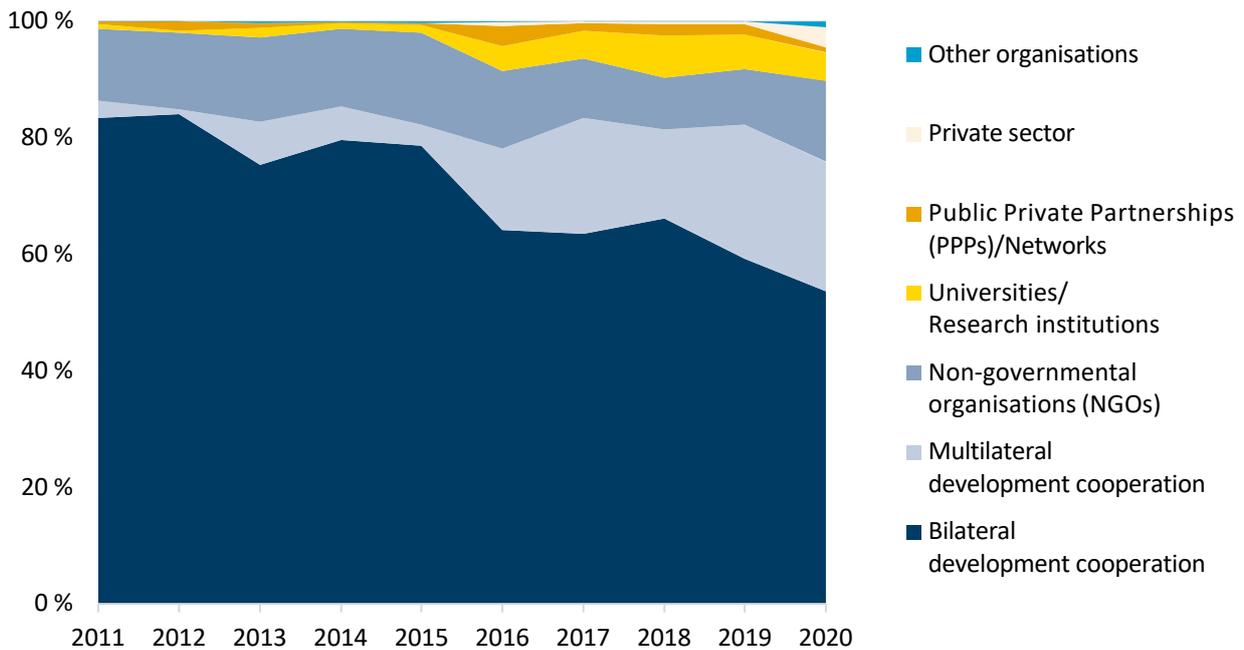
Source: OECD DAC CRS data 2011–2020, own calculations

At 82 percent, the vast majority of Germany's climate-relevant or adaptation-relevant ODA is the responsibility of the BMZ (USD 10.5 billion, 2011–2020). A further 9 percent (USD 1.1 billion) is the responsibility of the IKI Funding Programme. Between 2011 and 2020, the Federal Government's budget funds were supplemented by a further USD 4.9 billion from KfW's own funds. KfW's own funds primarily entail ODA-eligible promotional loans, but in part also development loans (combination of public budget funds and own funds). The agriculture sector, at around USD 2.4 billion, constitutes the largest share of the BMZ portfolio. In the IKI Funding Programme, around 76 percent of the funding (USD 836 million) goes to the environmental protection sector.

¹⁰ In addition to purely bilateral funds, the total of budget funds also includes the earmarked funds ("multi-bi") to multilateral organisations.

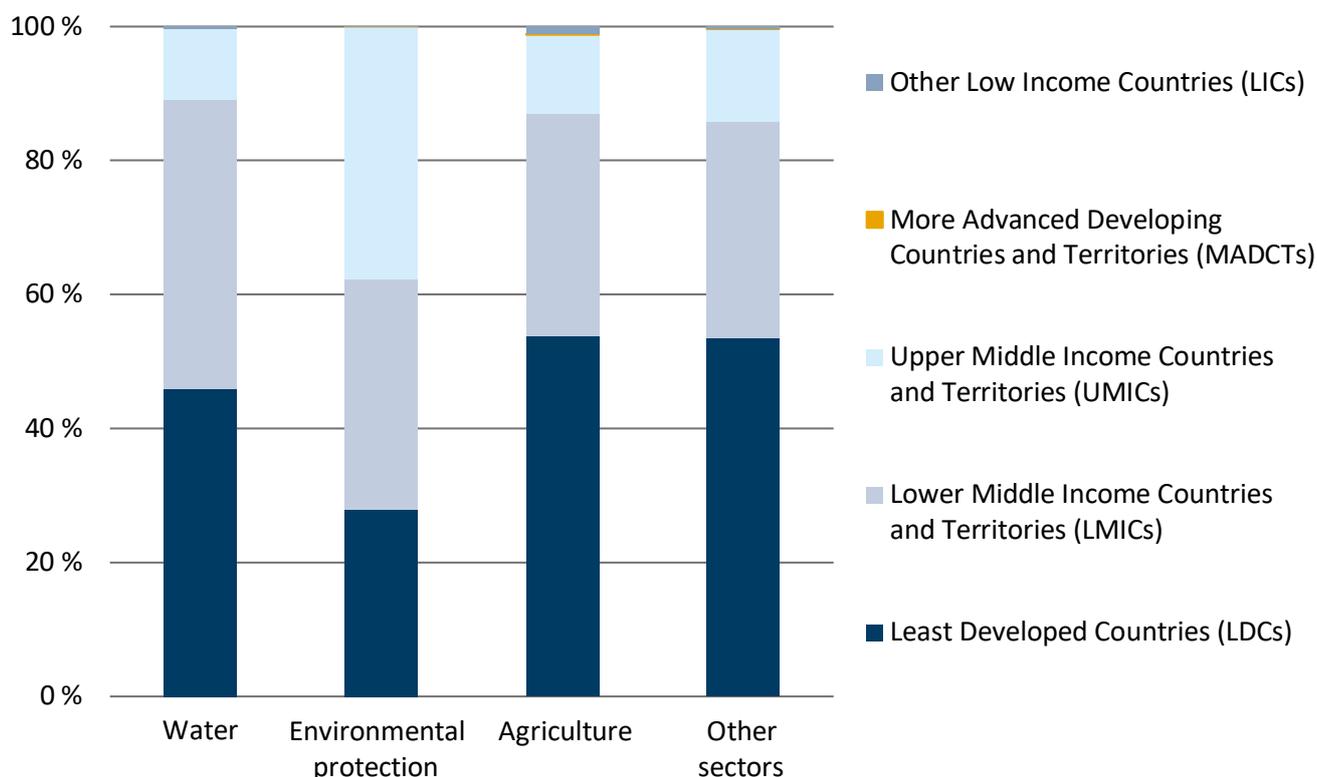
The international adaptation financing of German DC predominantly takes place through official bilateral cooperation, including earmarked funds to multilateral organisations (see also Noltze and Rauschenbach, 2019; Figure 3). However, the share of bilateral DC (bilateral and multi-bilateral DC) declined from over 80 percent in 2011 to slightly over 50 percent in 2020 – mainly in favour of multilateral DC. Other forms of cooperation, such as civil society engagement, remained largely constant in this period (see Noltze and Rauschenbach, 2019). Adaptation financing via the private sector plays practically no role in funding through budget funds. The strongest growth in multilateral DC is seen in the environmental protection and agriculture sectors. At over 90 percent, the share of bilateral DC in the water sector is comparably high.

Figure 3 Adaptation commitments by form of cooperation (in percent)



Source: OECD DAC CRS data 2011–2020, own calculations.

German adaptation financing predominantly goes to LDCs and lower middle income countries (LMICs). Sectoral differences can be seen here. For example, over 50 percent of the adaptation funds in the agricultural sector goes to LDCs, while the value in the environmental protection sector is less than 30 percent. Further shares go to countries in the upper middle income category (UMICs, see Figure 4). At nearly four billion US dollars, countries of Sub-Saharan Africa receive the largest share of all adaptation commitments, which is also increasing over time.

Figure 4 Adaptation commitments by sector and income categories of partner countries (in percent)

Source: OECD DAC CRS data 2011–2020, own calculations

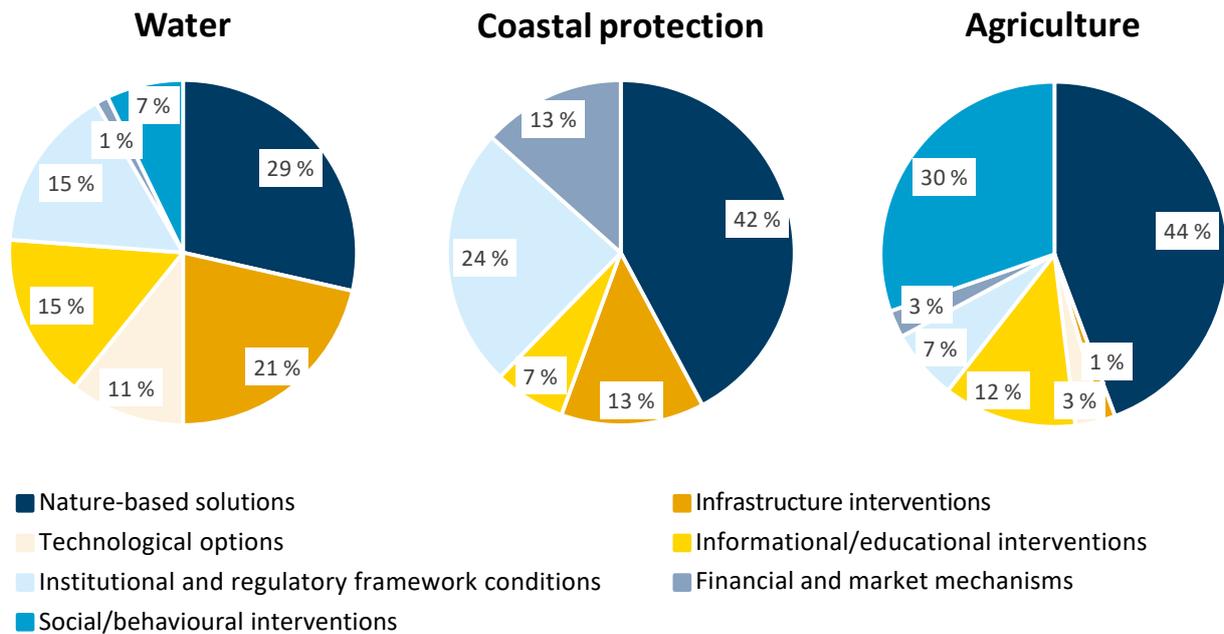
The Federal Government continues to assign adaptation funding based on the climate risk and climate vulnerability of its partner countries. For example, Noltze and Rauschenbach (2019) show that, although Germany tends to allocate adaptation funds to climate-vulnerable countries, the degree of vulnerability has no impact on the level of funding. Based on the Climate Risk Index (CRI) of the non-governmental organisation Germanwatch¹¹, an average of nearly 20 percent of the adaptation commitments go to countries with a high to very high climate risk, whereas around 60 percent go to countries with a low to very low risk. The remaining 20 percent go to countries with a medium risk. Based on the exposure index of the Notre Dame Global Adaptation Initiative¹², the climate vulnerability of the partner countries presents a very similar picture. Over time, commitments for adaptation financing for countries with high risk categories were increasingly made via the agriculture and water sectors in particular. Countries with a medium to low climate risk, in contrast, receive the largest quantity of funds via the environmental protection sector. Moreover, very vulnerable countries receive high funding commitments in the agricultural sector, but also for environmental protection. In the water sector, very vulnerable countries and countries that are not vulnerable both benefit from increased commitments.

¹¹ The Germanwatch Climate Risk Index is based on four indicators relating to extreme weather events that are connected to climate change: number of deaths, number of deaths per 100,000 inhabitants, total loss in US dollars and loss per unit of the gross domestic product per year and country (see Eckstein et al., 2021). Germanwatch obtains its data from the NatCatService of the reinsurance company Munich RE and from the International Monetary Fund (IMF). In this analysis, the extracted data was weighted and aggregated to form an index, the Climate Risk Index (CRI). For details on this see, for example, Eckstein et al. (2021).

¹² A country's climate vulnerability is defined using the exposure index of the Notre Dame Global Adaptation Initiative (ND-GAIN Exposure). This is also a risk indicator, but is based on the biophysical perspective and is thus independent of the socio-economic environment. A high value defines a high level of vulnerability and a high country ranking (Chen et al., 2015).

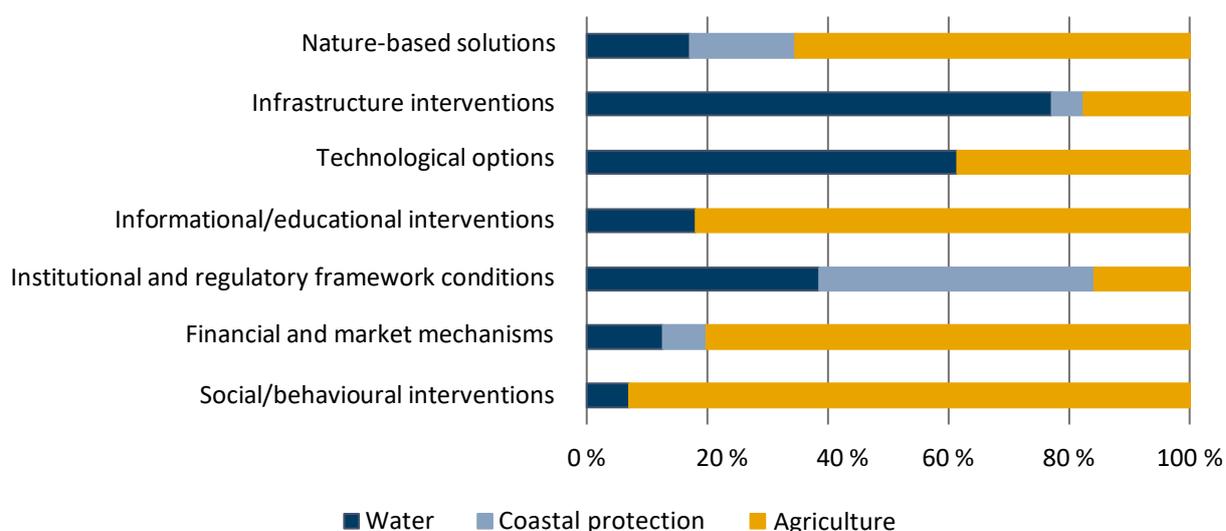
Looking at the types of adaptation interventions as per Doswald et al. (2020) reveals the priority areas and special sectoral features of the German adaptation portfolio. For example, nature-based solutions are the most frequent type of intervention in all three sectors (see Figure 5); their share is highest in the agricultural sector, at 44 percent of all interventions, followed by social and behavioural interventions. In the water sector there is also an increased use of infrastructure interventions, informational/educational interventions, and interventions to improve the institutional and regulatory framework. In coastal protection, not only infrastructure interventions, but also the improvement of institutional framework conditions play a role.

Figure 5 Share of the types of adaptation interventions by sector/area (in percent)



Source: Data from the IHM as per Doswald et al. (2020)

The financing of the interventions also exhibits sectoral differences (see Figure 6). For example, the water sector receives large amounts of funding for infrastructure interventions and technological options compared to the other sectors. In the agricultural sector, funding accordingly goes mainly to social/behavioural interventions, to informational/educational interventions and to financial and market mechanisms. In contrast, the area of coastal protection receives large amounts of funding to improve the institutional and regulatory framework. Across the three sectors/areas, a majority of the funding goes to infrastructure interventions and nature-based solutions (over 40 percent of the funding considered in the IHM).

Figure 6 Adaptation commitments by types of adaptation interventions per sector/area (in percent)

Source: Data from the IHM as per Doswald et al. (2020)

Beyond the sectoral promotion of adaptation interventions, the cross-sectoral promotion of NDCs and NAP processes to implement the Paris Agreement through German DC adaptation interventions is particularly important (see Section 5.1.5). With a view to the German DC objective of enhancing the enabling environment, Noltze and Rauschenbach (2019) identify potential in this area for integrating climate adaptation interventions into the national climate policies of the partner countries. Since the agreements regarding the NDCs and NAP processes under the UNFCCC, German DC has been supporting its partner countries through 28 individual interventions (2015–2020, 14 interventions each via the BMZ and the IKI) and through the international initiatives of the NDCP and NAP GN. Almost all of these interventions were in the area of technical cooperation and under the responsibility of GIZ (27 interventions), while KfW was responsible for one policy-based financing intervention. The portfolio of individual interventions consists of six global projects (3 each by the BMZ and IKI), one BMZ sector programme, five regional projects (3 BMZ, 2 IKI) and 16 bilateral interventions (7 BMZ, 9 IKI). According to the principal objectives, around half of the interventions focus on NDCs while the other half focus on NAP processes. Regional focuses are in South America, North Africa and West Africa. Only four interventions are in direct cooperation with LDCs. However, these interventions are additionally supported by the Least Developed Country Fund (LDCF) in designing their National Adaptation Programmes of Action (NAPAs) aimed at short-term adaptation policies. Small Island Developing States (SIDS) are considered in two regional projects for the Caribbean, a bilateral intervention and a global project. The technical cooperation interventions have an average volume of less than EUR 10 million; funding of over EUR 10 million is provided through global and regional projects. The total funds for technical cooperation amount to around EUR 260 million. The policy-based financing intervention of KfW has funds of EUR 350 million (over three phases), but not all payments can be defined as direct promotion of NDCs and NAP processes in this case.

Summary of the findings:

- Germany's adaptation-relevant ODA increased continually in the period from 2011 to 2020, especially through the sectors of environmental protection, agriculture and water.
- Compared to the vast majority of adaptation commitments via bilateral official development cooperation, multilateral cooperation is becoming increasingly important over time.
- Adaptation-relevant ODA goes primarily to LDCs, LMICs and, in particular, countries in Sub-Saharan Africa.
- Adaptation commitments to especially climate-vulnerable countries are made above all through the agriculture and water sectors, while in the environmental protection sector they go to countries with a medium to low climate risk.
- The German adaptation portfolio focuses on using nature-based solutions (the most frequent type of adaptation intervention in all three sectors), infrastructure interventions (water sector, coastal protection) and informational/educational interventions (water sector).
- Adaptation interventions for the cross-sectoral support of NDCs and NAP processes are primarily in the area of bilateral technical cooperation; they are supplemented by regional projects, sector programmes, global projects and international initiatives such as the NDCP and NAP GN.

5. FINDINGS

5.1 Effectiveness

The section on the effectiveness of adaptation interventions is structured as follows: It begins by presenting the benchmarks (Section 5.1.1). It then presents the findings along the corresponding benchmarks. Based on the findings from the evaluation synthesis on the effectiveness and impact of German DC adaptation interventions (Section 5.1.2), it also presents evidence of the outcomes and impacts of international interventions (Section 5.1.3) and finally performs a comparison of the evidence (Section 5.1.4). Section 5.1.5 describes the findings regarding the effectiveness of cross-sectoral support for NDCs and NAP processes through German DC.

5.1.1 Benchmarks

To address the question regarding the effectiveness of adaptation interventions, the evaluation operationalises the evaluation dimensions introduced in Section 1.4 through the following benchmarks (see Section 8.2 in the Annex):

Evaluation question 1: To what extent are German DC interventions for climate change adaptation effective?

Benchmark 1.1: German adaptation interventions achieve their objectives of 1) better responding to shocks and stressors, 2) increasing adaptive capacities and 3) enhancing the enabling environment.

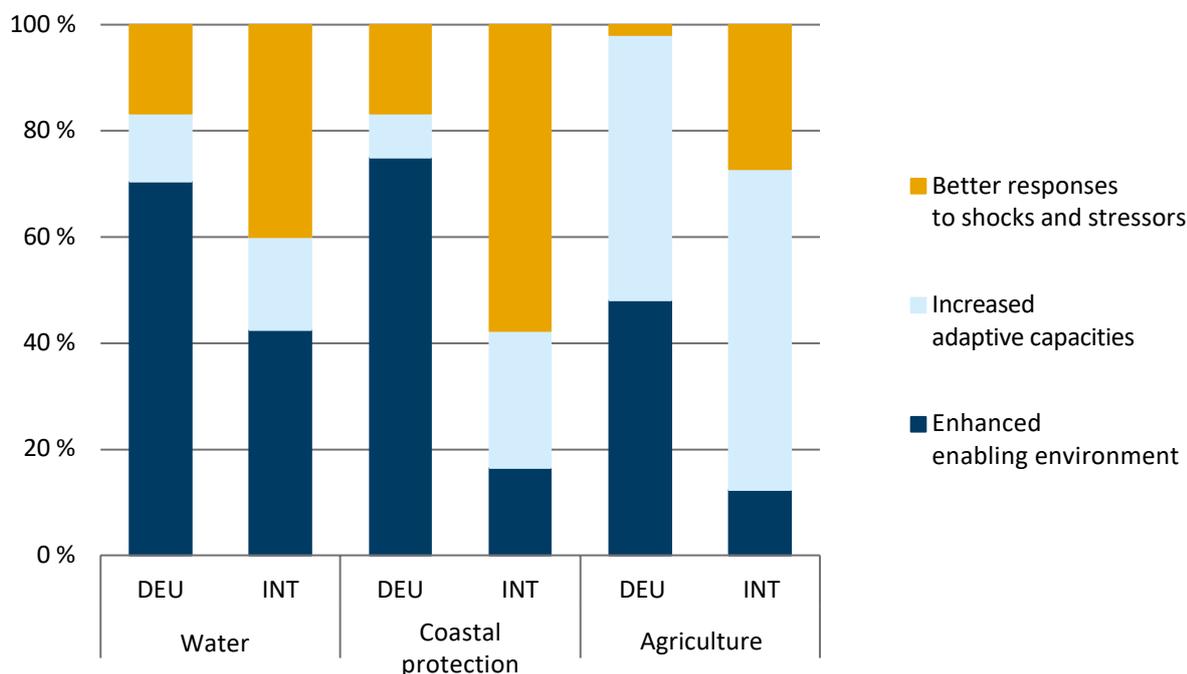
Benchmark 1.2: German adaptation interventions contribute to achieving the objectives of 1) better responding to shocks and stressors, 2) increasing adaptive capacities and 3) enhancing the enabling environment.

Benchmark 1.3: German adaptation interventions contribute to integrating climate adaptation into the national policies of partner countries.

Benchmark 1.4: German adaptation interventions avoid negative unintended effects and maladaptation.

5.1.2 German adaptation interventions

As the evaluation synthesis has shown, enhancing the enabling environment is the most frequent objective of German DC adaptation interventions (see Figure 7) – it applies to at least 50 percent of all interventions across all three sectors. In the agricultural sector, increasing adaptive capacities is also of great significance. In the water sector and in the area of coastal protection, in contrast, this objective barely plays a role.

Figure 7 Objectives of German and international adaptation interventions by sector/area

Source: DEval, own visualisation based on the results of the evaluation synthesis of evaluations on German DC adaptation interventions (DEU) in comparison to the systematic review of studies on the effectiveness of international adaptation interventions (INT)

As described in Section 4, the priority areas of the German adaptation portfolio entail the implementation of nature-based solutions, infrastructure interventions and informational/educational interventions. Different adaptation interventions are preferred for certain objectives. For example, the evaluated portfolio places an emphasis on interventions to improve the institutional and regulatory framework (see Figure 5), which primarily aim to enhance the enabling environment and make up 47 percent of all evaluated interventions. The main objective of using nature-based solutions is to better respond to shocks and stressors. All types of adaptation interventions are used to increase adaptive capacities.

But to what extent do the adaptation interventions used actually contribute to achieving their objectives? The evaluations provide too little evidence of impact with regard to this question. Only a few evaluations explicitly address climate risks and the vulnerability context of adaptation interventions. Most reports fail to present the theory of change with regard to the adaptation outcomes and impacts of the interventions performed. In total, verifiable impact findings are available for only 16 percent of all adaptation interventions evaluated up to now (N=118). This doesn't mean that the objectives are not achieved in the remaining 84 percent of interventions. It simply means that there is hardly any evidence of the contribution of German interventions. The share of interventions for which verifiable impact findings are available for interventions with adaptation as a principal objective (CLA-2), at 19 percent (N=36), is higher than for interventions with adaptation as a significant objective (15%, CLA-1, N=82). No significant differences are seen between the sectors here.

The potential effectiveness of the German adaptation portfolio cannot be assessed solely on the basis of the synthesis of project evaluations of the two implementing organisations. This also has methodological reasons, such as a lack of impact indicators, insufficiently specific impact indicators or difficulties in measuring impact using the methods available in project evaluations (see also Noltze et al., 2018b). The complexity of climatic changes, shifting baselines and long time periods between cause and effect relationships pose further fundamental challenges for the evaluation of adaptation interventions (see Bours et al., 2014; Dinshaw et al., 2014; Noltze et al., 2021). This is particularly apparent with a view to the improvement of institutional and regulatory frameworks and the informational/educational interventions.

The lack of evidence overall regarding effectiveness and impact is in conflict with the expectations that this evaluation places on the learning and accountability function of German DC project evaluations. At the same time, the possible consequential assumption that the interventions of German DC correspondingly achieve practically no adaptation outcomes and impacts seems to be hardly plausible.

Summary of the findings:

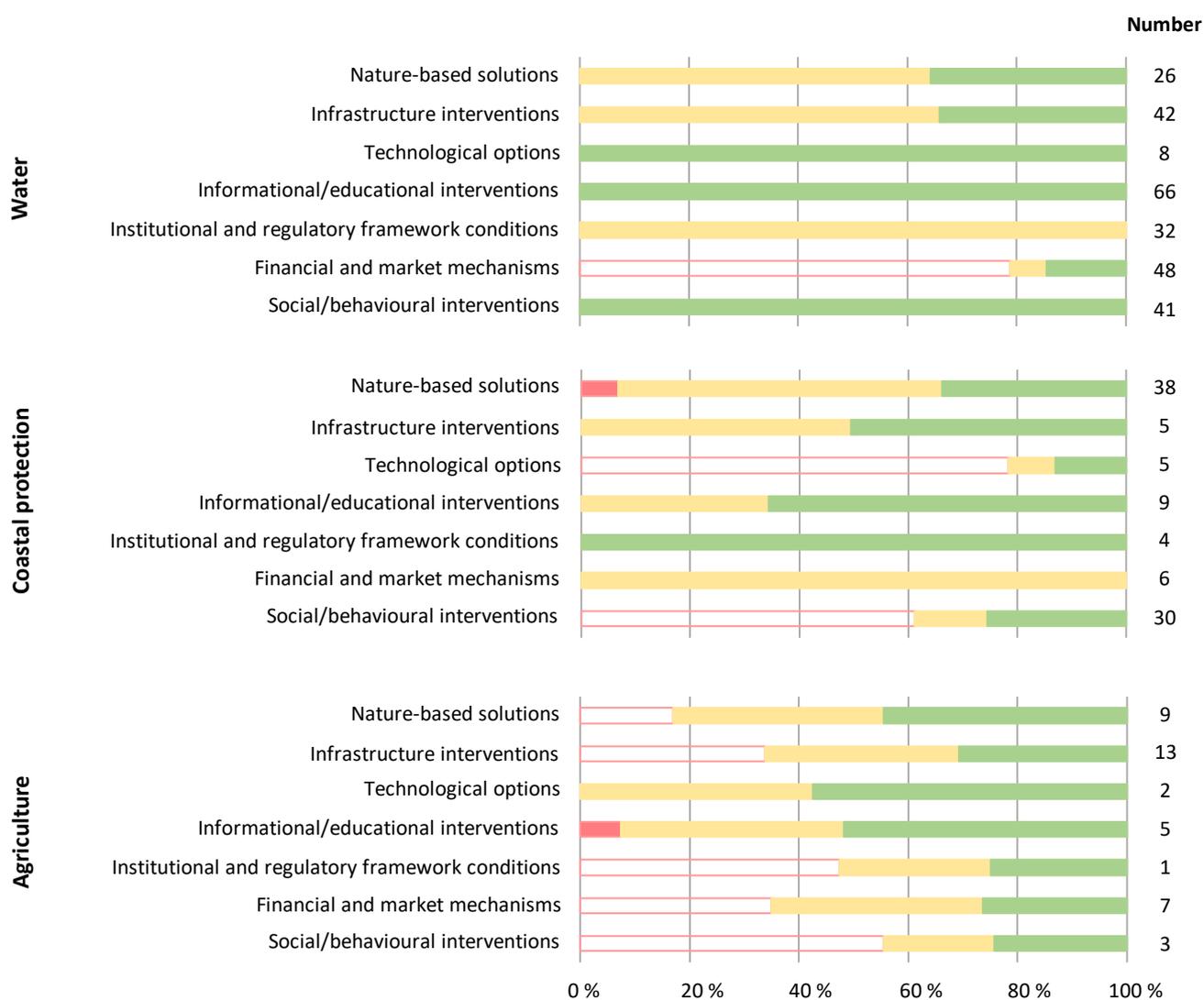
- The most frequent objective of German adaptation interventions in the agriculture and water sectors and in the area of coastal protection entails enhancing the enabling environment.
- Further objectives are increasing adaptive capacities (in the agriculture and water sectors) and better responding to shocks and stressors (in the area of coastal protection).
- To achieve its objectives, German DC uses nature-based solutions (the most frequent type of adaptation intervention in all three sectors), infrastructure interventions (water sector, coastal protection) and informational/educational interventions (water sector).
- Verifiable findings regarding effectiveness are available for only 16 percent of the evaluated German DC adaptation interventions. This primarily involves interventions to improve the institutional and regulatory framework.
- It is not possible to assess the question of effectiveness conclusively on the basis of the evaluation synthesis alone.

5.1.3 International adaptation interventions

In the international climate change adaptation interventions examined in Doswald et al. (2020), better responding to shocks and stressors was among the most frequent objectives. Improving the institutional and regulatory framework is less important. In the area of coastal protection, the main interventions involve nature-based solutions and social/behavioural interventions. For the water and agriculture sector, a more balanced distribution of all types of adaptation interventions is seen.

In contrast to the evaluation synthesis, the systematic review demonstrates a large number of verifiable and methodically sound impact findings (see Figure 8 and Figure 9). Across all sectors, intervention types and adaptation objectives, 56 percent of adaptation interventions exhibit a significantly positive effect in the sense of achieving objectives, while 34 percent exhibit an insignificant effect and 10 percent a significantly negative effect. In the agricultural sector, positive effects are seen for nearly all types of interventions. Predominantly positive effects are seen, in particular, for the informational/educational interventions and technological options. A similarly positive picture is also seen for adaptation interventions in the water sector, with a particularly large number of positive effects for infrastructure interventions, as well as for nature-based solutions and informational/educational interventions. Regardless of the intervention, significantly positive and insignificant impact findings are approximately balanced in the area of coastal protection. Unintended significantly negative effects also arise in isolated cases in all sectors.

Figure 8 Direction of the impact of international adaptation interventions by sector/area (in percent)



Source: DEval, own visualisation based on the results of the systematic review of studies on the effectiveness of international adaptation interventions. Green = significantly positive effect, yellow = insignificant effect, red = significantly negative effect.

Figure 9 presents the results of the systematic review in the form of an intervention results matrix. It shows how frequently adaptation interventions were effective with regard to their objectives. Based on the colouring and the quantity of evidence of impact for the various interventions and sectors, the following statements can be made: There is strong evidence in the agricultural sector of the effectiveness and impact of informational/educational interventions and for infrastructure interventions, namely with a view to the objective of increasing adaptive capacities. There is comparably little evidence of negative effects of interventions in this sector. In coastal protection, there are positive effects for nature-based solutions, above all with regard to better responding to shocks and stressors. In the water sector, the same can be said for infrastructure interventions (also with regard to responding to shocks and stressors). Interventions aimed at social and behavioural change in coastal protection and in the agricultural sector, in contrast, have a predominantly negative impact on increasing adaptive capacities (also refer to Section 5.4.3 for an example from coastal protection).

Figure 9 Direction of impact of international adaptation interventions by sector/area and adaptation objective

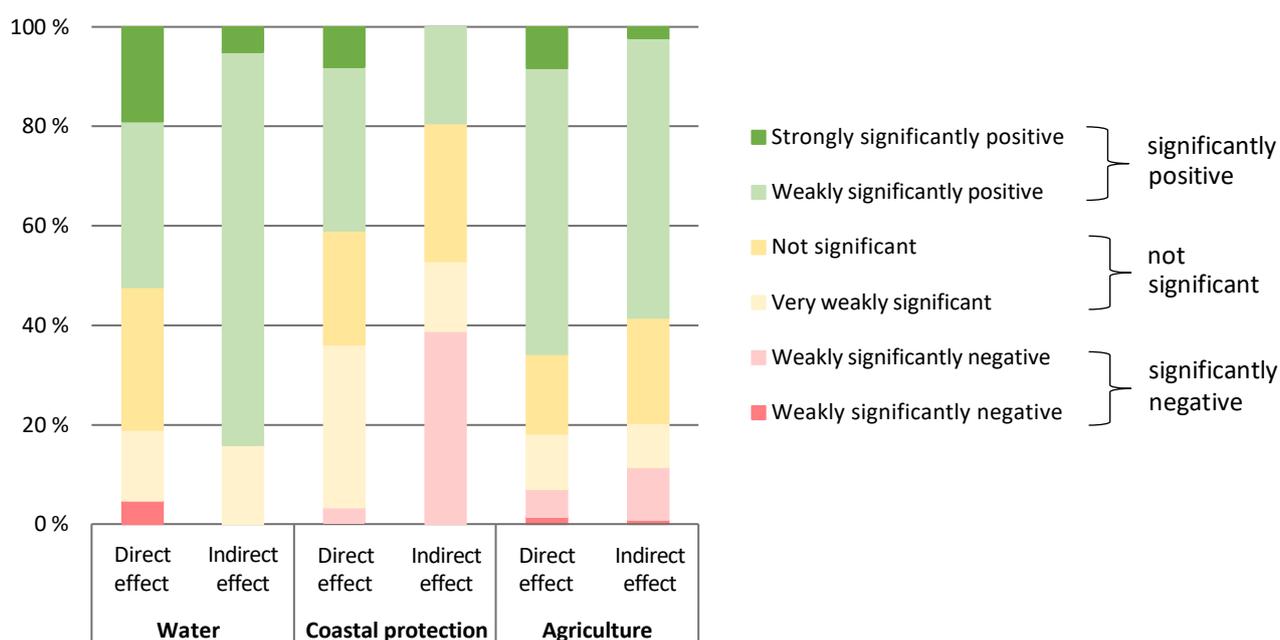
Interventions		Adaptation objectives								
		Better responses to shocks and stressors			Increased adaptive capacities			Enhanced enabling environment		
		sign. neg.	not sign.	sign. pos.	sign. neg.	not sign.	sign. pos.	sign. neg.	not sign.	sign. pos.
Water	Nature-based solutions	0	0	1	0	0	2	0	4	2
	Infrastructure interventions	0	3	5	0	1	0	0	2	2
	Technological options	0	0	0	0	0	1	0	0	1
	Informational/ educational interventions	0	0	2	0	0	1	0	0	2
	Institutional and regulatory framework conditions	0	1	0	0	0	0	0	0	0
	Financial and market mechanisms	0	0	2	0	1	1	1	0	2
	Social/behavioural interventions	0	0	2	0	0	0	0	0	1
Coastal protection	Nature-based solutions	1	17	9	0	8	0	0	2	1
	Infrastructure interventions	0	1	2	0	0	0	0	2	0
	Technological options	0	0	0	1	0	0	2	1	1
	Informational/ educational interventions	0	2	4	0	1	0	0	1	1
	Institutional and regulatory framework conditions	0	0	2	0	0	1	0	0	1
	Financial and market mechanisms	0	3	0	0	1	0	0	2	0
	Social/behavioural interventions	4	2	9	8	4	1	0	2	0
Agriculture	Nature-based solutions	1	1	4	0	7	9	0	1	2
	Infrastructure interventions	1	8	7	3	5	18	0	0	1
	Technological options	0	1	1	0	2	5	0	0	0
	Informational/ educational interventions	0	5	13	1	5	26	0	3	4
	Institutional and regulatory framework conditions	1	3	4	2	14	12	2	1	6
	Financial and market mechanisms	0	2	9	3	4	14	2	4	1
	Social/behavioural interventions	1	0	7	7	4	12	0	2	2
Overall (percentage)		9 (9%)	49 (33%)	83 (58%)	25 (6%)	57 (35%)	103 (59%)	7 (19%)	27 (18%)	30 (63%)

Source: DEval, own visualisation based on the results of the systematic review of studies on the effectiveness of international adaptation interventions. Green = significantly positive effect, yellow = insignificant effect, red = significantly negative effect. The figure in each cell represents the number of interventions from the systematic review

In addition to the frequency analysis on the direction of impact, an examination of the magnitude of impact has also been performed for the data of the systematic review, looking at direct and indirect effects (see Figure 10). The analysis of the direct effects concerns the achievement of objectives (outcome level). One possible example of this is switching to drought-resistant crops in agriculture. In analysing the indirect effects, the evaluation considers the contributions of the interventions to the aspired development changes (impact level). One possible example of this is increasing food security. The agricultural sector has the most direct positive effects, while the agriculture sector (59%) and also the water sector (84%) exhibit large shares of indirect significantly positive effects. The latter includes both direct, strongly significantly positive effects as

well as strongly significantly negative effects. For example, the impact of drip irrigation in regions of China threatened by drought was rated as an effective instrument for increasing yield in agriculture, but not for achieving environmental sustainability (Khor and Feike, 2017). This means there is a greater risk of interventions in the water sector causing an imbalance between positive and negative impacts on environmental and economic stability. Accordingly, greater attention needs to be paid to this in interventions (Lei et al., 2016). Weakly significantly negative indirect effects are seen to a small extent for 39 percent of interventions in the area of coastal protection. One example of this is provided in Section 5.4.3 regarding the resettlement of coastal dwellers in Bangladesh.

Figure 10 Direction and magnitude of direct and indirect adaptation outcomes and impacts by sector/area



Source: DEval, own visualisation based on the systematic review of studies on the effectiveness of international adaptation interventions

Summary of the findings:

- According to the findings of the systematic review regarding international evidence, around half (56%) of international adaptation interventions achieve their objectives (significantly positive effect).
- 44 percent of international adaptation interventions fail to achieve their objectives, while 34 percent have no observable effects (not significant) and 10 percent exhibit significantly negative effects.
- Informational/educational interventions contribute towards increasing adaptive capacities, especially in the agricultural sector.
- Nature-based solutions have the greatest impact in the area of coastal protection, while infrastructure interventions are effective in better responding to shocks and stressors in the water sector.

5.1.4 German and international adaptation interventions

The comparison of German and international adaptation interventions establishes both common features and differences. Compared to other countries, German DC places a particular emphasis on the objective of enhancing the enabling environment and the corresponding interventions to improve the institutional and regulatory framework conditions. According to Doswald et al. (2020), this objective is less important on an international scale, where better responding to shocks and stressors is a more frequent objective. The improvement of institutional and regulatory framework conditions, too, is of much less importance overall in the case of international adaptation interventions. However, it is to be found, for example, in the area of forest management/rural development in China (Gutiérrez Rodríguez et al., 2016) and in water management in Ethiopia (Legesse and Rao, 2015). In coastal protection, the main interventions on an international scale involve nature-based solutions and social/behavioural interventions. For the water and agriculture sector, a more balanced distribution of all types of adaptation interventions is seen.

To what extent can the findings from the systematic review be conveyed to the German adaptation portfolio? To answer this question, the evaluation compared the types of international adaptation interventions and their respective objectives with the corresponding categories of the German adaptation portfolio (Figure 11) and conveyed the directions of impact of the systematic review to the data of the evaluation synthesis. Taking all limitations into account, the findings on the directions of impact can basically be confirmed. Moreover, the findings of the IHM as per Doswald et al. (2020) show that German DC uses types of adaptation interventions for which the international evidence finds positive effects (see Figure 15 in the Annex). The reliable evidence from the systematic review confirms the positive impact findings of the evaluation synthesis regarding informational/educational interventions in the water sector and interventions to improve the institutional and regulatory framework conditions in coastal protection, and also regarding these two intervention types in the agricultural sector. Via these two types, German DC makes a contribution towards achieving the objectives of “better responding to shocks and stressors” and “increasing adaptive capacities”.

Figure 11 Adaptation interventions and objectives of German development cooperation by sector/area and their potential direction of impact based on international evidence

Interventions	Adaptation objectives			
	Number	Better responses to shocks and stressors	Increased adaptive capacities	Enhanced enabling environment
Water	Nature-based solutions	0	0	0
	Infrastructure interventions	2	1	1
	Technological options	2	0	2
	Informational/ educational interventions	21	3	16
	Institutional and regulatory framework conditions	24	5	15
	Financial and market mechanisms	5	0	4
	Social/behavioural interventions	0	0	0
Coastal protection	Nature-based solutions	2	1	1
	Infrastructure interventions	1	1	0
	Technological options	0	0	0
	Informational/ educational interventions	1	0	1
	Institutional and regulatory framework conditions	6	0	5
	Financial and market mechanisms	2	0	2
	Social/behavioural interventions	0	0	0
Agriculture	Nature-based solutions	3	0	2
	Infrastructure interventions	2	0	0
	Technological options	5	0	1
	Informational/ educational interventions	14	0	8
	Institutional and regulatory framework conditions	24	1	12
	Financial and market mechanisms	4	0	2
	Social/behavioural interventions	0	0	0
Overall (percentage)	118	12 (10%)	34 (29%)	72 (61%)

Source: DEval, own visualisation based on the results of the evaluation synthesis in comparison to systematic review. Green = significantly positive effect, yellow= insignificant effect, red = significantly negative effect, grey = no evidence available on the effectiveness of international adaptation interventions. Hatched areas take account of an unclear direction of impact based on the two dominant colours (see also Figure 9).

Summary of the findings:

- German and international informational/educational interventions in the agriculture and water sectors and interventions to improve the institutional and regulatory framework conditions in coastal protection prove to be highly effective.
- Positive effects can be seen in particular with regard to better responding to shocks and stressors and increasing adaptive capacities.

5.1.5 Adaptation interventions to support NDCs and NAP processes

The central objective of adaptation interventions to support the NDCs and NAP processes in the partner countries of German DC involves the systematic and cross-sectoral integration (mainstreaming) of climate adaptation into the national policies. Further objectives, especially in the case of more recent interventions, include implementing and financing the adaptation objectives and interventions defined in the NDCs and NAPs. This is apparent both on the basis of the document study covering all 28 adaptation interventions and also in the six country case studies. The German objective is thus consistent with the objectives of the NAP process under the UNFCCC, which envisages integrating adaptation and avoiding vulnerability. This means that the focus of interventions, as was already the case for the sectoral interventions (see Section 4), is on enhancing the enabling environment. In view of the rising number of NDCs with voluntary adaptation components that have already been submitted, the harmonisation (alignment) of the processes is also of increasing importance.

To achieve the objective of integrating adaptation, around 60 percent of the 28 individual interventions focus on supporting NDCs (see Box 1). In this respect, 40 percent of the interventions target element B of the Technical Guidelines for NAP processes, which relate to the development of strategies and plans. In addition, the interventions also particularly support element C – regarding implementation and financing. Whereas the first interventions concentrate on developing NDCs and NAP documents, the focus has shifted over the period under observation to the further development of submitted NDCs and to implementation and financing. At a global level, the implementation of the individual interventions is accompanied by the promotion of international initiatives. For example, the NAP GN promotes knowledge exchange and coordination between the actors. Through the NDCP, German DC supports the integration of climate and development goals and the coordination of bilateral and multilateral programmes.

Box 1 Nationally Determined Contributions and National Adaptation Plans, NDCP and NAP GN

In the Paris Agreement, all contracting parties have committed themselves to formulating and implementing **Nationally Determined Contributions (NDCs)**. The NDCs are to be revised every five years, making them more and more ambitious in order to achieve the objective of the agreement. Many countries voluntarily include adaptation in the NDCs.

The process of the **National Adaptation Plans (NAPs)** was established in 2010 under the Framework Convention on Climate Change. It aims to formulate and implement the National Adaptation Plans of the contracting states. National Adaptation Plans are instruments that the states can use for medium and long-term systematic adaptation planning. They should include all sectors and regions and pinpoint both current and future risks. The NAPs should help to set programmatic and political priorities in such a way that they increase resilience and avoid damage.

The BMZ and the Federal Ministry of the Environment initiated the **NDC Partnership (NDCP)** in 2016. It aims to enable developing and emerging countries to bring together their national climate and development goals and coordinate their implementation with the aid of bilateral and multilateral donor programmes. In Mali, for example, the NDCP supported a roadmap for NDC implementation and identified priority cooperation requirements in order to set up a governance structure for implementation and mobilise resources. It also determined requirements for the development of communication plans to reach the local target groups.

The **NAP Global Network (NAP GN)** was founded in 2014 on the initiative of eleven countries during the UNFCCC Conference of the Parties (COP) 20 in Lima, Peru. The network promotes South-South exchange, short and long-term technical support at national level and the development of knowledge products relating to the NAP process. It also promotes donor coordination and helps to ensure that the country priorities defined in NAP processes are taken into account in development cooperation interventions. In the period from 2017 to 2020, for example, the network helped to improve the framework conditions and build up capacities in South Africa – by means of workshops on risk and vulnerability analyses in the mining sector, technical support regarding the costs of the adaptation options and training courses for the improved integration of climate information into decision-making processes.

The objective of the interventions for integrating climate adaptation into the national policies is largely achieved. A final report was available at the time of analysis for eight projects (two for NDC support and six to support the NAP processes), thus making it possible to assess the achievement of objectives at the outcome level. One of the two projects for supporting NDCs achieved its objectives and fulfils the criterion of effectiveness, while the second project did not achieve its objectives within the intended term. Four of the six projects for NAP support fulfil their objectives, two of which exceed them. The degree of achievement of objectives is slightly higher for the interventions with a focus on supporting NAP processes than for the interventions with a focus on NDC support. Despite an increasing number of voluntary adaptation components in the NDCs over time, this is the case because climate adaptation continues to play a lesser role in the NDCs compared to the issue of mitigation.

To begin with, the contribution of German DC to supporting NDCs and NAP processes can be assessed largely positively. The majority of the planned activities and services are performed as planned. However, the performance-based indicators (output indicators) are often adjusted over the course of interventions and/or only achieved with a time delay.

When it comes to designing the interventions, participatory and integrative elements in the sense of the achievement of objectives prove to be particularly beneficial. Thanks to its long-standing expertise in supporting NDCs and NAP processes, German DC is perceived as an international knowledge provider and relevant cooperation partner in this field. This facilitates the implementation of objectives that rely on coordination and cooperation with international partners. When adaptation is considered as a cross-sectional issue, it provides a comparative advantage over other donors and is additionally supported by the demand-oriented approaches offered.

However, the case studies also reveal the risk of a delay in the implementation of interventions if their concepts are closely related and they also rely on services provided by other actors. In dealing with this risk, German DC is largely attributed a high adaptive capacity in the face of changing framework conditions. It is also apparent that the interventions have limitations based on their term. Not all interventions achieve their objectives during the period available.

The most important success factors identified for the implementation of interventions include the political will of the development partners and other parties involved, combined with the adaptive capacity of the intervention. By making the interventions demand-oriented, German DC contributes towards promoting and preserving the partners' political interests and ownership. Demand orientation is particularly relevant for NDC and NAP support, as the adaptation requirements and other, largely conflicting interests of a large number of public, private and civil-society actors need to be considered during planning in the medium and long term and incorporated into implementation.

The effective strengthening of ownership can be seen, for example, when the instrument of policy-based financing is used with incentive-promoting interventions in the country case study for Colombia. This is accompanied by an overall increase in the level of ambition: According to the Climate Action Tracker¹³, Colombia is among the group of countries that have submitted increased objectives for the reduction of greenhouse gas emissions as part of their NDC updates up to 2022.¹⁴ The financing provided by Germany promotes the examination of climate adaptation at the high government level and helps to preserve ownership over an extended period. It even still proves to be effective when external risks occur, for instance a change of personnel in central positions. Connecting payments with concrete services proves to be a success factor. In the German DC portfolio, though, the portfolio analysis identified only policy-based financing that refers to direct support for NDCs and NAP processes.

¹³ <https://climateactiontracker.org/climate-target-update-tracker-2022/>

¹⁴ According to the Climate Action Tracker, not only Colombia, but also the case study country Thailand is among the group of countries that have submitted increased objectives for the reduction of greenhouse gas emissions as part of their NDC updates. The case study country Vietnam did not submit any increased objectives in this process. The Action Tracker does not provide any details regarding Tanzania, Benin and Jordan.

Changes in government and staff turnover emerge as recurring external risks and generally have a restrictive effect on the degree of achievement of objectives. The institutional framework conditions of the partner organisations also influence the success of the interventions. In fragile contexts in particular, Wencker and Verspohl (2019) pinpointed state capacities as an essential factor for development successes. Alongside the human and financial capacities, comparably time-consuming inter-ministerial coordination requirements that persist for long periods of time also present challenges for the implementation of interventions in the case of the NDCs and NAP processes. Last but not least, the coronavirus pandemic also requires the interventions to have an adaptive capacity. In country-related work, it is primarily the participation of local groups of actors and inclusion of their perspectives that is restricted in this context.

Looking at the alignment of NDCs and NAP processes in the case study countries reveals a development over time. One success factor here is the institutional affiliation of those responsible for the respective process: Pooling the responsibility for NDCs and NAP processes in one ministry and its units promotes alignment.

The successful implementation of individual interventions in the partner countries is accompanied by integration into the international NAP GN and NDCP initiatives. With its approaches towards international networking and towards knowledge exchange between actors, German DC's support for the NDCP and the NAP GN plays a role in ensuring that climate adaptation is taken into account in the national policies. In this context, integration into the long-term initiatives has the potential to support country-specific requirements even beyond the limited terms of bilateral interventions. Nevertheless, not all relevant partner countries of German DC are part of the initiatives, so there is still room to expand the engagement. In the past, moreover, linking sometimes complex interventions to the global initiatives has led to delays in implementation. One reason for this is the substantial coordination effort resulting from the large number of issues, actors and levels involved. Synchronising different forms of cooperation (bilateral and regional interventions, sector programmes, global projects, global initiatives) is generally challenging.

Since being established in 2014 at the UNFCCC COP20 in Lima, the NAP GN has developed, with the support of German DC, into an internationally recognised sector network. By its own account, it provided 58 countries with direct support through technical cooperation up to 2022. Through the connection with country-related individual interventions, further experience is gained and new knowledge generated. At the same time, the partners benefit from knowledge exchange regarding everything from the planning and implementation to monitoring and evaluation of NAP processes. The NDCP, which counts more than 120 countries worldwide (including 90 developing and emerging countries) and numerous international organisations among its members, performs a similar function. Many of the NAP GN members are also members of the NDCP, which is also perceived to form a connection between the IKI and the BMZ as well as between different donors. For example, partnership plans drawn up via the NDCP also take account of IKI interventions in country-related work. However, the focus of German DC on LDCs is not reflected in the NAP GN. Only around one third of the countries that receive in-depth support via long-term technical support are LDCs. The NDCP with its focus on reducing greenhouse gas emissions additionally comprises industrial countries and also institutions, which means that no focus on LDCs and their requirements can be seen here either.

German DC is also successful in promoting synergy effects between the NDCP and the NAP GN. For example, adaptation queries are passed on between the two networks and exchange at country level is enabled. Many partner countries have not participated in the NAP GN up to now, though. This is true for the time both before and after the "BMZ 2030" reform process, which underscores the focus on LDCs with its concentration on bilateral cooperation. However, the work of the initiatives is affected by the restrictions of the coronavirus pandemic. Activities that previously built on personal exchange could be performed more rarely or could not be performed as planned, with the result that the initiatives could only realise their positive effects to a limited extent over the last two years from the viewpoint of the partners.

Summary of the findings:

- With regard to the systematic and cross-sectoral integration of adaptation into the national policies of the partner countries, the German adaptation interventions are highly effective.
- The strengths of German DC include the area of demand-oriented and inclusive solutions.
- At present, the cooperation primarily takes the form of technical cooperation. Financial cooperation instruments, for example in the form of policy-based financing, are hardly used.
- Up to now, the group of LDCs has only benefited to a very small extent from the direct support for NDCs and NAP processes through German DC adaptation interventions.

5.2 Impact

The section on the impact of adaptation interventions is structured as follows: It begins by presenting the benchmarks (Section 5.2.1). Using the benchmarks, it then presents the findings based on German and international evidence (Section 5.2.2). The examination of the contributions of German DC towards strengthening climate resilience is supplemented by the findings of the geospatial impact evaluation of irrigation infrastructure interventions in Mali (Section 5.2.3).

5.2.1 Benchmarks

To address the question regarding the impact of adaptation interventions, the evaluation operationalises the evaluation dimensions introduced in Section 1.4 through the following benchmarks (see Section 8.2 in the Annex):

Evaluation question 2: To what extent are German DC interventions for climate change adaptation impactful?

Benchmark 2.1: In the area of German adaptation interventions, a strengthening of climate resilience can be detected or foreseen.

Benchmark 2.2: German adaptation interventions contribute towards strengthening climate resilience by 1) better responding to shocks and stressors, 2) increasing adaptive capacities and 3) enhancing the enabling environment.

Benchmark 2.3: German adaptation interventions avoid negative unintended effects and maladaptation.

5.2.2 German and international adaptation interventions

By better responding to shocks and stressors, increasing adaptive capacities and enhancing the enabling environment, the German DC adaptation interventions aim to strengthen climate resilience (see also Noltze et al., 2023). German DC also strives to avoid maladaptation. Contrary to the intention of adaptation interventions, maladaptation may contribute towards increasing a population's vulnerability or reducing climate resilience (IPCC, 2018; Schipper, 2020).

But to what extent do the achieved objectives of responding to shocks and stressors, increasing adaptive capacities and enhancing the enabling environment contribute towards strengthening climate resilience? For the breadth of the German DC portfolio in the agriculture and water sectors and in coastal protection, this question can only be answered to a limited extent on the basis of the evaluation synthesis. For a start, there is a lack of information regarding intended high-level development changes. The evaluation synthesis on the effectiveness and impact of German adaptation interventions showed that only 46 percent of the evaluated interventions in the agriculture sector achieve the planned changes to strengthen climate resilience. This share amounts to 47 percent in the water sector, and even only 37 percent for coastal protection interventions. Generally, interventions with climate adaptation as a principal objective (CLA-2) have clearer connections to the aspired adaptation-relevant changes at development cooperation level. Here too, however, a lack of indicators and impact assumptions at the higher impact levels and methodical restrictions make it hard to establish the causal correlation between the achievement of objectives and development changes.

Finally, the project evaluations of the implementing organisations confirm contributions to development changes in the area of strengthening climate resilience for only a few of the interventions of German DC. This is also due to the types of adaptation interventions and the focus of German DC on enhancing the enabling environment. In the sectors investigated, there are only a few interventions that are also able to bring about short-term changes, for instance through technological options or the development of infrastructure (also refer to Section 5.2.3). With interventions to improve the institutional and regulatory framework conditions or informational/educational interventions, German DC relies much more on approaches that have comparably long results chains up to the achievement of development objectives. No differences are apparent between CLA-2 and CLA-1 interventions.

The systematic review of international interventions also addressed the question as to the contributions of the interventions towards development changes and distinguishes between outcomes (the contribution of interventions to their direct objectives) and impacts (contribution of the intervention to higher-level development changes, see Section 5.1.3 and Figure 10). It can be seen here that the contributions decrease from the outcome to the impact level. In all three sectors/areas, the share of strongly positive effects decreases accordingly. The interventions therefore achieve their objectives, but contribute to a lesser extent to overarching development changes (for example to individual SDGs). In the agriculture sector and in the area of coastal protection, the share of slightly positive effects is also falling. In contrast, the share of unintended negative effects is rising, especially in the area of coastal protection.

Summary of the findings:

- The envisioned development changes to strengthen the climate resilience of German adaptation interventions are not sufficiently presented in the evaluations.
- Altogether, there is only little evidence regarding the contributions of German and international adaptation interventions to strengthening climate resilience. This particularly concerns the impact pathway via enhancing the enabling environment, for which hardly any reliable evidence of impact is available.

5.2.3 Contributions towards strengthening climate resilience

For an in-depth and methodically rigorous evaluation of the contributions of adaptation interventions towards strengthening climate resilience, the findings of the evaluation synthesis and the systematic review were supplemented by a geospatial impact evaluation of irrigation infrastructure interventions in Mali. As described in Section 3.6, this is a “typical case” of German adaptation interventions in the nexus of the two large sectors of agriculture and water in a region particularly affected by climate change. A common type of adaptation intervention in the area of infrastructure is used here, with clear adaptation-related objectives that give rise to a particular learning potential (with regard to this and for a more detailed presentation of the methodology and findings, see BenYishay et al., 2023).

The climate vulnerability context for Mali is characterised by increasing difficulty in forecasting rainfall as a result of climate change, an increasing need for agricultural irrigation due to rising temperatures and a growing vulnerability to extreme weather events such as prolonged droughts and heavy rainfall (PIK, 2020). Agriculture in the Sahel region is highly dependent on rain (Nkonya et al., 2020; Zwarts et al., 2005). Artificial irrigation has the potential to increase the resilience of Malian society to climate change by increasing agricultural productivity, reducing poverty and improving social stability. As a result of long-standing conflicts, the Malian population is also subject to multiple vulnerabilities (Hegazi et al., 2021).

Against this backdrop, German DC has been supporting the development and maintenance of agricultural irrigation infrastructure in Mali since the end of the 1990s. Through various KfW projects and joint programmes with GIZ, German DC promotes small-scale pump-based irrigation, large-scale gravitation-based irrigation and the valorisation of floodplains. River water is used for irrigation in the northern project regions, while stored rainwater is used at just a few project locations in the south. The adaptation interventions aim to strengthen climate resilience. In addition, the interventions include gender-sensitive and conflict-sensitive interventions intended to contribute to strengthening resilience more broadly. In this case example, the evaluation investigated a sample of around 1,000 project locations. The data analysed came from various irrigation projects that were implemented between 1999 and 2020.¹⁵

With a view to the multidimensional concept of resilience (see Section 2), the evaluation measures the impact of the interventions on food security, child health, income, the decision-making power of women, social cohesion (based on the risk and intensity of conflict) and environmental impacts. The evaluation uses data on pump-based irrigation and on the valorisation of floodplains (see BenYishay et al., 2023).

Analysing remote sensing data showed that the interventions increased agricultural production at the level of the direct objectives of the interventions. The assessment used the Normalised Difference Water Index (NDWI) and the Normalised Difference Vegetation Index (NDVI). By increasing the continuity of irrigation and thus becoming less dependent on rainfall, the target groups reached were able to boost their agricultural yields. These increases arose for the first time in the harvest season following the completion of the irrigation infrastructure and continued over the following ten or so years. Both before and during the rainy season, the water availability was substantially higher and the vegetation was considerably greener.

To determine the extent to which the adaptation interventions examined in the case example also improved food security and child health as a result of the greater yields, the evaluation investigated the causal relationships between the implementation of the interventions and food security, the composition of foodstuffs and the state of children’s health. The analysis used not only data from standardised household surveys on living standards, but also biometric data on child nutrition and health. The evaluation established a decline in wasting and stunting of children as a result of the interventions in areas in direct proximity (0–4 kilometres) to the project locations. However, the underdevelopment (weight and size) increased again at

¹⁵ The data forms a sample of locations from the following projects: Mali North (before 2010), PAIP (*Projet d’appui à l’irrigation de proximité – Local Irrigation Support Project*) 2010–2014; IPRODI (Irrigation Projects – Inner Delta) since 2015 and REAGIR II (*Renforcement de l’agriculture irriguée*) 2018; IPRO-REAGIR I/II/III, Component Inner Delta, since 2010.

a distance of more than four kilometres from the location – thus showing that the positive effects are limited to project locations.

To determine possible economic impacts of the intervention, the evaluation analysed the correlation between increased agricultural production and higher agricultural incomes. Although the value of the sold harvest actually rose in the project areas, the evaluation did not detect any increase in household incomes. This may be due to the fact that the household income of families is made up of various components and the increase in value only has a small proportionate effect, or perhaps that other sources of income are substituted by gains from cultivating field crops. The analysis of household assets did not find any changes that can be attributed to the interventions either. It therefore seems that the gains in agricultural production are sufficient to improve child nutrition, but do not make it possible to increase household income or material gains.

In addition, the evaluation investigated the extent to which the interventions contribute towards strengthening the role of women in the project areas. It could be assumed that the irrigation interventions, some of which are reserved for management by women, would change the decision-making power of women in their households and change the views concerning violence against women in their families. However, the evaluation did not find any sound evidence of the increased decision-making power of women. Nevertheless, the interventions did play a role in ensuring that violence against women is considered more problematic and is less often considered to be justified. This indicates a limited improvement in women's capacity to act and demonstrates the potential for supporting gender equality through irrigation interventions.¹⁶

As a substantial share of social conflicts are also triggered by resource scarcity, the evaluation additionally examined the possible impact of the irrigation interventions on conflict reduction and peacebuilding. The results in the direct proximity of the project locations actually do show a decline in conflict events. Having said that, conflict events seem to be increasing in areas slightly further away from the interventions (4–6 km), which could be an indication that the conflicts have shifted to different locations and not decreased overall. Qualitative interviews with project team members and a focus group discussion with representatives of the target group revealed that the project locations were spared from attacks by the rebels located there. The displacement of the conflict events could mean that the rebels have relocated their attacks – for example for plundering – to the areas surrounding the project locations. Another possibility is that the conflicts concerned were triggered by an increased degree of frustration (greed) among the surrounding population because they have observed the improvement in the living conditions in the project locations without benefiting themselves.

The evaluation also investigated the environmental effects of the interventions. To this end, it examined changes with regard to water-induced soil erosion, soil moisture and biodiversity at selected project locations. By using high-resolution satellite images, the evaluation actually did find a lower level of soil erosion there in comparison to control locations. Moreover, the project locations showed signs of increased soil moisture. However, it was not possible to clarify in the evaluation whether this was due to the irrigation intervention, to a higher groundwater level or to rainfall. Finally, the evaluation established that the variety of crops at the project locations increased with the implementation of the irrigation interventions. In contrast to the other findings, the environmental effects could only be investigated for a small sample of locations – on the basis of remote sensing data with a very high resolution. The findings can therefore only be conveyed to a limited extent to the population of the interventions.

¹⁶ This entails average impacts of the projects on women's capacity to act. Due to inadequate data quality, it was not possible to use the number of fields per project location that are managed by women in order to determine the influence of the intervention (treatment) separately.

Summary of the findings:

- Adaptation interventions for developing irrigation infrastructure contribute towards strengthening climate resilience in Mali.
- Long-term increases in yields in agricultural production contribute towards child health and peacebuilding.

5.3 Sustainability

The section on the sustainability of adaptation interventions is structured as follows: It begins by presenting the benchmarks (Section 5.3.1). Using the benchmarks, it then presents the findings based on German and international evidence (Section 5.3.2). The examination of the sustainable contributions of German DC towards strengthening climate resilience is supplemented by the findings of the geospatial impact evaluation (Section 5.3.3).

5.3.1 Benchmarks

To assess the sustainability of adaptation interventions, the evaluation operationalises the evaluation dimensions introduced in Section 1.4 through the following benchmarks (see Section in the Annex):

Evaluation question 3: To what extent are German DC interventions for climate change adaptation sustainable?

Benchmark 3.1: Those involved and affected have the capacity to preserve the effects in the long term.

Benchmark 3.2: German adaptation interventions contribute towards supporting sustainable capacities.

Benchmark 3.3: The objectives of better responding to shocks and stressors, increasing adaptive capacities, enhancing the enabling environment and achieving climate resilience are sustainably achieved.

5.3.2 German and international adaptation interventions

As adaptation-related outcomes and impacts are not very clear and hardly backed by quality evidence from project evaluations, the sustainability of adaptation interventions can also only be assessed to a limited extent on the basis of the evaluation synthesis. However, with a view to the contributions to their objectives and intended development changes, the synthesis has addressed internal and external factors that can also be used to establish whether outcomes and impacts are likely to be preserved over time. In addition, the systematic review examined the sustainability-related findings of the international studies.

Regardless of the type of intervention, Noltze et al. (2018a) have shown that the sustainability of DC interventions during implementation is primarily dependent on internal factors, in other words on the direct services and the type of implementation. When the interventions are ended, external factors such as the contributions of the development partners and those involved in or affected by the interventions become increasingly important.

In analysing effectiveness and impact, the evaluation synthesis determined a series of factors that Noltze et al. (2018a) also found to be important for preserving the outcomes and impacts over time. In the agricultural sector, participatory and inclusive approaches and using existing institutional structures proved to be sustainability-relevant internal success factors for adaptation interventions. Other internal factors included adaptive project management and flexibility in project implementation. The external factors comprise the acceptance and prioritisation of adaptation interventions on the part of the development partners and target groups. In the case of the early adaptation interventions, in particular, a lack of climate policy strategies and thus insufficient state capacities proved to inhibit success. In the water sector, internal cooperation with the various actors, parties involved and those affected boosted success, whereas the insufficient consideration of institutional and regulatory framework conditions and an inadequate strategic orientation of the adaptation interventions had the opposite effect. In the case of adaptation interventions in the area of coastal protection, the replicability of the interventions proved to be a sustainability-relevant success factor, while insufficient partner priorities and low coordination capacities posed a challenge.

The project evaluations have pinpointed a series of success factors that can also be expected to support the sustainability of the adaptation outcomes and impacts over time. At the same time, there were also inhibiting factors, not all of which are in the area of influence of the interventions. This gives rise to a mixed picture with regard to the sustainability assessment. For example, it seems likely that adaptation interventions that meet with great acceptance and correspond to the priorities of the partners will also yield sustainable adaptation outcomes and impacts. However, this also requires corresponding state capacities with regard to institutional and regulatory framework conditions and corresponding political strategies. These capacities are not available in some cases, and have changed greatly over the course of the implementation of the interventions in other cases. Particular mention should also be made of the fact that possible maladaptation hardly comes up in the evaluations of German DC, and unintended effects are hardly mentioned either.

Beyond a general confirmation of very similar influencing factors in the international studies, the systematic review is also not able to conclusively assess the sustainability of adaptation interventions. Despite the inclusion of different indicators in the review's analysis grid, the available studies hardly contain any information regarding the sustainability of adaptation outcomes and impacts. This is the case for both direct and indirect effects (see Figure 10).

Summary of the findings:

- Sustainable adaptation outcomes and impacts can be achieved through participatory and inclusive approaches and by using (existing) institutional framework conditions.
- Other factors conducive to success comprise cooperation with the partners and the appropriate consideration of institutional and regulatory framework conditions (in the water sector) and the replicability of interventions (in the area of coastal protection).
- In the case of older interventions in particular, a lack of climate policy priorities and insufficient state capacities in the partner countries prove to be factors that inhibit sustainability.
- Restrictions with regard to the assessment of sustainability also arise as a result of inadequate information about unintended effects and maladaptation.

5.3.3 Contributions towards strengthening climate resilience

With the geospatial impact analysis in Mali, this evaluation addressed the sustainability of adaptation outcomes and impacts in order to close the substantial evaluation gap regarding the sustainability of adaptation interventions (see Section 5.3.2). Up to now, rigorous studies and evaluations have focused on the direct and short-term effects – also in the specific case of interventions in smallholder agriculture. Only few studies have set themselves the goal of analysing longer-term effects (Strobl and Strobl, 2011). Alongside the resulting uncertainty regarding the long time frame of outcomes and impacts to unfold, another development challenge emerges. Short-term adaptation successes can namely turn out to be maladaptation in the long term, hindering climate resilience. To take one example, the use of air conditioning systems in rural healthcare facilities can provide effective protection against the effects of heatwaves on physically

debilitated patients but – if based on the use of fossil fuels – can contribute to further global warming. Bearing this in mind, the evaluation considers both the sustainability of the interventions and the multidimensional concept of climate resilience.

Taking Mali as an example, the evaluation shows that both the direct effects (greater yields) and the development changes (for instance in the area of food security) can be preserved over time. The direct effects are already apparent in the first year following the completion of the irrigation infrastructure and continue over the following ten years or longer. As expected, the development changes take effect with a time delay. This means that a causal link to the intervention can be established only if the evaluation considers an extended period. The different changes in strengthening social, economic and environmental resilience can therefore only be assessed at least ten years after the interventions are completed. This is also the case for the evaluation of maladaptation. In the case of Mali, too, unintended effects such as a displacement of the conflict potential or lower food security in communities living further away only become apparent after a certain time.

Summary of the findings:

- Preserving the direct positive effects of the interventions in the long term contributes towards strengthening climate resilience.
- Some contributions towards strengthening climate resilience only become apparent long after the interventions are implemented.
- Unintended effects and contributions towards maladaptation, in particular, can sometimes only be conclusively evaluated after a period of ten years.

5.4 Effectiveness, impact and sustainability by sector/area

The following section summarises the findings of Sections 5.1 to 5.3 for the agriculture and water sectors and the area of coastal protection.

5.4.1 Agriculture

With over USD 2.5 billion, the agriculture sector receives the second highest total funding in the German adaptation portfolio after environmental protection (see Section 4). In addition, the sector records an increasing share of financial commitments through multilateral cooperation. More than 50 percent of the adaptation funds in agriculture go to LDCs. The partner countries are located in Sub-Saharan Africa, East Asia and South-East Asia, and thus in regions that are subject to increasingly high climate risks. The agriculture sector is demonstrably influenced by climate change in various ways, for instance through the salinisation of coastal agricultural areas, limited water availability or crop failures as a result of extreme weather events (IPCC, 2022).

The agricultural sector yields the most scientific evidence of the effectiveness and impact of German adaptation interventions. The evaluation synthesis comprises 45 evaluated agriculture projects with a total of 52 interventions (67% CLA-1 interventions). The systematic review, too, finds a large quantity of evidence of the effectiveness and impact of adaptation interventions in agriculture. Positive impact findings are most common for infrastructure interventions and informational/educational interventions. In the agricultural sector, financial support is provided predominantly through social/behavioural interventions, informational/educational interventions, and financial and market mechanisms. However, there is no corresponding evidence from German DC on the impact of social/behavioural interventions. Infrastructure interventions receive less adaptation finance. This includes interventions to increase irrigation efficiency or expand sustainable irrigation systems.

Effectiveness

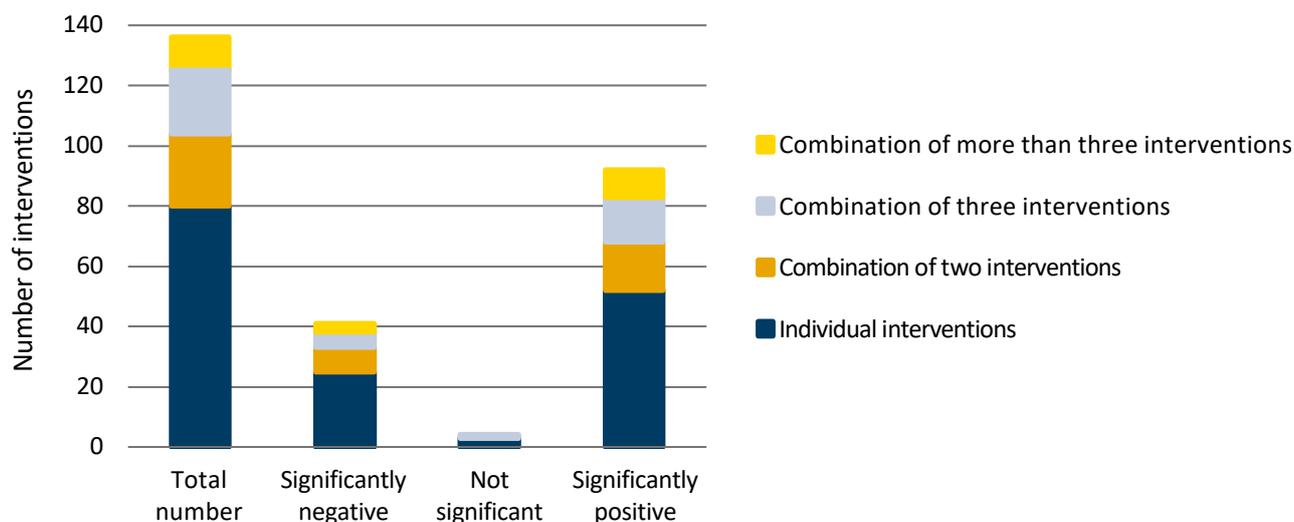
Interventions in the agricultural sector primarily aim to increase adaptive capacities and enhance the enabling environment, as is apparent from the data from the IHM regarding German DC. This applies in each case to more than 45 percent of the projects. The interventions involve promoting specific policies, improving institutional structures, providing policy advice, offering advisory services on agricultural practices and products, providing training seminars and enabling knowledge exchange. Regardless of the objective, nature-based solutions are particularly likely to have a positive effect in comparison with the other interventions.

The systematic review yields a large quantity of reliable evidence of impact for informational/educational interventions in the agricultural sector, with two thirds of the corresponding projects having a positive effect. Adaptation interventions in the agricultural sector generally exhibit very positive effects. Regardless of the adaptation types, 58 percent of the interventions exhibit a significantly positive effect, 5 percent an insignificant effect and 37 percent a significantly negative effect. The direct effects in the agricultural sector include switching to drought-resistant crops or intensifying production. However, unintended negative effects are also found. For example, the construction of a water retention basin in Burkina Faso resulted in changing and partly destroying the surrounding meadow landscape.

Impact

Adaptation-specific changes as a result of development policy are often especially difficult to establish in the agricultural sector. This is due, in particular, to insufficient delimitation between adaptation-specific and other development objectives. For example, the cause-effect relationship between climate-friendly agriculture and food security with a view to SDG 13 (“Climate protection”) and SDG 2 (“Zero hunger”) may contain both a climate-specific and a nutrition-specific impact dimension. Unless the climate vulnerability context is explicitly established, however, it is not possible to determine the share of interventions with adaptation-specific outcomes and impacts. The evaluation synthesis revealed that only 46 percent of the evaluations of German DC adaptation interventions establish the planned adaptation-specific changes.

The systematic review shows that international projects rely mainly on individual interventions (59%, see Figure 12). In 41 percent of cases, different types of adaptation interventions were combined with one another. A connection is apparent between the combination of interventions and the occurrence of positive effects. A combination with nature-based solutions especially makes positive effects more likely. Above all, nature-based solutions were combined with technological options and with social/behavioural interventions. Although interventions to improve the institutional and regulatory framework conditions exhibited positive effects in combination with nature-based solutions, they exhibited negative effects to a greater extent as individual interventions (one positive effect to two negative effects). Evaluating interventions to improve the institutional and regulatory framework conditions in Botswana, for example, Basupi et al. (2017) find an increased risk of conflict between population groups as a result of insufficient and unbalanced participation mechanisms. Social/behavioural interventions that aim to strengthen adaptive capacities in the agricultural sector also prove to have negative effects. In a study investigating the adaptation strategies of livestock farmers in Pakistan, for example, Rahut and Ali (2018) pinpoint negative economic effects in the case of interventions to promote geographical mobility.

Figure 12 Number of interventions (individual and in combination) in the agricultural sector

Source: DEval, own visualisation based on the systematic review of studies on the effectiveness of international adaptation interventions

Sustainability

In the agricultural sector, various factors are named that may make both a positive and a negative contribution to sustainability. However, factors both within and outside of projects are often cross-sectoral and can therefore not be exclusively attributed to the agriculture sector. The sector-independent success factors include the relevance of the intervention for the target group, the target group's appreciation of the intervention and good project management, while inhibiting factors may include an overly ambitious project design or a disregard of conflicts of interest between target groups. A specific success factor in the agricultural sector proves to be focussing the interventions on production processes along value chains. The inhibiting factors here include inadequate environment or market analysis, which makes it difficult, for example, to introduce weather insurance in a complex regulatory context.

5.4.2 Water

With two billion US dollars, the water sector receives the third-highest total funding in the German adaptation portfolio (see Section 4). In the water sector, 90 percent of adaptation interventions are implemented through bilateral cooperation and 74 percent are implemented through interventions with adaptation as a significant objective. Adaptation interventions in the water sector are seen in the areas of drinking water provision, water resource management, sewage systems and sanitation interventions. Through positive co-benefits, these interventions can make an important contribution to climate adaptation, for instance in that they ensure the health of the population by providing clean drinking water in times of drought. In the water sector, the probability of receiving adaptation commitments is higher for countries with a high climate risk. Accordingly, 90 percent of the funding goes to LDCs and to countries with low middle incomes (45% in each case). The regional focus is on countries in Sub-Saharan Africa, North Africa and West Asia.

The evaluation synthesis on German DC investigated 54 evaluated interventions in the water sector. An impact can be demonstrated for only four percent of the interventions. The low level of evidence of impact is also reflected in the international interventions. The systematic review identified only 17 interventions with an impact measurement for adaptation in the water sector. Evidence of impact was found mainly for infrastructure interventions, informational/educational interventions and the improvement of institutional and regulatory framework conditions. However, a lower level of evidence of impact does not necessarily mean lower investment, as the water sector receives a comparably high level of funding in German DC in

comparison to the environmental and agriculture sectors – not only for infrastructure interventions, but also for technological options. This includes interventions in water resource management.

Effectiveness

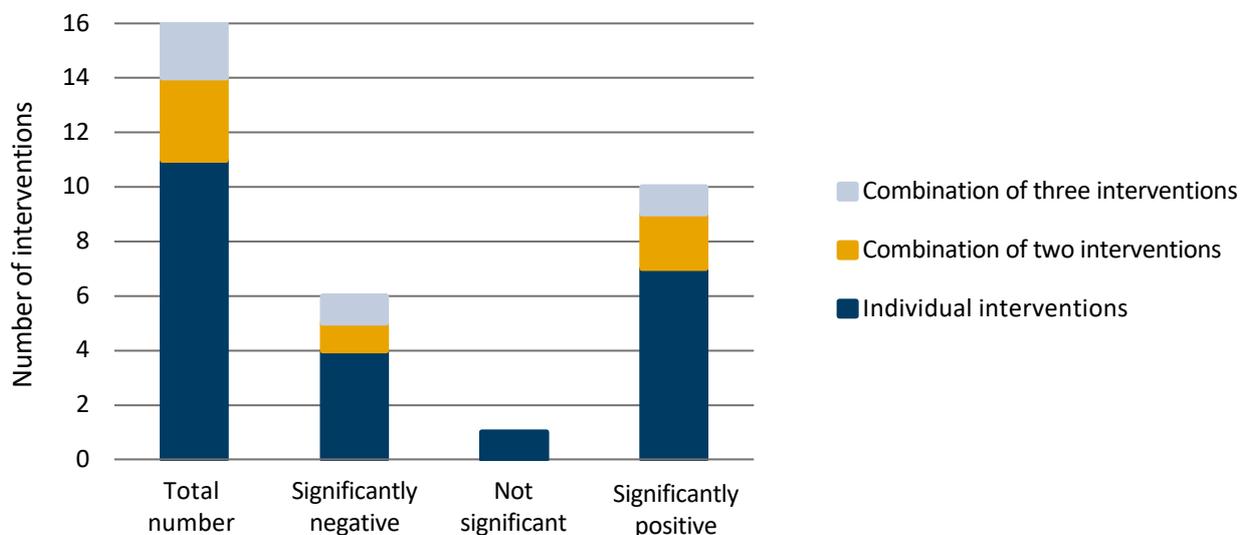
Compared to the other two sectors, the water sector pays greater attention to increasing adaptive capacities, for which it uses a relatively balanced distribution of all types of adaptation interventions. Positive impact findings can be confirmed above all for informational/educational interventions. A particularly high level of positive effects can also be found in the case of nature-based solutions, the promotion of financial and market mechanisms and infrastructure interventions. The latter exhibit positive effects above all in responding to shocks and stressors, for example through improved flood management or the development of early warning systems. Direct positive effects are only rarely seen in the water sector, but indirect positive effects are common (84% of the interventions). According to one evaluation, for example, the construction of a drinking water facility has contributed towards improving the population's access to clean drinking water (outcome level). This direct effect also contributes towards reducing the risks for the population of falling ill due to contaminated water (impact level). Having said that, the evaluation report does not explicitly address the vulnerability context with regard to climate change and therefore does not sufficiently underline the impact in the sense of adaptation.

The systematic review of the international evidence does not identify any notable negative effects of adaptation interventions in the water sector. Due to a lack of evidence and conflicting evidence, however, there is great uncertainty regarding the adaptation impact of enhancing the enabling environment through informational/educational interventions and the improvement of institutional and regulatory framework conditions, for example by developing and implementing frameworks, reforms and strategies, setting up new institutions or strengthening the coordination between existing institutions.

Impact

Looking at the contributions of interventions towards impacts revealed that a long-term assessment is rarely performed in the water sector. At international level, the analysis of indirect effects shows contributions towards strengthening climate resilience for only 47 percent of the interventions. This is the lowest contribution in all three sectors. Above all, the water sector is characterised by weak significantly positive and very weak significant indirect impact findings. There are no findings regarding significantly negative effects. One example of an intended development change is the preservation of water resources in light of changing climate parameters and the resulting reduction of climate vulnerability, to which the intervention contributes through improved protection against climate-based water scarcity and the management of seasonal water surpluses. For example, a combination of informational/educational interventions and the improvement of institutional and regulatory framework conditions has the direct objective of informing the target groups about sustainable water management and, in the long term, allowing access to clean drinking water (impact level). One example is provided by a water programme as part of technical cooperation in Jordan, which has helped to improve the management of water resources. Not only ministries, but also water suppliers and the local population were involved here in shaping a sustainable circular economy.

Combinations of interventions in the water sector may slightly increase the potentially positive effects. Based on the evidence of the impact of international interventions, it is apparent that one in three interventions in the water sector uses a combination of several types of adaptation interventions (see Figure 13). The interventions most often implemented as an individual intervention are infrastructure interventions and nature-based solutions. Nature-based solutions are combined, for example, not only with financial and market mechanisms, but also with informational/educational interventions. However, it is not clear whether these combinations have a more positive or negative impact. This may also be due to the fact that the impact of educational interventions can often only be gauged after a certain time.

Figure 13 Number of interventions (individual and in combination) in the water sector

Source: DEval, own visualisation based on the systematic review of studies on the effectiveness of international adaptation interventions

Sustainability

In the water sector, successes in German DC were primarily identified with regard to development impact, but not so much with a concrete connection to adaptation. It was predominantly factors within the projects that made a positive contribution here. This includes cooperation with regional non-government organisations and national/international actors, a relationship of trust between these actors and in-depth context knowledge. Inhibiting factors included the failure to take framework conditions into account, and inadequate implementation and measurement of effects with regard to project objectives. Only one evaluation – on a project in the Democratic Republic of the Congo – addressed unintended negative effects. In this case, the establishment of a decentralised coordination institution had the result of weakening a national Institution in the area of drinking water.

5.4.3 Coastal protection

The area of coastal protection is part of the large adaptation-relevant sector of environmental protection. With USD 3.4 billion, the environmental protection sector receives the highest total funding in the German adaptation portfolio (see Section 4). Most adaptation commitments in environmental protection go to developing and emerging countries with lower middle incomes, whereas adaptation commitments for LDCs and climate-vulnerable countries are lower. The area of coastal protection is an exception in this respect. Many coastal protection interventions are implemented in particularly climate-vulnerable countries, such as in Vietnam. In the regions affected, a rising sea level and the increase in the sea's temperature are leading to habitat loss, marine pollution, excessive nutrient enrichment and even to the introduction of non-native species. Without adaptation interventions, it is very likely that climate risks will increase in coastal areas in the future (IPCC, 2022).

Despite the special role played by coastal protection as part of the German adaptation portfolio, only limited knowledge is available up to now regarding the effectiveness and impact of the interventions. Only twelve evaluated interventions are available for German DC in this respect. The picture for the international evidence is similar. Overall, available evidence of impact in coastal protection concentrates on the adaptation types of nature-based solutions and the improvement of institutional and regulatory framework conditions. These two types of adaptation interventions also form the financial focus of German DC.

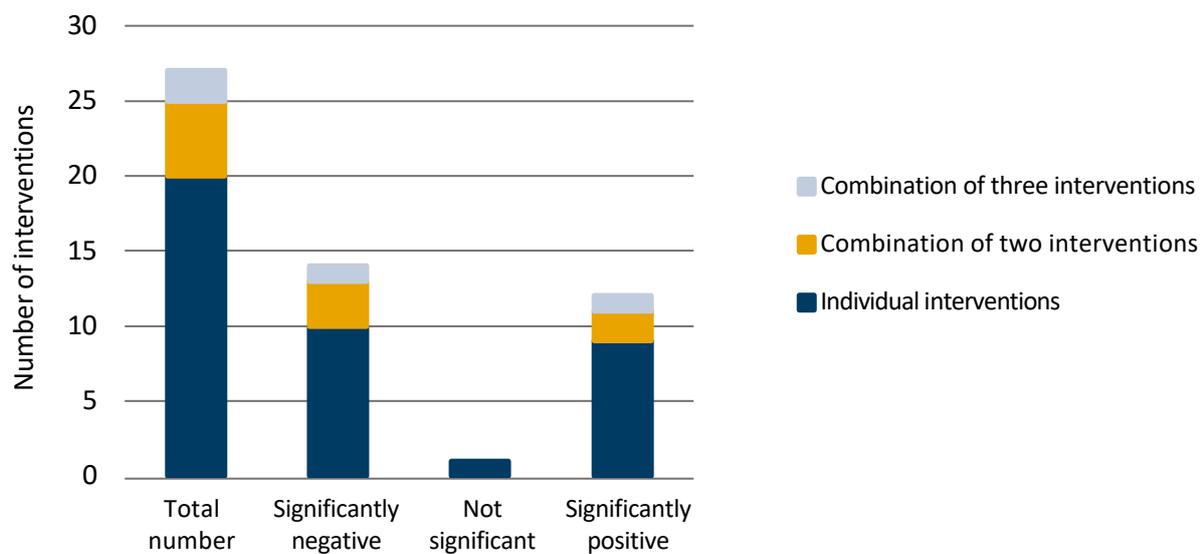
Effectiveness

The systematic review shows that coastal protection interventions primarily help to respond to shocks and stressors. Overall, however, the evidence is conflicting, with an approximate balance between significantly positive and insignificant impact findings.

Coastal protection also exhibits unintended negative effects particularly often. The difference compared to interventions in the agriculture and water sectors is considerable. Based on the international evidence, such negative effects arise above all through technological options with the objectives of increasing adaptive capacities and enhancing the enabling environment. In their study in Argentina, for instance, Jacobo et al. (2015) find that dykes contribute to soil changes and structural changes, which in turn reduce biodiversity and have a negative impact on the ecosystem processes of adjoining grasslands. Further negative effects are seen for social/behavioural interventions with the aim of better responding to shocks and stressors and increasing adaptive capacities. This entails primarily indirect negative effects (39%); only a very small number of interventions (3%) exhibit direct negative effects. Nevertheless, these interventions are not among the priority areas of German DC in coastal protection, which means that the total number of projects with negative effects is fairly small.

Impact

Across all intervention types, adaptation interventions in the area of coastal protection exhibit just as many positive contributions towards strengthening climate resilience as negative contributions. This is the case regardless of the number of combinations of different intervention types (see Figure 14). The evaluation synthesis on German DC established contributions to development changes for only around one third of the twelve evaluated interventions in the area of coastal protection. The systematic review shows that 75 percent of the interventions in coastal protection are individual interventions (see Figure 14). Only few projects combine the prevalent type of nature-based solutions with further types of interventions (25 percent combine at least two types of interventions). The positive and negative effects are balanced overall in the case of nature-based solutions, as well as for social and behavioural interventions. Negative findings in coastal protection primarily concern the resettlement of the population from coastal regions to new environments. For example, a study from Bangladesh established difficulties in integrating the population into the new local labour market and giving them access to agricultural areas (Mallick and Sultana, 2017).

Figure 14 Number of interventions (individual and in combination) in the area of coastal protection

Source: DEval, own visualisation based on the systematic review of studies on the effectiveness of international adaptation interventions

Sustainability

In the area of coastal protection, too, German DC is characterised by a series of factors that are significant for the long-term preservation of outcomes and impacts. Thus, the alignment with the policies and priorities of the partners, transparency, impact orientation and capacity building prove to be success factors that promote sustainability in the case of coastal protection interventions. Factors identified in the evaluations as inhibiting sustainability were overly ambitious objectives and deviating partner priorities. Particular mention should also be made of the fact that possible maladaptation hardly comes up in the evaluations of German DC up to now, and unintended effects are hardly mentioned.

6. CONCLUSIONS AND RECOMMENDATIONS

This section rates the effectiveness, impact and sustainability of the German adaptation portfolio in the agriculture and water sectors and in the area of coastal protection (Section 6.1). It also reaches a conclusion on the effectiveness of adaptation interventions to support NDCs and NAP processes through German DC (Section 6.2). The section ends with a discussion on making German adaptation interventions easier to evaluate (Section 6.3). The assessment uses the evaluation dimensions listed under the evaluation questions.

6.1 Effectiveness, impact and sustainability in the agriculture and water sectors and in the area of coastal protection

In order to establish the extent to which German DC adaptation interventions achieve their objectives, the evaluation first addressed the adaptation-related objectives of all evaluated interventions in the agriculture and water sectors and in coastal protection in the context of the evaluation synthesis. It found evidence of the achievement of objectives for only 16 percent of evaluated interventions. The achievement of objectives is slightly higher, at 22 percent, for interventions with climate adaptation as a principal objective.

However, comparing these results with the results of the systematic review indicates that the achievement of the objectives of German adaptation interventions may be underestimated. The review establishes that objectives are achieved for around 56 percent of interventions. However, German DC sets different priorities in comparison to international interventions. The findings regarding the achievement of objectives of international interventions can therefore only be transferred to German DC to a limited extent. The latter concentrates on enhancing the enabling environment and thus, across different sectors, on interventions to improve the institutional and regulatory framework conditions. Based on the systematic review, this objective plays a much lesser role in the international comparison, with the result that there is also less evidence here regarding the achievement of objectives. Therefore, German DC can be assumed more likely to achieve its objectives above all in the case of better responding to shocks and stressors in the area of coastal protection and in the case of increasing adaptive capacities in the agriculture and water sectors.

The benchmark for the objectives of “better responding to shocks and stressors” and “increasing adaptive capacities” is partially fulfilled, while the benchmark for the objective of “enhancing the enabling environment” is barely fulfilled.

Aiming to establish to what extent German DC adaptation interventions contribute to the achievement of objectives, the evaluation used the evaluation synthesis and IHM as a basis to examine the types of adaptation interventions and their respective objectives. It became apparent that nature-based solutions are used above all in responding to shocks and stressors, whereas a wide range of different interventions are used for increasing adaptive capacities. Interventions primarily aim to enhance the enabling environment by improving institutional and regulatory framework conditions. All interventions are used in the agriculture and water sectors, while nature-based solutions are predominant in the area of coastal protection.

Due to the lack of robust evidence, the question as to the contributions of German DC can only be answered to a limited extent based on the evaluation synthesis. Accordingly, DEval once again performed a comparison with the findings regarding the impact of international interventions from the systematic review. This revealed that it is primarily informational/educational interventions that make positive contributions in the agricultural sector. In the water sector, moreover, both infrastructure interventions and nature-based solutions contribute to the achievement of objectives. The area of coastal protection exhibits a rather mixed picture comprising positive, not significant and even negative contributions. Technological options and social/behavioural interventions, in particular, tend to entail a greater risk for negative effects in this respect. Across all sectors, the systematic review showed eleven percent of the interventions to exhibit negative effects. Practically no negative effects were found in the evaluations of German DC.

Overall, the systematic review reveals a series of positive effects for adaptation interventions that are also used in German DC. For example, the particularly effective area of nature-based solutions constitutes the focus of German DC in the agriculture sector and coastal protection area. In the water sector, German DC focuses on effective infrastructure interventions. The strongest outcomes and impacts at the level of direct objectives are seen in the agricultural sector.

Adaptation interventions that a) take place in a climate vulnerability context, b) set themselves adaptation-related objectives and c) are based on a theory of change geared towards dealing with climate risks, fulfil the benchmark of contributing to the objectives of “responding to shocks and stressors” and “increasing adaptive capacities” through nature-based solutions, infrastructure interventions and informational/educational interventions.

In the context of the evaluation synthesis and systematic review, the evaluation assessed the outcomes and impacts of German adaptation interventions in order to obtain evidence of their contributions to (foreseeable) climate resilience strengthening. It then used the geospatial impact analysis in Mali to evaluate a typical adaptation intervention in the nexus of the agriculture and water sectors.

On the basis of the evaluation synthesis, changes leading to improved climate resilience can be established or foreseen in only a few cases. Accordingly, as a result of a lack of evidence, there is also great uncertainty regarding the contributions of the interventions. This is also due to the focus of German DC on enhancing the enabling environment and the resulting long results chains, as well as to methodical challenges. The systematic review reveals that the effects of the interventions decrease from outcomes to impacts. The greatest positive impacts are seen in the water and agriculture sectors. In contrast, the area of coastal protection exhibits some negative effects at this level, which can primarily be explained by interventions with objectives that do not lead to a change in behaviour or to social change.

Adaptation interventions with the aim of “responding to shocks and stressors” and “increasing adaptive capacities” mostly fulfil the benchmark with regard to whether a strengthening of climate resilience can be detected or foreseen in the environment of the intervention. Adaptation interventions for “enhancing the enabling environment” fail to fulfil the benchmark of demonstrable effectiveness and impact. Adaptation interventions partially fulfil the benchmark with regard to contributions towards strengthening climate resilience in the agriculture and water sectors, but barely do so in the area of coastal protection.

Based on the geospatial impact evaluation of irrigation infrastructure interventions in Mali, this evaluation has shown that – using a rigorous impact evaluation – contributions of German DC towards strengthening climate resilience can be determined. In the process, it became clear that the irrigation interventions lead to an increase in agricultural production and in this way contribute to a substantial increase in food security and child health. Further moderate contributions include increasing household income and ensuring gender equality. There is additional potential in peacebuilding and ecological impacts of the interventions. Despite some negative effects on neighbouring regions in the area of conflict and child health, the evaluation assumes overall that the climate vulnerability of the Malian population in the project regions has decreased and their resilience has increased. The evaluation also assumes that similar results could potentially be seen for comparable interventions in other parts of the Sahel region too, for instance in Niger, Nigeria, Burkina Faso, Senegal or Chad. Moreover, a comparison spanning many years indicates that the outcomes and impacts can also be preserved in fragile contexts and even over periods of very intense conflict.

Irrigation infrastructure interventions by German development cooperation in fragile and climate-vulnerable contexts in the African Sahel region have the potential to fulfil the benchmark of adaptation interventions with regard to contributions to increase climate resilience, to generate positive co-benefits and to avoid maladaptation.

This leaves the question as to whether the outcomes and impacts are actually permanent. The evaluation synthesis determined a series of factors to which a sustainability-promoting effect can be attributed and that are also in the area of influence of the interventions. This includes the implementation of participatory and inclusive solutions and the use of existing governmental and non-governmental institutional structures. External factors such as the acceptance of those involved and affected and the consideration of their priorities proved to be factors that may influence the sustainability of interventions. Interventions that take these factors into account in implementing adaptation-related objectives also exhibit a higher potential for

sustainability. However, there is largely a lack of evidence of unintended effects and maladaptation, which should additionally be taken into account when estimating the sustainability potential.

Taking Mali as an example, the evaluation shows that both the direct effects (greater yields) and the development changes (for instance in the area of food security) can be preserved over time. The direct effects are already apparent in the first year following the completion of the irrigation infrastructure and continue over the following ten years or longer. As expected, the development changes take effect with a time delay. This means that a causal link to the intervention can be established only if the evaluation considers an extended period. The different changes in strengthening social, economic and environmental resilience can only be assessed at least ten years after the interventions are completed. This particularly concerns the evaluation of maladaptation. In the case of Mali, too, unintended effects such as a displacement of the conflict potential or reduced food security in communities living further away only become apparent after a certain time.

Adaptation interventions that take sustainability-relevant influencing factors into account in design and implementation have a greater potential of fulfilling the benchmark for supporting sustainable capacities on the part of those involved in and affected by interventions and thus contributing to the sustainability of the adaptation outcomes and impacts.

Box 2 Recommendation for promoting nature based solutions and infrastructure interventions

This report assesses the effectiveness of German adaptation interventions in the agriculture and water sectors and for the area of coastal protection. In the synthesis report of the modular adaptation evaluation, Noltze et al. (2023) aggregate the sectoral assessment and derive the following overarching recommendation:

Recommendation: The BMZ and the IKI Funding Programme should expand the funding for nature-based solutions and infrastructure interventions in order to

- help deal with shocks and stressors more effectively in particularly climate-vulnerable contexts
- and help increase adaptive capacities in countries where these capacities are low.

Implementation guidance for the recommendation:

- There is additional positive impact potential in combining various interventions if they also include informational/educational interventions.
- Interventions with the objective of enhancing the enabling environment, in particular, could be examined using specific theories of change and indicators to establish their effectiveness and impact.
- The funding could also be expanded in particular in cooperation with other donors and (multilateral) organisations.

6.2 Effectiveness of adaptation interventions in supporting NDCs and NAP processes

The contribution of German DC interventions towards integrating climate adaptation into the national policies of the partner countries by supporting NDCs and NAP processes was assessed as part of a desk study. This study examined the objectives of all German adaptation interventions to directly support NDCs and NAP processes. Based on six country case studies, it also investigated the degree of achievement of objectives and the contributions of German DC.

In the context of the case studies, it became apparent that the objective of integrating climate adaptation into the national policies of partner countries is mostly achieved. The interventions contribute towards the achievement of objectives by providing demand-oriented services. Thanks to its long-standing expertise and support for international initiatives such as the NDCP and NAP GN, German DC is recognised as a relevant cooperation partner and knowledge provider. Due to participatory and cooperative elements, however, the achievement of objectives is highly dependent on the changes in the environment of the interventions. The objectives of German DC are therefore only partially achieved in the form originally planned and barely achieved within the intended time frames.

Adaptation interventions with the objective of directly supporting NDCs and NAP processes mostly fulfil the benchmark of integrating adaptation into the national policies of partner countries.

With a view to implementing the Paris Agreement, the Federal Government continues to see a need for action in the partner countries of German DC and, with the BMZ core area strategy, aims to achieve much more ambitious policies for climate change mitigation and adaptation (BMZ, 2021). As the Federal Government sees it, most countries are only just beginning to adapt to climate change. Bearing this in mind, the BMZ has also defined new objectives for supporting NDCs and NAP processes. Its core area strategy envisages using the NDC partnerships to provide direct or indirect support to over 50 developing and emerging countries in implementing their NDCs and further increasing their ambition up to 2025. Moreover, the BMZ plans direct interventions for all partner countries that are also members of the NDCP. It also intends to expand the support for NAP processes, for example by promoting climate risk analyses.

Bearing the generally positive findings of this evaluation in mind, it appears reasonable to extend the existing engagement to support NDCs and NAP processes. However, this also seems rather ambitious in view of the small number of interventions with direct NDC and NAP support up to now. After all, the previous interventions involve quite substantial costs. For example, the average annual funding volume for BMZ-financed bilateral interventions amounts to around EUR 5 million, while that for sector programmes and global projects amounts to around EUR 10 million. Bilateral and regional IKI joint programmes have a funding volume of up to EUR 20 million.

At the same time, financial cooperation interventions have thus far failed to provide direct support for NDCs and NAP processes. Further potential could be found in commissioning policy-based financing with incentive-promoting funding volumes for implementing the NDCs and NAPs. This financing could contribute towards strengthening ownership and acceptance at the higher government levels and ultimately also towards increasing ambitions. The DEval evaluation synthesis on the effectiveness of budget support interventions (Orth et al., 2017) and the DEval evaluation of accompanying measures to budget support (Krisch et al., 2015) confirm the positive effects of such interventions on the ownership of partner countries. Expanding the support for reform processes by (co-)financing multilateral policy-based financing, which is also stipulated in the BMZ core area strategy, seems to make sense with a view to coordinated and coherent DC. However, it needs to be connected with specific adaptation-related objectives to a greater extent than has been the case so far. Finally, the instrument needs to be designed in a demand-oriented and context-specific manner. One form of policy-based financing, which DEval has investigated as part of the evaluation of the cooperation model for the reform partnerships, is what is referred to as reform financing (see Roxin et al., 2022). According to the BMZ's current Africa strategy (2023), the tried-and-tested structural elements of this model need to be incorporated into future solutions with a view to political dialogue and financial incentives and, especially in the implementation of development policy priorities, be put to use in climate change mitigation and adaptation. In line with DEval's recommendations from the evaluation of reform partnerships, the

instruments of budget and reform financing in German development cooperation should also be expanded (BMZ, 2023).

With a view to the identified need for action, the BMZ core area strategy sets a regional emphasis with its focus on LDCs (through bilateral and regional interventions) and SIDS (through multilateral and multi-donor partnerships). However, the findings of the present evaluations reveal a low level of engagement. Up to now, cooperation with LDCs takes place primarily through educational activities as part of global projects and sector programmes. Compared to other country groups, though, LDCs are also considered substantially less by these interventions. Only two LDCs (Mauritania and Bangladesh) have benefited from direct bilateral cooperation with BMZ-financed interventions up to now. However, the project volumes in these two countries, at two million and three million euros respectively, reveal a fairly low level of financing compared to other countries and in view of the transformative benchmark of the interventions. Out of all the LDCs examined, only Bangladesh obtains NDC and NAP support through bilateral cooperation, in conjunction with incorporation into a sector programme. The relatively low level of cooperation with this group of countries was already established in the allocation analysis of this evaluation (see Noltze and Rauschenbach, 2019). Targeted LDC support could be achieved by expanding the cooperation as part of bilateral interventions. As sector programmes and global projects become less relevant in conjunction with the BMZ 2030 reform process, this could additionally be linked with international initiatives. One possibility would be to integrate NDC- and NAP-specific components into adaptation interventions that are already related to enhancing the enabling environment, but are up to now not directly related to promoting NDCs and NAP processes. In more recent interventions, moreover, a greater need for support is to be expected for implementation and financing (element C of the NAP process). Especially in the case of NDC support, which continues to concentrate on mitigation objectives, it would be important to establish concrete references to adaptation and thereby also connections to the NAP process.

In view of the findings of this evaluation and the Federal Government's current objectives in expanding support for NDCs and NAP processes in partner countries of German DC, the evaluation makes the following recommendations:

Recommendation 1: The BMZ should review the use of policy-based financing to promote NDCs and NAP processes and – taking account of the results of the review – make greater use of it in order to

- achieve the objective of expanding direct support for NDCs and NAP processes
- and contribute to increasing ambitions in the partner countries in the context of the Paris Agreement.

Implementation guidance for recommendation 1:

- The BMZ could take up G7 discussions of policy-based financing by incorporating the discussion results into the internal decision-making process regarding direct support for NDCs and NAP processes.
- In conjunction with designing the instrument to meet needs and accommodate specific contexts, the BMZ could draw on recent experience with the reform financing instrument, as a form of policy-based financing, and further expand such financing forms – in line with the aspiration of the BMZ's Africa strategy.
- In addition, the BMZ could look into the possibility of strategically promoting policy-based financing – in connection with technical support and knowledge management – via the NDCP and NAP GN.

Recommendation 2: The BMZ should increase the funding for bilateral interventions in LDCs and incorporate the bilateral partner countries into the exchange of knowledge and experience of the global NDCP and NAP GN initiatives in order to

- achieve the objective of expanding direct support for NDCs and NAP processes
- and thus promote comprehensive interventions to deal with climate risks.

Implementation guidance for the recommendation 2:

- In cooperation with the IKI Funding Programme, the BMZ could address the needs of LDC partner countries that go beyond support from global initiatives, sector programmes and global projects, and review the options regarding bilateral interventions.
- Considering the shared departmental responsibility of the IKI (BMWK, BMUV and AA), the BMZ could advocate interdepartmental exchange and promote joint management of the interdepartmental portfolio to support NDC and NAP processes in LDCs.

6.3 Strengthening an evidence-based policy design

Considering the urgency of implementing effective interventions for climate adaptation in development cooperation, the lack of evidence found for the effectiveness and impact from project evaluations is rather surprising. It was assumed that project evaluations of increasingly complex DC interventions have to consider a range of evaluation questions and multiple project components that make it difficult to perform an explicit evaluation of individual issues. The assignment of the Rio marker for both CLA-2 and CLA-1 interventions, however, requires a coherent theory of change and explicit connections between the interventions and the climate vulnerability context (OECD DAC, no date). This should also be taken into account in evaluations. However, the responsibility for this does not begin with the evaluation. When assessing and designing the interventions, attention must also be paid to ensuring that such connections are explicitly conceptualised and thus possible to be evaluated later on. Even if the criticism regarding a lack of connections to adaptation cannot be conveyed without restriction to designing and implementing interventions solely on the basis of evaluations, the results of the evaluation synthesis cannot invalidate the finding regarding the overreporting of adaptation commitments either (Schramek and Harmeling, 2021; Weikmans et al., 2017).

In terms of the learning and accountability function of evaluations, the lack of evidence of the effectiveness and impact of adaptation interventions presents a clear restriction. According to the results of DEval's first meta-evaluation of the quality of the GIZ and KfW project evaluations, this was in the past primarily due to inadequate impact evaluation procedures (see Noltze et al., 2018b). The current DEval meta-evaluation by Guffler et al. (2022) does actually show that the quality of project evaluations by these two implementing organisations has increased significantly in recent years. However, both meta-evaluations pinpoint challenges in evaluation work as a result of insufficiently specific theories of change. Even against the backdrop of the large share of adaptation interventions with adaptation as a significant objective (which are substantially less visible in the theories of change and thus for the evaluation), this makes the adaptation sensitivity of project evaluations low overall.

Despite relatively large annual samples, only few evaluations are available to date that provide evidence of the effectiveness and impact of German adaptation interventions. Climate change adaptation interventions make up 17 percent of the total DC portfolio (2011–2019). The share of evaluations on adaptation interventions, however, amounts to only 10 percent of all GIZ and KfW project evaluations. This failure to obtain representative data is especially apparent for financial cooperation: As a result of the evaluation date of KfW's ex-post evaluations (3–5 years after the end of the interventions), only around 8 percent of all adaptation interventions have been evaluated up to now. In turn, only a small share of these evaluations have yielded reliable methodical evidence regarding adaptation outcomes and impacts.

The existing evaluation gaps can only be partially closed with the increasing evidence from the evaluation of international adaptation interventions. One reason for this is that the primary objective of German

adaptation-related ODA is enhancing the enabling environment. There are hardly any impact studies regarding this at international level. In addition, new evaluation gaps are to be expected for the growing share of multilateral engagement in the area of adaptation (especially in the agriculture and environmental protection sectors). This is the case at least for the question with regard to the direct contributions of German DC. An additional evaluation gap that already exists, and also cannot be closed by international studies, can be seen with regard to the sustainability of adaptation interventions. The causes include not only limited data availability and methodical challenges, but also the choice of evaluation date and the fact that climate models are still little used in the evaluation of interventions for dealing with climate risks (see Noltze et al., 2021).

Box 3 Recommendation on strengthening evidence based policies

This report assesses the coverage (share of evaluated interventions compared to the population of all interventions implemented) and the comprehensibility of evaluations of German adaptation interventions. As part of the modular adaptation evaluation, this assessment is included in the synthesis report on the evaluation. In the synthesis report, Noltze et al. (2023) provide the following overarching recommendation:

Recommendation: The BMZ and the IKI Funding Programme should strengthen the evidence-based programming of the adaptation portfolio in order to

- make the German adaptation portfolio more effective
- and thus contribute to strengthening climate resilience in the partner countries.

Implementation guidance for the recommendation:

- The BMZ and the IKI Funding Programme could compel the implementing organisations to make adaptation interventions easier to evaluate and increase the quality of evaluation – by systematically including the vulnerability context and using adaptation-related theories of change, objectives and indicators.
- The evaluations of the implementing organisations could address unintended effects and the risk of maladaptation better than they have done up to now.
- To supplement evidence from project evaluations, the BMZ and the IKI Funding Programme could promote rigorous (accompanying) evaluations, especially in “evidence-scarce” areas of the portfolio.
- Together with the implementing organisations, the BMZ and the IKI Funding Programme could improve the framework conditions for systematic learning – also through cross-sectional analyses.

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8. ANNEX

8.1 Rating scales in DEval evaluations

In DEval evaluations, findings are assessed based on evaluation questions and evaluation dimensions in line with the OECD evaluation criteria (see BMZ, 2020 and Section 1.4). Along the evaluation criteria, an evaluation subject is assessed on the basis of verifiable benchmarks. The benchmarks are evaluatory, ex ante judgements of the conditions under which the evaluation team considers that development interventions should be classified as appropriate and successful.

The rating scales are implemented based on the following steps:

- 1) Derivation of the benchmarks (for example from the theory of change) + operationalisation;
- 2) Operationalisation of the rating scales;
- 3) Data collection and analysis to determine the empirical values and assessment;
- 4) Overall assessment performed by compiling individual assessments along a six-point rating scale (see below).

Foundations for deriving benchmarks:

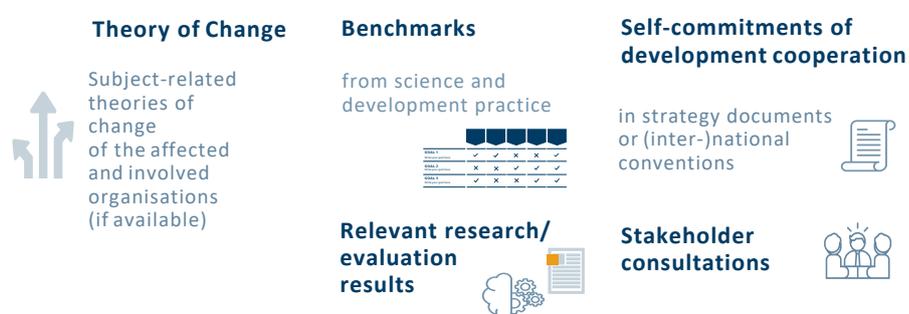


Table 3 The six-point rating scale for DEval evaluations:

Categories	Explanation
Exceeded	The intervention clearly exceeds the benchmark for the applied evaluation criterion. Findings demonstrate a result well above the benchmark.
Fulfilled	The intervention meets the benchmark for the applied evaluation criterion. Findings demonstrate that the benchmark is met.
Mostly fulfilled	The intervention largely meets the benchmark for the applied evaluation criterion. Findings which demonstrate that the benchmark is met predominate.
Partially fulfilled	The intervention partially meets the benchmark for the applied evaluation criterion. The numbers of findings demonstrating that the benchmark is met, and those demonstrating it is not, are (more or less) equal.
Barely fulfilled	The intervention barely meets the benchmark for the applied evaluation criterion. Findings which demonstrate that the benchmark is not met predominate.
Missed	The intervention does not meet the benchmark for the applied evaluation criterion. Findings demonstrate that the benchmark is not met.

8.2 Evaluation matrix

Evaluation question 1: To what extent are German DC interventions for climate change adaptation effective?

Benchmark	Indicators	Data basis	Analysis methods
German adaptation interventions achieve their objectives of 1) responding to shocks and stressors, 2) increasing adaptive capacities and 3) enhancing the enabling environment.	<p>Shocks and stressors: 1) reduced exposure to the effects of climate change/lower climate risks</p> <p>Adaptive capacities: 2a) social and 2b) economic development</p> <p>Enhanced enabling environment: development of 3a) environmental, 3b) socio-economic and 3c) institutional systems</p>	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, comparative case studies on supporting NDCs and NAP processes	Evaluation synthesis, systematic review, comparative case analysis
German adaptation interventions contribute to achieving the objectives of 1) responding to shocks and stressors, 2) increasing adaptive capacities and 3) enhancing the enabling environment.	The interventions 1) take place in a climate vulnerability context, 2) relate to dealing with climate risks, 3) have a clear and coherent theory of change with regard to dealing with climate risks and 4) can be shown to contribute to the achievement of objectives.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, comparative case studies on supporting NDCs and NAP processes	Evaluation synthesis, systematic review, comparative case analysis
German adaptation interventions contribute to integrating climate adaptation into the national policies of partner countries.	Mainstreaming of adaptation in the NDCs, harmonisation and alignment of NDCs and NAP processes.	Comparative case studies on support for NDCs and NAP processes	Comparative case analysis
German adaptation interventions avoid negative unintended effects and maladaptation.	The evaluations perform 1) an examination of unintended effects and maladaptation and show 2) to what extent the interventions anticipate unintended effects and 3) to what extent interventions against maladaptation are implemented.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, comparative case studies on supporting NDCs and NAP processes	Evaluation synthesis, systematic review, comparative case analysis

Evaluation question 2: To what extent are German DC interventions for climate change adaptation impactful?

Benchmark	Indicators	Data basis	Analysis methods
In the area of German adaptation interventions, a strengthening of climate resilience can be detected or foreseen.	Improved capacities of human and natural systems to learn to adapt and transform themselves.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, geocoded project locations, remote sensing data, geocoded survey data and focus group discussions	Evaluation synthesis, systematic review, geospatial impact evaluation
German adaptation interventions contribute towards strengthening climate resilience by 1) better responding to shocks and stressors, 2) increasing adaptive capacities and 3) enhancing the enabling environment.	By better responding to shocks and stressors, increasing adaptive capacities and enhancing the enabling environment, the interventions contribute to 1) social, 2) economic and 3) environmental changes.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, geocoded project locations, remote sensing data, geocoded survey data and focus group discussions	Evaluation synthesis, systematic review, geospatial impact evaluation
German adaptation interventions avoid negative unintended effects and maladaptation.	The evaluations perform 1) an examination of unintended effects and maladaptation and show 2) to what extent the interventions anticipate unintended effects and 3) to what extent interventions against maladaptation are implemented.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, geocoded project locations, remote sensing data, geocoded survey data and focus group discussions	Evaluation synthesis, systematic review, geospatial impact evaluation

Evaluation question 3: To what extent are German DC interventions for climate change adaptation sustainable?

Benchmark	Indicators	Data basis	Analysis methods
Those involved and affected have the capacity to preserve the effects over time.	Internal and external conducive and impeding success factors that can be plausibly correlated to the sustainability of effects.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, geocoded project locations, remote sensing data, geocoded survey data and focus group discussions.	Evaluation synthesis, systematic review, geospatial impact evaluation
German adaptation interventions contribute towards supporting sustainable capacities.	Contribution to supporting conducive factors that can be plausibly correlated to the sustainability of effects.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, geocoded project locations, remote sensing data, geocoded survey data and focus group discussions.	Evaluation synthesis, systematic review, geospatial impact evaluation
The sustainability of the achieved objectives in 1) better responding to shocks and stressors, 2) increasing adaptive capacities and 3) enhancing the enabling environment and achieving climate resilience over time.	Evidence of the sustainability of effects over time.	GIZ and KfW project evaluations, internationally available evidence from studies, evaluations and grey literature, geocoded project locations, remote sensing data, geocoded survey data and focus group discussions.	Evaluation synthesis, systematic review, geospatial impact evaluation

8.3 Tables and illustrations

Figure 15 Adaptation interventions and objectives of German development cooperation based on the IHM by sector/area and their potential direction of impact based on international evidence

Interventions	Number	Adaptation objectives		
		Better responses to shocks and stressors	Increased adaptive capacities	Enhanced enabling environment
Water	Nature-based solutions	22	30	20
	Infrastructure interventions	10	44	0
	Technological options	1	14	12
	Informational/educational interventions	3	7	29
	Institutional and regulatory framework conditions	8	6	25
	Financial and market mechanisms	0	3	0
	Social/behavioural interventions	18	3	14
Coastal protection	Nature-based solutions	7	0	12
	Infrastructure interventions	4	2	0
	Technological options	0	0	0
	Informational/educational interventions	0	0	3
	Institutional and regulatory framework conditions	1	0	10
	Financial and market mechanisms	4	2	0
	Social/behavioural interventions	0	0	0
Agriculture	Nature-based solutions	39	283	163
	Infrastructure interventions	1	9	3
	Technological options	7	11	10
	Informational/educational interventions	3	56	77
	Institutional and regulatory framework conditions	0	38	34
	Financial and market mechanisms	8	13	7
	Social/behavioural interventions	8	112	212
Overall (percentage)	1.391	129 (10%)	631 (45%)	631 (45%)

Source: DEval, own visualisation based on the results of the IHM as per Doswald et al. (2020) for German DC and on the systematic review of studies on the effectiveness of international adaptation interventions. Green = significantly positive effect, yellow= insignificant effect, red = significantly negative effect, grey = no evidence available on the effectiveness of international adaptation interventions. Hatched areas take account of an unclear direction of impact based on the two dominant colours (see also Figure 9)

Table 4 Overview of the studies included from the systematic review

Authors	Year of publication	Country	Climate risks	Study design	Adaptation interventions	Outcome	Direction of impact	Magnitude of impact	ID EGM paper
			0 = Not specified	1 = Experimental; 2 = Quasi-experimental; 3 = Non-experimental; 4 = Review	1 = Nature-based solutions; 2 = Infrastructure; 3 = Technology; 4 = Information/education; 5 = Institutions/regulation; 6 = Financial/market mechanisms; 7 = Behaviour/society	1 = Shocks and stressors, 2 = Adaptive capacities, 3 = Enhanced enabling environment	1 = Significantly negative; 2 = Not significant; 3 = Significantly positive; 99 = NA	1 = Very small/insignificant 2 = Small/medium; 3 = Large/very large; 99 = NA	
Agriculture									
Abate et al.	2015	Ethiopia	Droughts	2	1, 3, 4	2 (x3)	2 (x3)	3 (x3)	143
Adu et al.	2018	Ghana	0	4	3 (x3), 4 (x3)	1 (x2), 2 (x4)	3 (x6)	2 (x6)	172
Arshad et al.	2018	Pakistan	Droughts, floods, heat stress	3	4	2	2	1	229
Arshad et al.	2017	Pakistan	Droughts, floods, heat stress	3	3, 4	2 (x2)	3 (x2)	2 (x2)	231
Asfaw et al.	2018	Niger	Droughts, floods	3	7 (x2)	1, 2	1, 3	2 (x2)	238
Asravor	2018	Ghana	Droughts, floods	3	5 (x2)	1 (x2)	3 (x2)	2 (x2)	240

Bandyop adhyay et al.	2007	Philippines	Droughts	2	5	2	2	1	144
Basupi et al.	2017	Global	Droughts	4	5 (x3)	2 (x2), 3	1 (x3)	2 (x3)	256
Berhe et al.	2017	Ethiopia	Droughts	3	7	2	3	2	262
Cai et al.	2010	China	0	1	6	2	3	2	145
Camacho and Conover	2011	Colombia	0	1	4 (x2)	1, 2	2, 3	1, 2	147
Cardona Santos et al.	2015	Mexico	0	2	6 (x3)	3 (x3)	1 (x2), 2	1, 2 (x2)	24
Chhetri and Easterlin g	2010	Nepal	Droughts, cold	3	3, 5	3 (x2)	1 (x2)	2 (x2)	303
Chowdh ury and Moore	2017	Banglades h	Floods, water logging	4	1 (x2)	1, 2	3 (x2)	2 (x2)	307
Cinco et al.	2016	Philippines	Rainfall, droughts, floods, cyclones	3	1, 4 (x3)	3 (x4)	2 (x2), 3 (x2)	1, 2 (x3)	546
Daidone et al.	2017	Lesotho	0	2	4 (x2), 6 (x2)	1 (x2), 2 (x2)	2, 3 (x3)	1, 2 (x3)	319
Dang et al.	2014	Vietnam	0	3	2 (x4)	1 (x4)	2 (x3), 3	1(x2), 2(x2)	323

Datta	2015	India	0	2	1 (x3), 2 (x2)	2 (x5)	2 (x3), 3(x2)	1, 2 (x4)	332
Diab	2015	Egypt	0	3	4 (x8)	2 (x8)	3 (x8)	2 (x8)	350
Duflo and Pande	2007	India	0	3	2, 5 (x2)	2 (x2), 3	1, 3 (x2)	3 (x3)	354
Fang et al.	2017	China	Rainfall	3	2 (x2), 7(x2)	2 (x4)	1 (x2), 3 (x2)	3 (x4)	381
Gautier et al.	2016	West Africa	Droughts	4	1, 5, 6, 7(x3)	2 (x4), 3 (x2)	2, 3 (x5)	2 (x5), 99	405
Gedan et al.	2011	Global	Rising seal level	4	3 (x3)	1 (x3)	3 (x3)	3 (x3)	409
Gessesse et al.	2018	China	0	3	4 (x6)	2 (x6)	2, 3 (x5)	2 (x2), 3 (x4)	412
Gil et al.	2017	Global	Droughts, rain, vegetation	4	1 (x4)	1 (x3), 2	3 (x4)	2 (x4)	414
Gomez	2015	Philippines	0	3	2, 3	2 (x2)	3 (x2)	2 (x2)	416
Gori Maia et al.	2016	Brazil	Droughts	3	1 (x4), 3 (x10), 4(x5), 6 (x5), 7 (x5)	2 (x29)	1 (x2), 2 (x12), 3 (x15)	1 (x12), 2 (x17)	43
Gutiérrez Rodríguez et al.	2016	China	Floods, soil erosion	4	1 (x10), 4 (x10), 6 (x10)	1 (x6), 2 (x9), 3 (x15)	1 (x3), 2 (x6), 3 (x21)	2 (x24), 99 (x6)	906
Gutu	2017	Ethiopia	Droughts, floods	3	3, 4, 6	1 (x3)	3 (x3)	2 (x3)	49
Imran et al.	2018	Pakistan	Droughts, falling groundwater level	3	1 (x2), 3 (x2), 4 (x2), 6 (x3)	2 (x9)	1, 2 (x8)	1 (x8), 2	457

Jawid and Khadjavi	2018	Afghanistan	Droughts, floods	2	4 (x4), 5 (x4)	1 (x6), 3 (x2)	2 (x4), 3 (x4)	1 (x4), 2 (x4)	899
Keshavarz et al.	2017	Iran	Droughts	3	3, 6, 7	1 (x3)	3 (x3)	2 (x3)	497
Khanal et al.	2018	Nepal	Temperature, rain, monsoon periods, storms, landslides, droughts	2	1 (x2), 3 (x2), 7	2 (x5)	2 (x2), 3 (x3)	2(x5)	503
Khandker and Koolwal	2016	Bangladesh	Floods, fires	2	6 (x2)	2 (x2)	2 (x2)	1 (x2)	505
Khatri-Chhetri et al.	2016	India	Droughts, floods	2	1 (x3), 3 (x6), 6 (x2)	2 (x11)	2 (x2), 3 (x9)	2 (x11)	506
Klumper and Theesfeld	2017	Tajikistan	Droughts, floods	3	5 (x4)	3 (x4)	2, 3 (x3)	2 (x4)	521
Kumar et al.	2016	India	Rain, heatwaves	2	1, 3, 4, 7	2 (x4)	3 (x4)	2 (x4)	535
Leclerc et al.	2013	Kenya	Droughts	3	4 (x2)	2 (x2)	3 (x2)	2 (x2)	549
Li et al.	2018	China	Droughts	3	2	1	3	2	560
Li et al.	2017	China	Droughts	3	2, 4, 5, 7	2 (x4)	2, 3 (x3)	1, 2 (x3)	559
Li et al.	2016	China	0	4	1 (x3)	2 (x3)	2, 3 (x2)	2 (x3)	557

Liu et al.	2010	China	0	2	5	2	2	1	565
Longe and Oyekale	2013	Nigeria	Droughts, floods, heat stress	3	4	1	3	2	164
Ma and Maystadt	2017	China	Droughts	3	7	2	3	3	575
Magombeyi et al.	2018	Global	Droughts	4	1 (x4), 3 (x5)	2 (x9)	2 (x6), 3 (x3)	1 (x6), 2 (x2), 3	578
Mango et al.	2018	Malawi	Droughts, floods	3	1 (x2), 2 (x2), 6 (x2)	1 (x6)	2 (x2), 3 (x4)	1, 2 (x5)	590
Mapfumo et al.	2013	Global	Rain, droughts	1	1 (x2), 3, 7	2 (x4)	3 (x4)	2 (x4)	592
Mishra et al.	2018	India	0	2	5 (x4)	1 (x2), 2, 3	1, 3 (x3)	2 (x4)	610
Mueller and Osgood	2009	Brazil	Rain	3	7	2	2	1	619
Muricho et al.	2018	Kenya	Droughts, animal epidemics	3	1, 2 (x3), 3 (x3), 4, 6 (x2), 7(x2)	1 (x12)	1, 2 (x6), 3 (x5)	1 (x3), 2 (x9)	624
Mutsvanga-Sammie et al.	2013	Zimbabwe	Droughts, floods	3	4, 7	1 (x2)	2, 3	2 (x2)	80
Narayan and Sahu	2016	India	Cyclones, rain, temperature	3	4, 7	1 (x2)	3 (x2)	2 (x2)	633

Ngigi and Birner	2013	Kenya	Droughts, floods	3	1, 7	2 (x2)	2 (x2)	3 (x2)	85
Otieno et al.	2017	Kenya	Droughts	3	4, 5, 6, 7	2 (x4)	2, 3 (x3)	2 (x4)	662
Oxfam	2012	Pakistan	Floods	2	2 (x4), 4 (x4), 5 (x4)	1 (x3), 2 (x9)	2 (x3), 3 (x9)	1 (x3), 2 (x9)	902
Oyekale	2013	South Africa	Droughts, rain, epidemics, storms, temperature	3	1 (x3), 6	1 (x4)	3 (x4)	2 (x4)	664
Palanisa mi et al.	2014	India	0	2	4	2	3	2	669
Palmer Jones et al.	2012	Thailand	Droughts	2	2, 4, 7	2 (x3)	2 (x3)	2(x3)	156
Rahut and Ali	2018	Pakistan	0	2	1 (x3), 6 (x6), 7 (x3)	2 (x10), 3 (x2)	1 (x4), 2 (x5), 3 (x3)	1 (x4), 2 (x8)	703
Rahut and Ali	2017	Pakistan	Rain, storms, droughts, floods	2	1 (x5), 3 (x3), 7 (x3)	2 (x7), 3 (x4)	1, 2 (x3), 3 (x7)	1 (x3), 2 (x8)	702
Ramirez et al.	2011	Jordan	0	3	1 (x2), 2 (x3), 4, 6	2 (x7)	2, 3 (x6)	2 (x6), 3	704
Raseduzz aman and Jensen	2017	Global	0	4	1	2	2	2	707
Roco et al.	2017	Chile	Droughts, floods, frost	3	2 (x2), 3	2 (x3)	2, 3(x2)	2 (x2), 99	718

Rouabhi et al.	2016	Algeria	0	3	6 (x2)	2 (x2)	3 (x2)	2, 3	726
Rufin et al.	2018	Global	0	3	2	2	3	2	728
Samuel Oyekale and Mukela	2013	Nigeria	Floods	3	4 (x5), 6 (x5), 7 (x10)	1 (x12), 2 (x4), 3 (x4)	2 (x13), 3 (x7)	1 (x2), 2 (x18)	739
Scantlan and Tamang	2018	Nepal	Floods, landslides	2	1, 4 (x7), 6 (x2), 7 (x2)	1 (x6), 2 (x2), 3 (x4)	3 (x12)	2 (x12)	108
Schmidt and Tadesse	2012	Ethiopia	Droughts, floods	2	1, 2	2 (x2)	3 (x2)	2 (x2)	157
Sekhri	2011	India	0	2	2	3	3	2	746
Seo	2011	Global	Temperature, rain	2	5	2	2	2	749
Shaik	2013	India	0	3	6 (x2)	1 (x2)	3 (x2)	2 (x2)	757
Song et al.	2018	China	Droughts, floods, temperature, rain	2	2 (x2)	2 (x2)	2, 3	1, 3	780
Stalland	2012	Niger	Floods	2	4 (x2), 6 (x2), 7 (x2)	1 (x3), 2 (x3)	3 (x6)	2 (x6)	46
Steward et al.	2018	Global	Heat stress, droughts	4	1	2	3	2	793
Strobl and Strobl	2011	Global	Droughts	3	2	2	3	2	795

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Tabbo and Amadou	2017	Niger	0	3	1 (x3), 2, 3 (x2), 4, 6 (x3), 7 (x2)	2 (x12)	1 (x4), 2 (x2), 3 (x6)	2 (x7), 3 (x4), 99	803
Tang et al.	2016	China	Water scarcity	3	3 (x2), 7	1 (x2), 2	3 (x3)	2 (x2), 3	810
Treacy et al.	2018	China	0	2	5 (x3)	1, 2 (x2)	2 (x2), 3	1, (2x)	830
Wang et al.	2014	China	Droughts	3	2 (x3)	2 (x3)	2, 3 (x2)	2 (x3)	851
Wilson et al.	2018	Global	Floods, droughts	4	1, 4, 7	1 (x3)	2 (x3)	1 (x3)	132
Yegbemy et al.	2017	Benin	0	3	1 (x9), 4 (x3), 6 (x3), 7 (x3)	2 (x6), 3 (x12)	1, 2 (x9), 3 (x8)	2 (x18)	873
Zaveri et al.	2016	India	Droughts	3	2	1 (x4)	1, 2, 3 (x2)	1, 2 (x3)	141
Zhang et al.	2016	China	Droughts, temperature, rain	3	3, 6	1, 2	2, 3	1, 2	884
Zhao et al.	2017	China	0	4	1	2	2	1	888
Zhou et al.	2017	China	Water scarcity	3	7	2	2	1	895
Coastal protection									
Ahsan et al.	2016	Bangladesh	Coastal flooding	3	7	1	3	2	179

Ajibade et al.	2015	Nigeria	Coastal flooding	3	7 (x2)	1 (x2)	3 (x2)	2 (x2)	181
Allaire	2016	Thailand	Coastal flooding	2	4	1	3	3	198
Bahinipati and Patnaik	2015	India	Cyclones, coastal flooding	3	5 (x2)	1 (x2)	3 (x2)	2 (x2)	247
Bhattacharjee and Behera	2018	India	Floods	3	1 (x2)	1 (x2)	3 (x2)	2 (x2)	266
Brink et al.	2016	Global	Floods	4	5	3	3	2	275
Chatenoux and Peduzzi	2007	Global	Tsunamis	3	1 (x2)	1 (x2)	1, 3	2	292
Chinh et al.	2017	Vietnam	Rising river and sea levels	3	2 (x2), 4	1 (x3)	2, 3 (x2)	2 (x3)	305
Das and Vincent	2009	India	Coastal flooding	3	1, 4	1 (x2)	3 (x2)	2, 3	330
Huang-Lachmann et al.	2018	Global	Droughts, floods, storms	3	5	2	3	2	452
Jacobo et al.	2015	Argentina	Floods	1	3 (x5)	2, 3 (x4)	1 (x3), 2, 3	2 (x5)	467
Kaplan et al.	2009	Sri Lanka	Tsunamis	3	1	1	2	1	484
Li et al.	2018	China	0	3	2, 4, 6	3 (x3)	2 (x2), 3		556

Mallick and Sultana	2017	Bangladesh	Rising sea level, floods	3	7 (x17)	1 (x6), 2 (x11)	1 (x12), 2 (x4), 3	1 (x4), 2 (x13)	589
Morris et al.	2018	Global	Floods, storm surges	4	1 (x5), 2 (x2)	1 (x3), 3 (x4)	2 (x4), 3 (x3)	1, 4 (x4), 99 (x2)	616
Perez-Maqueo	2018	Mexico	Storms, cyclones, hurricanes	3	1 (x22)	1 (x14), 2 (x8)	2 (x22)	1 (x22)	682
Shepard et al.	2011	Global	Coastal flooding	4	1 (x2)	1 (x2)	3 (x2)	2 (x2)	762
Wang et al.	2018	China	Droughts	3	2 (x2)	1, 2	1, 3	2 (x2)	852
Water									
Arriagada et al.	2012	Costa Rica	0	2	6	3	3	2	227
Corps	2017	Ethiopia	Droughts	2	1 (x3), 4 (x3), 6 (x4)	1 (x3), 2 (x4), 3 (x3)	2, 3 (x9)	2 (x10)	29
Costedoat et al.	2015	Mexico	0	3	6	3	1	3	316
Datta et al.	2015	Costa Rica	0	1	4, 7	3 (x2)	3 (x2)	2 (x2)	150
De los Santos-Montero and Bravo-Ureta	2017	Nicaragua	0	2	1	2	3	2	333

DeLonge and Basche	2018	Global	0	4	1 (x4)	3 (x4)	2 (x4)	2 (x4)	337
Kamara et al.	2018	South Africa	Droughts	4	4, 5, 7 (x2)	1 (x4)	2, 3 (x3)	2 (x2), 3, 99	480
Khan	2014	Pakistan	Floods	2	2 (x4), 6	1 (x5)	3 (x5)	2 (x5)	499
Kisakye and Van der Bruggen	2018	Uganda	0	1	3	2	3	2	516
Klasen et al.	2011	Yemen	Water-borne diseases	2	2 (x2)	1 (x2)	2 (x2)	1 (x2)	153
Legesse and Rao	2015	Ethiopia	Droughts, floods	3	2 (x4)	1, 2, 3 (x2)	2 (x4)	1 (x4)	551
Reckien	2014	India	Rain, heatwaves	3	2	1	3	3	711
Tabatabaee and Han	2010	Iran	0	1	3	3	3	3	802
Wang et al.	2012	China	0	1	1	3	3	2	848
Xu et al.	2014	China	0	1	2 (x2)	3 (x2)	3 (x2)	3 (x2)	868

Table 5 Overview of the case study countries for NDCs and NAP processes

Case study	Focus	Intervention, project number (PN)	Commissioning party/ implementation	Term	German contribution (in millions of euros)
Tanzania	NAP	Climate Policy Support Project, PN 201420017	BMZ/GIZ	2014–2018	17.75
		Climate Finance Readiness Programme, PN 201297696	BMZ/GIZ	2012–2019	10
Benin	NAP	Science-based support for national adaptation plan (NAP) processes in francophone LDC in Sub-Saharan Africa, PN 201590439	IKI/GIZ	2016–2019	5.64
Thailand	NAP	Risk-based national adaptation plan (risk NAP), PN 201490432	IKI/GIZ	2015–2019	4.55
		Integrating Agriculture into National Adaptation Plans Programme (NAP-Ag)	IKI/UNDP/FAO	2015–2020	15 (global)
Vietnam	NDC	Support for Vietnam in implementing the Paris Agreement, PN 201790104	IKI/GIZ	2018–2022	10.3
Jordan	NDC	Development of an effective mechanism for revising and implementing the Jordanian NDCs: PN 201790138	IKI/GIZ	2018–2020	2
		Climate Policy Support Project, PN 201420017	BMZ/GIZ	2014–2018	17.75
Colombia	NDC	German contribution to the EU climate programme in Latin America, EUROKLIMA+, PN 201697507, PN 201722016	BMZ/GIZ	2016–2021 2016–2021	11.65 1.96
		NDC support for Colombia, PN 201790567	IKI/GIZ	2018–2022	9.63
		Implementation of the SDG agenda in the environmental sector (phase I-III): PN 201867126	BMZ/KfW	2019–2021 (phase I, II) 2021–2022 (phase III)	100 per phase I, II 150 for phase III

8.4 Evaluation schedule

This evaluation is part of the modular DEval evaluation of interventions for climate change adaptation. The evaluation as a whole began with a conception phase for the various modules in December 2018. The individual modules (see also the portfolio and allocation analysis by Noltze and Rauschenbach, 2019 and the instrument evaluation on managing residual climate risks by Leppert et al., 2021) then each underwent an inception, data-collection, analysis, synthesis and reporting phase. The modular evaluation ends with the joint publication of this evaluation report and the synthesis report on the evaluation (see Noltze et al., 2023).

Time frame	Tasks/phases
1/2019 – 3/2019	Conception phase
3/2019	Reference group meeting
3/2020 – 6/2020	Inception phase
5/2020	Reference group meeting
7/2020 – 12/2020	Data-collection phase
1/2021 – 6/2021	Analysis and synthesis phase
10/2021	Reference group meeting
6/2022 – 11/2022	Reporting phase
5/2023	Publication

8.5 Evaluation team and contributors

Core team	Function	CRedit statement ¹⁷
Dr Martin Noltze	Senior Evaluator and team leader	Supervision, conceptualisation, methodology, project administration, visualisation, writing – original draft, writing – review & editing
Alexandra Köngeter	Evaluator	Conceptualisation, data curation, formal analysis, investigation, methodology, software, visualisation
Dr Isabel Mank	Evaluator	Data curation, formal analysis, investigation, methodology, software, validation, visualisation

¹⁷ The CRedit statement (Contributor Roles Taxonomy, <https://credit.niso.org/>) indicates the roles of the authors of this evaluation report in the evaluation. The CRedit taxonomy distinguishes between 14 different roles to show the specific contribution of the individual authors.

Kevin Moull	Evaluator	Conceptualisation, data curation, formal analysis, investigation, methodology, software, visualisation
Dr Mascha Rauschenbach	Evaluator	Conceptualisation, data curation, formal analysis, investigation, methodology, software, supervision, validation, visualisation
Sylvia Vogt	Project Administrator	

Contributors	Role
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Dr Rachel Sayers	External consultant (AidData)
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Responsible	Role
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