

Corporate Unit Evaluation Central Project Evaluation

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Central Project Evaluation

Promotion of Geothermal Energy in Central America

Project number: 2014.2507.3

Evaluation Report

On behalf of GIZ by Tim-Patrick Meyer and Allan López Saborío

Published: January 2022

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Contents

List of tables and figures	4
Abbreviations	5
The project at a glance	7
1 Evaluation objectives and questions	8
1.1 Objectives of the evaluation	8
1.2 Evaluation questions	8
2 Object of the evaluation	9
2.1 Definition of the evaluation object	9
2.2 Results model including hypotheses	11
3 Evaluability and evaluation process	14
3.1 Evaluability: data availability and quality	14
3.2 Evaluation process	14
4 Assessment according to OECD/DAC criteria	17
4.1 Relevance	17
4.2 Effectiveness	26
4.3 Impact	40
4.4 Efficiency	46
4.5 Sustainability	50
4.6 Key results and overall rating	54
5 Conclusions and recommendations	58
5.1 Factors of success or failure	58
5.2 Conclusions and recommendations	59
List of references	62
Annex: Evalutaion matrix	64

List of tables and figures

Table 1: List of evaluation stakeholders and selected interviewees.	15
Table 2: Rating of OECD/DAC criterion: relevance	26
Table 3: SMART assessment of outcome indicators	27
Table 4: Rating of OECD/DAC criterion: effectiveness.....	40
Table 5: Rating of OECD/DAC criterion: impact	45
Table 6: Rating of OECD/DAC criterion: efficiency	50
Table 7: Rating of OECD/DAC criterion: sustainability	54
Table 8: Overall rating of OECD/DAC criteria and assessment dimensions.	57
Table 9: Rating and score scales.....	57
Figure 1: Results model adapted on 24 June 2020 at the inception workshop with project team.	12

Abbreviations

BGR	Bundesanstalt für Geowissenschaften und Rohstoffe (Federal Institute for Geosciences and Natural Resources)
BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung (German Federal Ministry for Economic Cooperation and Development)
CECACIER	Comité Regional de CIER para Centroamérica y El Caribe (Association of Companies and Organizations in the Central American Energy Sector)
CEPAL	Comisión Económica para América Latina y el Caribe (Economic Commission for Latin America and the Caribbean)
CIER	Comisión de Integración Energética Regional (Regional Energy Integration Commission)
CRIE	Comisión Regional de Interconexión Eléctrica (Commission for the Electrical Network System)
DKTI	Deutsche Klima- und Technologieinitiative (German Climate Technology Initiative)
FECAICA	Federación de Cámaras y Asociaciones de América Central (Federation of Central American Chambers of Industry and Associations)
FOGEO	Proyecto Fomento de la Geotermia en Centro América (Project Promotion of Geothermal Energy in Central America)
GDF	Geothermal Development Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICE	Instituto Costarricense de Electricidad (Costa Rican Electricity Institute)
INCAE	Instituto Centroamericano de Administración de Empresas (Central American Institute for Business Administration)
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
OECD/DAC	Organisation for Economic Cooperation and Development/Development Assistance Committee
PA	Priority area
PN	Project number
SDG	Sustainable Development Goal
SICA	Sistema de la Integración Centroamericana (Central American Integration System)
SMART	Specific, measurable, achievable, relevant, time-bound
TAF	Technical Assistance Forum
UCE	Unidad de Coordinación Energética (Energy Coordination Unit)



The project at a glance

Central America (Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua, Panama): Promotion of Geothermal Development

Project number	2014.2507.3
Creditor Reporting System Code	23260 - Geothermal energy
Project objective	There is increased demand in Central America for geothermal energy, and the climate for investment in geothermal projects is steadily improving.
Project term	August 2015 to November 2020
Project volume	EUR 6,000,000
Commissioning party	German Federal Ministry for Economic Cooperation and Development (BMZ)
Lead executing agency	Central American Integration System (Sistema de la Integración Centroamericana, SICA)
Implementing organisations (in the partner countries)	<p>The energy ministries of the partner countries were important implementing partners at the national political level. The energy ministers of the countries form the Council of Energy Ministers within SICA and are therefore part of the lead executing agency.</p> <p>In relation to pilot projects, the project worked with private and public project developers from the energy sector.</p> <p>In terms of dialogue and information, the Association of Companies and Organizations in the Central American Energy Sector (Comité Regional de CIER para Centroamérica y El Caribe, CECACIER) was an important implementing partner. Furthermore, in the area of information the think tank and applied research institution of INCAE Business School played an important role in project implementation.</p> <p>In the area of research, education and science, the Universities of El Salvador and Costa Rica, the Technological Institute of Costa Rica, the Technical University La Salle (Nicaragua) as well as the research centre of La Geo were important implementing organisations.</p>
Other development organisations involved	KfW Development Bank (Geothermal Development Facility), BGR Technical Cooperation (Identification of Geothermal Resources)
Target groups	The project's direct target groups were energy companies, investors and project developers active in the field of geothermal energy or interested in technology. The indirect target group consisted of energy consumers – such as private households – industry and commerce as well as the public sector. All these parties would benefit from a secure, cost-effective and climate-friendly energy supply, which the project intends to advance. Finally, women and disadvantaged population groups like the poor rural population also belonged to the target group. Geographically, the regional project focused on Costa Rica, Guatemala, El Salvador, Honduras, Nicaragua and Panama.

1 Evaluation objectives and questions

This chapter aims to ensure a common understanding between the evaluators, the project team and GIZ's Cooperate Evaluation Unit of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH concerning the objective of the evaluation and the questions to be pursued by the evaluation.

1.1 Objectives of the evaluation

The evaluated project was selected as part of the GIZ Evaluation Unit's random sample. As a final project evaluation, it pursues the following objectives:

- to provide the basis for GIZ's accountability requirements, particularly towards BMZ,
- to contribute to GIZ's continuous organisational learning process, and
- to satisfy the knowledge needs of implementing partners and other stakeholders, and assist their decision-making through evidence from past experiences.

Given that results orientation is a key characteristic of the work of GIZ, the evaluation aimed to measure the project's success not only in terms of the activities performed and services delivered. It also looked at results in terms of changes that could be attributed to the project. In this context, the evaluation considered internal and external factors (strengths, weaknesses, threats and opportunities) that influenced progress towards the intervention's objectives.

The evaluation pursued a participatory approach by involving stakeholders whenever possible. They were not only informed about the evaluation process and goals and asked for their views on the project itself (in the actual evaluation phase), but also invited to provide input on their information and knowledge requirements regarding the evaluation in its inception phase.

1.2 Evaluation questions

The project was assessed on the basis of standardised evaluation criteria and questions to ensure comparability. This is based on the OECD/DAC criteria for the evaluation of development cooperation and the evaluation criteria for German bilateral cooperation: relevance, efficiency, effectiveness, impact and sustainability. Aspects regarding the criteria of coherence, complementarity and coordination are included in the other criteria.

Specific evaluation dimensions and analytical questions are derived from this given framework by GIZ. These evaluation dimensions and analytical questions are the basis for all central project evaluations in GIZ and can be found in the evaluation matrix (see Annex 1). In addition, the contributions to Agenda 2030 and its principles (such as the integrative approach, Leave No One Behind) are also taken into account along with cross-cutting issues such as gender, the environment, conflict sensitivity and human rights.

In order to supplement the standardised questions and increase the utility of the evaluation, the evaluation team collected additional questions from selected partners and stakeholders¹ during the inception mission thereby incorporating their particular knowledge and learning interests in the evaluation. These additional questions have been added to the evaluation matrix in a separate sheet and addressed in the assessment of the

¹ These are: GIZ Regional Director for Guatemala, El Salvador and Belize; GIZ's Sectoral Unit, CECACIER, ICE, LaGeo, SICA.

corresponding OECD/DAC criteria below.

2 Object of the evaluation

This chapter encompasses the definition of the object of evaluation. This includes a description of the project, its results model and central hypotheses, as well as a description of the current project status.

2.1 Definition of the evaluation object

The object of this evaluation is the technical cooperation module Promotion of Geothermal Energy in Central America, project number 2014.2507.3. In this report, it is referred to as 'the project'. The initially foreseen duration was from 17 August 2015 to 30 June 2020, but in April 2020 a cost-neutral extension was granted by the German Federal Ministry for Economic Cooperation and Development, Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung, BMZ) until 31 October 2020. Otherwise, there have not been any modifications to the project. There was also no increase of the project budget, which remained at EUR 6,000,000. The funding was provided by the German Federal Ministry of Economic Cooperation and Development (BMZ) within the German Climate Technology Initiative (DKTI).

A predecessor module does not exist and therefore was not part of the evaluation. A follow-up project entitled Geothermal Use of Heat in Industrial Processes in Central America (PN 2019.2268.1) has been running since November 2020 and has a duration of three years. It was not part of the evaluation, nor did the evaluation provide input into its design.

The project was part of a larger coordinated German development cooperation engagement and implemented in close cooperation with the technical cooperation module Identification of Geothermal Resources in Central America of the Federal Institute for Geosciences and Natural Resources (Bundesanstalt für Geowissenschaften und Rohstoffe, BGR) and the Geothermal Development Facility (GDF), a financial cooperation initiative of KfW Development Bank.

The project covered all Central American countries with the exception of Belize (Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua and Panama). Around one third of the energy generation in these countries is based on the combustion of fossil fuels, which are almost all imported. In addition, Central America's energy consumption is growing constantly (between 2000 and 2013 it saw an increase by 72%), and the rising energy requirements are covered primarily by conventional energy sources (GIZ 2015).

In order to counteract energy dependency on other countries, rising prices as well as environmental damage and climate change caused by fossil fuels, the Sustainable Central American Energy Strategy 2020 – adopted in 2007 – anticipates an increase of renewable sources in the Central American energy matrix, particularly in the power sector. Hydropower plants have contributed around 47% to electricity generation in the region in 2013 (GIZ 2015), but their energy production is affected by seasonal and climate-related fluctuations and the power plants face rising resistance from the population. Therefore, the regional energy strategy foresees an increased role for geothermal energy. As a base-load capable energy carrier, geothermal energy has the advantage of constantly generating electricity and heat regardless of climatic influences. This would facilitate supply and grid stability.

Central America's geology comprises active volcanoes, which allows successful use geothermal energy of

high, medium and low enthalpy. The region already has experience in various stages of this industry, which has developed differently in each country, but the total potential is far from being exploited. Currently only 8% of annual regional electricity needs are met by geothermal sources but there is potential to develop it up to 70% of the installed capacity (GIZ 2015). Also, there is significant potential for the direct use of geothermal heat.

Against this background, the project aimed to improve the investment climate for geothermal projects in its partner countries. The methodological concept was based on a multilevel approach that included the macro, meso and micro levels. Through an integrated approach, the project intended to reduce uncertainties involved in implementing geothermal projects due to high initial investment and the low rate of return over time. Specifically, the project worked in the following five priority areas (PA):

PA 1: Advice on improving legal and regulatory framework conditions for using geothermal energy

To make investment in geothermal projects of all enthalpies attractive, a very well-defined and transparent legal and regulatory framework is required to attract new capital. Against this background, the project advised the national ministries and regulatory authorities of the partner countries on reducing legal, regulatory and normative investment barriers (macro level). On the regional level, the main implementing partner in this PA was the Central American Integration System (SICA).

PA 2: Demonstration of technical feasibility and profitability of geothermal direct use applications

The project cooperated with project developers and other stakeholders (such as universities) to support the elaboration of feasibility studies to promote pilot projects and demonstrate their viability (micro-level). Since there was practically no experience in the use of geothermal energy in the low-enthalpy range in Central America, this PA focused on direct geothermal uses for the benefit of rural communities.

PA 3: Capacity building on geothermal energy

The project supported the creation of capacities needed to expand geothermal energy in Central America. It aimed to cover the need for specialists and executives in the geothermal sector in energy ministries, companies and universities. To this end, the project supported educational and training institutions (meso level) in developing and anchoring geothermal qualification programmes. The project also carried out trainings for multipliers – or those who pass on the knowledge in future trainings – to implement the educational programmes.

PA 4: Support to national and regional dialogue processes to intensify technical exchange, promote learning across borders and foster greater market development

In this PA, the project aimed to foster regional dialogue at the macro level in order to promote cross-border exchange between ministries and regulatory authorities. The project worked to put geothermal energy (with a focus on direct uses) on the agenda of existing communication platforms by providing organisational support, expertise and know-how to the dialogue processes and moderating whenever required.

PA 5: Promoting a network of experts who provide information and advice for geothermal investors, project developers, academia and governments

The project promoted the development of a range of previously unavailable information and advisory services on geothermal energy. It implemented this on the meso level together with the Association of Companies and Organizations in the Central American Energy Sector (Comité Regional de CIER para Centroamérica y El Caribe, CECACIER), establishing a network of experts and advisors covering a broad range of geothermal topics.

The direct target groups of the project were energy companies, investors and project developers that are active

in the field of geothermal energy or interested in the technology. The indirect target group consisted of energy consumers such as private households, industry and commerce as well as the public sector – parties who would all benefit from the secure, cost-effective and climate-friendly energy supply that the project intends to foster. Finally, women and disadvantaged groups such as the poor rural population in some regions covered by the project also belonged to the target group. The project has taken into account the situation of women and concrete measures have been implemented to promote their labour and social participation in areas where they previously did not have access. Gender-specific aspects were also taken into account in PA 3; for instance, by fostering the participation of women in training through an inclusive invitation process and modern teaching methods such as e-learning.

Human rights violations in connection with geothermal projects are not known in the project region, but cannot be ruled out in principle, particularly in countries such as Guatemala. Therefore, the project tried to ensure that potential human rights aspects were taken into account in the design of legal and regulatory frameworks, the selection of pilot projects, further training measures and advice for investors.

The project also made important publicity efforts by explaining the environmentally positive effects of geothermal energy in reducing both greenhouse gas emissions and dependence on fuels, coupled with its strength as a firm source of generation at all scales of enthalpy.

2.2 Results model including hypotheses

The project's theory of change is the central basis for the theory-based evaluation approach and it is essential for assessing all five OECD/DAC criteria. Within GIZ, a project's theory of change is visualised in a results model. Two versions of a results model had been elaborated by the project in May 2016 and April 2018. However, both focused strongly on the output level but did not reflect the theory's central hypotheses from activities to intended outputs and outcomes up to intended impacts. Against this background, the project prepared a new version of the results model (see Figure 1), which was then discussed in detail and further amended during the inception workshop.

The system boundary is shown by the shaded red area and indicates the elements for the achievement in areas of project responsibility (due to limited space some elements only touch the system boundary, but they need to be taken into account within it). These are the project's activities (grey boxes), outputs (light green boxes) and the project objective or outcome (dark green box).

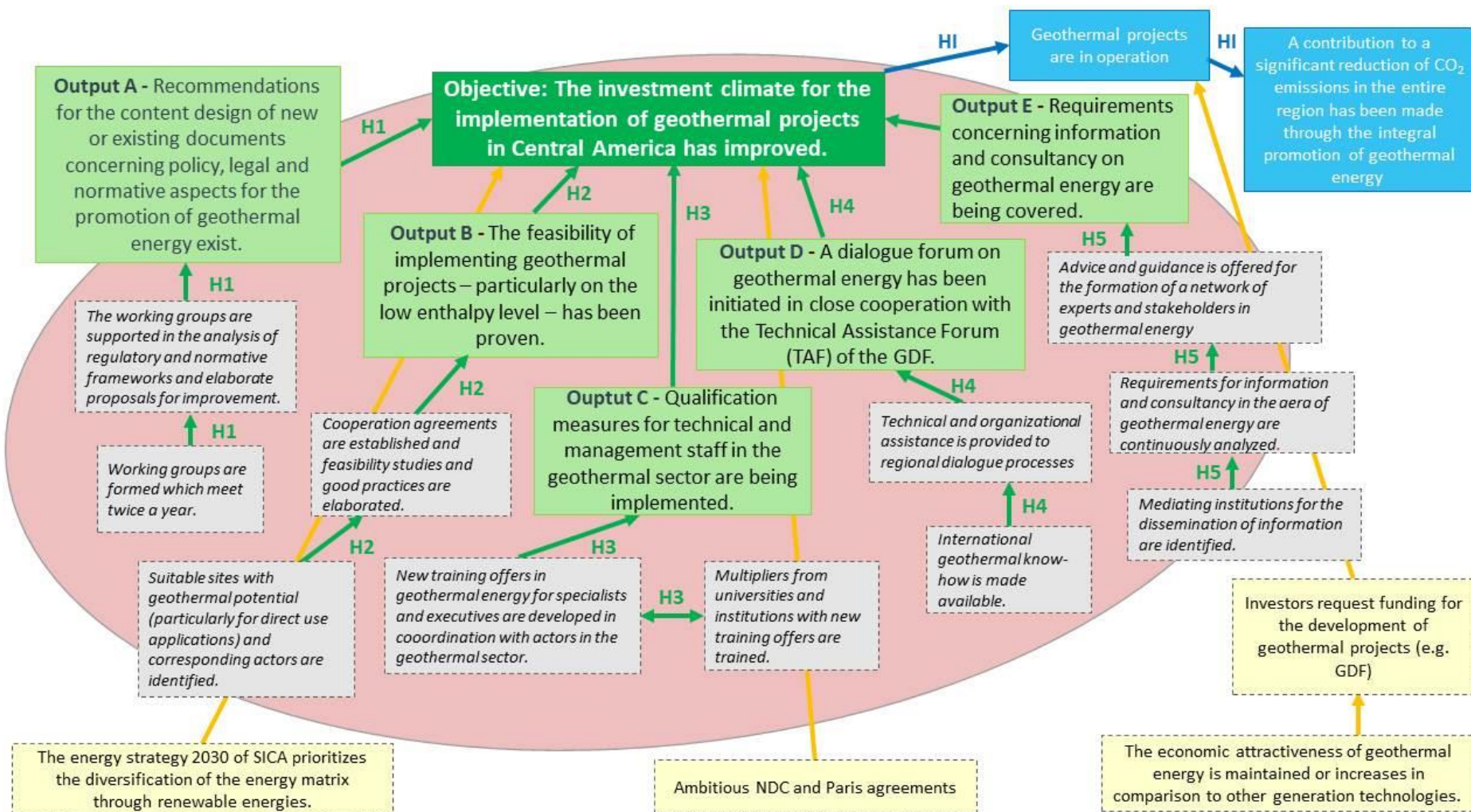
Elements beyond the direct influence of the project are placed outside of the system boundary. One set represents the primary intended impacts, which are indicated by blue boxes.² The other shows external factors that influence the achievement of the project objective and impacts or assumptions (yellow boxes).

The project encompasses the following five results on output level (one in each priority area):

- **Output A (related to PA 1):** Recommendations for the content design of new or existing documents concerning policy, legal and normative aspects for promoting geothermal energy exist.
- **Output B (related to PA 2):** The feasibility of implementing geothermal projects – particularly on the low enthalpy level – has been proven.
- **Output C (related to PA 3):** Qualification measures for technical and management staff in the geothermal sector are being implemented.
- **Output D (related to PA 4):** A dialogue forum on geothermal energy has been initiated in close cooperation with the Technical Assistance Forum (TAF) of the GDF.
- **Output E (related to PA 5):** Requirements concerning information and consultancy on geothermal energy are being covered.

² Further (secondary) impacts pursued by the project are described in Section 3.2 of this report but not reflected here, mainly for reasons of limited space.

Figure 1: Results model adapted on 24 June 2020 at the inception workshop with project team.



The discussions with the project team were used to define the following five main hypotheses. They described in a simplified manner the project's approach and also described assumed central causal links from activities through outputs to the project's main objective (outcome), which were assessed in the evaluation.

Main hypothesis for priority area 1 (H1): Supported by the project in analysing regulatory and normative frameworks, intrainstitutional and interinstitutional working groups elaborate proposals for improving the content design of new or existing documents concerning policy, legal and normative aspects for the use of geothermal resources. Once adopted, these contribute to improving the political and legal framework conditions and therefore, a better investment climate for the implementation of geothermal projects.

Main hypothesis for priority area 2 (H2): Based on the identification sites with geothermal potential that are conducted with parties interested in developing projects, cooperation agreements are established for elaborating feasibility studies for low enthalpy projects. The base of available information for the development of geothermal projects is broadened, which improves the investment climate for geothermal energy.

Main hypothesis for priority area 3 (H3): With its support of universities and companies (which are currently using geothermal energy) in developing new training offers and its focus on training multipliers, the project contributes to the implementation of qualification measures for technical and management staff in the geothermal sector. This boosts capacities in the area of geothermal energy, which strengthens participants in the sector and contributes to improving the investment climate for geothermal energy.

Main hypothesis for priority area 4 (H4): By providing technical and organisational assistance to regional dialogue processes and contributing international knowledge in geothermal energy, the project supports the formation and development of dialogue forums with relevant stakeholders from the regional geothermal sector. This strengthens regional knowledge, which contributes to improving the investment climate for geothermal energy.

Main hypothesis for priority area 5 (H5): By identifying mediating institutions for disseminating information, specifying information requirements and forming a network of experts and stakeholders interested in geothermal energy, the project provides guidance that facilitates the provision of advice, information and creates the space for technical exchange at the regional (and international) level. These activities foster interest along with establishing contacts and they cover some of the requirements for information and consultancy; therefore they contribute to improving the investment climate for geothermal energy.

These hypotheses are indicated by green arrows in Figure 1 above.

Finally, the following hypothesis describes how the project intends to contribute to the primary intended impact, which is climate protection through the reduction of greenhouse gas emissions.

Main hypothesis for impact (HI): The provision of financing offers through third parties and the improved investment climate in the region brought about by the project's integral promotion of geothermal energy contributes to the realisation and operation of geothermal energy projects. This increases the share of renewable energy sources, thereby replacing fossil fuels and contributing to a significant reduction of CO₂ emissions.

This hypothesis is indicated by blue arrows in Figure 1 above.

A discussion of risks and assumptions underlying the results model is included in Chapter 4.1 on the assessment of relevance.

3 Evaluability and evaluation process

This chapter clarifies the availability and quality of data and the process of the evaluation.

3.1 Evaluability: data availability and quality

Input data for the evaluation was obtained from documents as well as interviews and group discussions with partners and stakeholders of the project. The central documents that were used for the evaluation are reflected in the list of resources (Annex 2). All relevant central documents were available to the evaluation team.

The project used a combined Excel-based tool for operational planning as well as results-based monitoring to track progress towards achieving the indicators on output and outcome level. The monitoring tool outlines a comparison of indicator target and actual values every three months, using a traffic light system. Information collected for each indicator in the monitoring system is documented in the project's document management system with corresponding links within the monitoring tool. The monitoring tool is not based on or linked to SICA's or the monitoring system of any other implementing partner; SICA's system particularly works on a very generic level and focuses mainly on budgetary issues and therefore its data is not linked to the project's success indicators. However, to date the project has held two annual meetings with the main implementing partners in order to present and discuss the project's progress and measure results.

A SMART (specific, measurable, achievable, relevant, time-bound) assessment of the project's outcome indicators was carried out jointly with the project team during the inception mission workshop and described in more detail in Chapter 4.2. All output and outcome indicators are formulated so that they reflect only the results and objectives to be achieved by the project itself. Therefore, the baseline values were all set at zero and a collection of baseline information was not required.

According to the initial project proposal, at the impact level the project intended to contribute to a reduction in greenhouse gas emissions and energy costs, improved competitiveness of local industries, market growth in the renewable sector – and ultimately job creation and poverty reduction. This is in line with the overarching goal of the joint development cooperation engagement of GIZ, KfW and BGR, which is to reduce CO₂-emissions and contribute to improved energy security in the region. However, no impact indicators have been formulated for the joint development cooperation engagement and the impact level is not included in the project's monitoring system. The intended impacts will be analysed in more depth in Chapter 4.3.

3.2 Evaluation process

The evaluation team was composed of Tim-Patrick Meyer, as the international evaluator and team leader, and Allan López Saborío, as the regional evaluator. While Meyer has long-standing experience with the design, implementation and evaluation of development cooperation projects in the energy sector, and is familiar particularly with German Technical and Financial Cooperation, López Saborío brought to the team in-depth knowledge of the Central American energy sector, especially with regards to geothermal energy as well as understanding of the Central American integration system (SICA) and the regional energy institutions.

The evaluation consisted of an inception and an evaluation phase. The inception phase was used to prepare the actual evaluation. On one hand, this meant reviewing project and sectoral documents that were mainly provided by GIZ to the evaluators and complemented by its own research for an overview of the project's context, approach, implementation and results. On the other hand, the inception phase included an extensive workshop with GIZ's project team in which the project's results logic and indicators were examined and updat-

ed, central hypotheses for the evaluation defined, and the most relevant stakeholders were selected for interviews during the evaluation mission. The choice of interview partners was guided by the principle of including representatives from all partner countries and relevant sectors, particularly governments and other national or regional political institutions, universities, public and private companies, as well as donor organisations. As described in Chapter 1.2 several initial interviews were carried out during the inception phase in order to gather additional evaluation questions. This phase ended with the presentation of a detailed inception report describing the methodological approach of the evaluation.

The actual evaluation phase then focused on gathering additional documents and data and collecting feedback by conducting interviews and focus group discussions with involved partners and stakeholders. Guiding questions for the interviews and focus group discussions were prepared in advance and sent to the respective stakeholders by email for their preparation. Nonetheless, the interviews and discussions were implemented with flexibility, giving stakeholders the opportunity to provide the feedback they considered important. The responses were documented in internal minutes of meeting by the evaluation team for further analysis and comparison (see below). Preliminary results were presented and discussed with GIZ and central implementing partners at the end of the evaluation mission as a way to transfer knowledge from the evaluation and obtain further input and feedback.

Due to the corona virus pandemic, the entire evaluation was implemented remotely using Microsoft Teams software to carry out virtual meetings. A total of 39 stakeholders (including 16 women) from 24 institutions were interviewed or participated actively in focus group discussions and workshops within the inception and evaluation missions. A complete list including gender disaggregation appears in Table 1 below:

Table 1: List of evaluation stakeholders and selected interviewees.

Organisation/company/target group	Overall number of people involve in evaluation (gender disaggregation)	Participation in interview (number of people)	Participation in focus group discussion (number of people)	Participation in workshops (number of people)	Participation in survey (number of people)
Donors					
BGR	1 (f)	1			
KfW	1 (f)	1			
World Bank	1 (f)	1			
GIZ					
Core project team	6 (4f & 2m)			6	
Regional director	1 (m)	1			
Sectoral Unit	1 (m)	1			
Partner organisations					
Sistema de Integración Centroamericana (SICA)	2 (1f & 1m)	2			
Comité Regional para Centroamérica y el Caribe (CECACIER)	1 (m)	1			
Comisión Económica para América	1 (m)	1			

Organisation/company/target group	Overall number of people involve in evaluation (gender disaggregation)	Participation in interview (number of people)	Participation in focus group discussion (number of people)	Participation in workshops (number of people)	Participation in survey (number of people)
Latina y el Caribe (CEPAL)					
Ministerio de Ambiente y Energía de Costa Rica (MINAE)	1 (f)	1			
Instituto Costarricense de Electricidad (ICE)	2 (m)	1	1		
Consejo Nacional de Energía de El Salvador (CNE)	1 (m)	1			
LaGeo (El Salvador)	4 (2f & 2m)	1	3		
Secretaría de Energía de Honduras (SEN)	2 (1f & 1m))		2		
Empresa Nacional de Energía Eléctrica de Honduras	1 (m)	1			
Ministerio de Energía y Minas de Nicaragua	1 (m)	1			
Secretaría Nacional de Energía de Panamá (SNE)	1 (f)		1		
Civil society and private actors					
Hotel Recreo Verde (Costa Rica)	1 (f)		1		
Invernadero Tomatissimo (Costa Rica)	1 (m)	1			
Proyecto San Michkael (Guatemala)	1 (m)	1			
Universities and think tanks					
Universidad de Costa Rica (UCR)	1 (m)		1		
Universidad Tecnológica de Costa Rica (TEC)	1 (m)	1			
Universidad del Valle Guatemala (UVG)	1 (m)		1		
Universidad Nacional Autónoma de Honduras (UNAH)	1 (f)		1		
Universidad La Salle Nicaragua (ULSA)	1 (m)		1		
Universidad de Panamá (UP)	3 (1f & 2m)		3		

The findings from the document analyses, interviews and discussions were compared, with the intention of assessing their credibility, reliability and validity and thereby arriving at well-grounded conclusions. This was complemented by combining the expertise and experience of evaluation team members, which ensured that

different views of the same object of analysis could be included – thus generating as complete and representative a picture as possible. When discrepancies were found between statements in the various documents and interviews, or where interpretations and perspectives of the team members deviated from each other in a significant way, the evaluation team held virtual synthesis meetings to discuss these and arrive at common conclusions. In some cases, follow-up questions were posed to selected interview partners.

The main advantage of combining different research methods as described above (known also as method and data triangulation) is that it helps overcome biases that are more likely to occur in approaches based on single methods or single observers. The main disadvantage lies in the increased time and effort required, as well as the potential identification of conflicting findings that might be difficult to resolve.

The final evaluation results are presented in this report. Publication of the evaluation report and knowledge transfer to other stakeholders (such as GIZ Sectoral Unit and project partners) lies within the responsibility of GIZ's Evaluation Unit.

4 Assessment according to OECD/DAC criteria

4.1 Relevance

Evaluation basis and design for assessing relevance

For relevance, the evaluation matrix consists of four assessment dimensions that are discussed below.

Relevance dimension 1 pursues the question of whether the project design is in line with the relevant strategic reference frameworks in the sector and region.

This was analysed by reviewing external documents that define the strategic reference frameworks (see analysis and assessment of relevance dimension 1 below for an overview of these documents) to see if their guiding principles and ideas are reflected in the project's concept. This was complemented by partner and stakeholder interviews that sought to find out (among other aspects) if the project's activities were subsidiary or complementary to the partners' efforts or efforts of other relevant organisations.

Relevance dimension 2 aims to find out if the project concept matches the needs of the target group(s).

Interviews were carried out with representatives from the direct target group, national energy utilities of the partner countries as well as private companies interested in implementing geothermal projects (particularly direct use pilot projects under PA 2). The interviews aimed to investigate whether the project had met the requirements and expectations of this group. The question was also pursued with the association of companies and organisations in the Central American energy sector (CECACIER) as a representative organisation for the direct target group institutions. Since it did not seem feasible to interview the indirect target group of end-users in a representative way during the evaluation, the project's relevance to them was discussed in interviews with the national energy ministries, regional institutions such as SICA and other donors. The particular needs of women as well as disadvantaged population groups and the poor rural population were also discussed in this context.

Relevance dimensions 3 and 4 ask if the project concept is adequately designed to achieve the chosen pro-

ject objective, and if it was adapted to changes in line with requirements and readapted where applicable.

Answering this question first requires knowledge of the main limiting factors to using geothermal energy on a broader scale in the region (such as political and financial factors) and what fears and reservations exist on the part of energy companies, investors and project developers (the project's main target group) to working and investing in the geothermal sector. It is then possible to analyse if the project tackled the right issues towards improving the investment climate for geothermal projects.

Given that the follow-up project (FoGeo II) will focus solely on the direct use of low-enthalpy geothermal resources, an additional evaluation question was raised during the inception mission: was the general approach of FoGeo I (including support for geothermal electricity generation) appropriate or should it have focused only on direct use applications?

These assessments were based mainly on an analysis of the project's results model and hypotheses (see Chapter 2.2) as well as its methodological approach (project proposals, plan of operations, capacity development strategy). These analyses were complemented by interviews with selected stakeholders from the same groups as for assessment dimension 2.

Analysis and assessment regarding relevance

Relevance dimension 1: Is the project concept in line with the relevant strategic reference frameworks?

The strategic reference framework of the project is set primarily by Germany's development cooperation strategies and priorities as well as the regional and national strategies for energy and implementation of Agenda 2030. Specifically, the following will be mentioned:

- BMZ Regional Strategy for Central America 2017-2022,
- BMZ The New Latin America Policy,
- BMZ Sector Concept for Sustainable Energy for Development,
- Sustainable Energy Strategy 2030 of the Countries of SICA, and
- Regional and national plans for implementing Agenda 2030 (internal factsheets of BMZ).

These documents underline the importance of reducing greenhouse-gas emissions for counteracting global climate change and the part that the energy sector plays in this, along with the role that reliable and sustainable energy plays in economic and social development and the reduction of poverty. In fact, renewable energy (and energy efficiency) is one of three focal areas of German development cooperation in Central America, which highlights geothermal energy due to its potential in the area and its capability of providing base-load supply based on renewable sources (BMZ 2017). Energy Strategy 2030 of the SICA countries argues similarly in favour of geothermal energy: in addition to its reliability and ability to offer a stable power source with high load factors, geothermal energy represents a technology with low environmental impact that is not affected by meteorological variations and climate change. The strategy adds that innovation, technological development and new financing schemes have made it possible to cut costs and risks in geothermal exploration and exploitation. It therefore gives geothermal energy a central role in providing both electrical and thermal energy (SICA 2020).

With its objective of improving the conditions for investment in geothermal projects in Central America, the project concept is fully in line with the documents mentioned above.

As members of the United Nations, all six countries in the project have adopted Agenda 2030 and are committed to pursuing the 17 Sustainable Development Goals (SDG) defined in it. SICA stresses that although the SDGs are objectives on a national level, it intends to create synergies between Agenda 2030 and its own strategy for regional integration so that activities fostering the integration process may complement member country

efforts towards achieving the SDGs (SICA 2018). National plans of member countries clearly mention the role that energy plays in achieving several of those goals. Against this background, the project contributed primarily to the following SDGs:

- **SDG 7 – Ensure access to affordable, reliable, sustainable and modern energy for all:** This goal has the sub-target of making a substantial increase of the share of renewable energy in the global energy mix, where the project contributed directly as a primary objective.
- **SDG 8 – Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all:** The project supports this through reducing energy-related costs and improving energy security, which strengthen the competitiveness of local businesses. This contributes to economic growth and opens up employment opportunities.
- **SDG 9 – Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation:** Energy systems that don't rely on imports and fluctuating fossil fuel prices are in themselves a part of resilient infrastructure. Furthermore, the project indirectly contributes to the market growth for geothermal products and facilities. This opens up possibilities for participation of local companies and industries on different levels of the production cycle.
- **SDG 13 – Urgent action to combat climate change and its impacts:** The project contributes directly to combating climate change by improving the preconditions for greenhouse gas reductions.

The above already describes the project's interactions such as synergies and trade-offs with other sectors, particularly the business and industrial sectors. The intervention also interacts with the educational sector, which the project supports in establishing training programs, capacities and resources (such as training multipliers). The project concept gives particular importance to institutionally anchoring technical knowledge in the respective facilities and in establishing a sound economic basis for the sustainable continuation of the training offers (GIZ 2015).

The project's implementing partners confirmed that it was subsidiary to their efforts and complemented their own activities to promote geothermal energy. This was particularly confirmed by SICA as the editor of the regional energy strategy mentioned above. SICA pointed out that one of the project's most important results was debunking negative myths and reducing prejudices about geothermal energy (for instance in relation to its cost), which contributed to a current perception of geothermal energy as a firm part of the region's energy transition. Furthermore, SICA stated that the project fostered regional cooperation and coordination, which is one of its aims in relation to regional integration in the energy sector (Int_5,9 with partners). A subsidiary function of the GIZ project was also confirmed by the universities involved in implementing the training measures under priority area 3, which felt that the project supported their own efforts towards establishing specific capacities and knowledge about geothermal energy in the region well (FG_1-6 with universities).

Concerning other donors, the project was embedded in a larger development commitment (EZ-Engagement) of the German government with Latin America, which also included projects of KfW and BGR. KfW contributed to this primarily through the Geothermal Development Facility (GDF) which provides grants for surface studies and exploratory drilling, thereby reducing the cost and associated risks of geothermal exploration. In cases of successful exploration, KfW provides subsidised loans to finance production drilling and geothermal plant construction. As described in Chapter 4.4 on efficiency, there was little subsidiarity or complementarity with KfW in this context. However, the GDF includes also a Technical Assistance Forum (TAF) open to government representatives, developers, financial institutions and other stakeholders. TAF provides opportunities for participating members to discuss current geothermal development trends in the region, address best-practice regulatory and legal frameworks, and facilitate the cooperation of private and public entities. Within its priority area 4, since 2017 the GIZ project has cooperated closely with TAF. It has enabled an active role for its regional partners in positioning their topics, interacting with international geothermal experts and exchanging knowledge and best practices. Against this background, TAF and GIZ's efforts to support national and regional dialogue processes complemented each other very well (Int_3 with donors; KfW, GIZ, BGR 2020).

BGR's project entitled Identification of Geothermal Deposits in Central America focused on advising energy ministries and geological services about the exploration of geothermal deposits, interpretation of the data generated and preparing feasibility studies for geothermal projects. Furthermore, the project developed training formats and cooperated with local educational institutions to ensure that they are sustainably anchored. By initiating regional specialist committees, it promoted the exchange of experience and the formation of networks between ministries, geological services and companies in the countries of Central America. The similarities to GIZ's project are evident, and collaboration with BGR existed in priority areas 2, 3, 4 and 5. Both projects support the activities of the regional Grupo Técnico de Geociencias (Geosciences Technical Group) of the Energy Coordination Unit of SICA, with dialogue and capacity building measures closely coordinated. Furthermore, planning and monitoring workshops are carried out jointly. Several interview partners stated during the evaluation mission that they could hardly tell the difference between the projects of GIZ and BGR. While there may be room for improving both projects in their communication and presentation towards partners, there was a high degree of complementarity between the two (Int_1 with donors; KfW, GIZ, BGR 2020).

In conclusion, the evaluation finds that the project concept is very well in line with the relevant strategic reference frameworks and scores relevance dimension 1 with 28 out of 30 points. The slight reduction in points is due only to the shortcomings in complementarity between the GIZ project and the GDF of KfW.

Relevance dimension 2: Does the project concept match the needs of the target group(s)?

As the project's main target group, energy companies and project developers active in the field of geothermal energy were involved in the project primarily in PA 2 where feasibility studies were elaborated to assess the technical and financial/economic viability of geothermal direct use pilot projects. While this focus on direct use applications coincided well with the needs of small private companies, it did not correspond with the core business of large electricity generation companies such as LaGeo and ICE – which see them more as projects of corporate social responsibility (Int_3 with partners).

Most of the companies interviewed during the evaluation mission confirmed that they were involved in elaborating the terms of reference for the studies in order to ensure that these would deliver what was required. However, one company stated that they never saw the terms of reference for the consultancy firm that performed the feasibility study (Int_3 with partners). According to GIZ's project team this was due to a lack of time in light of difficult administrative processes, which required different language versions of the terms of reference (Spanish for discussion with the partners and English for processing and contracting through GIZ in Germany). Therefore, it was not always possible to discuss the terms of reference with the project developers, but the internal process of elaborating the terms were stated as consistently thorough, intense, and conscientious (WS_1 with GIZ). Nonetheless, it seems essential from the evaluators' point of view that the terms of reference for consultancy services are developed jointly with the recipient of such support in their native language and that the final product (a feasibility study in this case) is delivered in that language. In fact, it is not quite comprehensible why some of the feasibility studies were elaborated in Spanish, while others elaborated in English.

Despite of the occasional shortcomings described above, the majority of beneficiaries of the feasibility studies stated that the studies met their needs for information and insight, saying for instance that it was 'complete and covered all relevant topics to be able to develop the project' (Int_2 with partners), or that it 'demonstrates that direct use applications are a viable option' (FG_3 with partners). However, it was suggested at times that the contracted consultants partially lacked knowledge of the local situation and framework conditions, and that more local/regional knowledge and expertise³ should have been involved in elaborating the studies (Int_3, 4 with partners, FG_2 with partners, FG_1 with private actors). Also, one interview partner (Int_3 with partners) pointed out a lack of capacity building and knowledge transfer during the elaboration of the feasibility study.

³ This is available in countries that are more advanced in their geothermal development, such as El Salvador and Costa Rica.

Despite the generally positive reception of the feasibility studies, several companies also mentioned that they need further support in order to move the projects forward towards implementation. This relates particularly to developing viable business models and identifying funding options, and also to other areas such as creating capacities for sustainable operation of the projects; the participants said that these needs were not sufficiently met (Int_2 with private actors; Int_3 with partners; FG_1 with private actors). However, it is also understood that with limited time and resources a cooperation project can only achieve so much and that the follow-up project FoGeo II has the objective of providing further support in realising the pilot projects.

The improvement of legal and regulatory framework conditions for using geothermal energy that the project pursued in priority area 1 – along with promotion of dialogue processes under priority area 4, which essentially contributed to the former – were also primarily geared at creating a conducive environment for companies in the sector. Although these activities were pursued with governmental institutions, which do not form part of the direct target group, it is worth mentioning that they generally targeted the requirements of the ministries and secretariats involved. Only in one case did the project provide support that was not specifically requested by the partner (it was based on a consultant's recommendation) when a proposal for improving regulations for geothermal concessions was elaborated in El Salvador. Consequently, the authorities of El Salvador rejected the proposal.

In terms of the capacity building measures carried out by the project under priority area 3, it can be concluded that they were well designed to meet the needs of the participants, given that 91% of those participating in a corresponding survey stated that the training helped them improve how they carried out their functions (GIZ 2020b). The universities involved in implementing the capacity building measures stated that they were thoroughly involved in the content design of the training, thereby considering their own priorities and perceptions of knowledge requirements (FG_1-6 with universities).

Finally, the users have generally seen the networking of regional experts, promoted by the project under priority area 5, as having addressed their needs for exchange of information and experiences very well. The only reservation in this context (as mentioned above) is that some companies would have liked to make more use of the expertise and knowledge already available in the region rather than falling back on consultants less familiar with the contexts of partner countries.

A further (indirect) target group consisted of energy consumers such as private households, industry and commerce as well as the public sector – which is essentially the entire population of the region. By aiming to create an improved investment climate in geothermal projects, the project intended to contribute to a secure, cost-effective and climate-friendly energy supply. Since energy is considered a precondition for economic and social activity, it can be concluded that the project aimed specifically to cover this essential need of all energy consumers. While these intended impacts (as well as further target group-related impacts, such as climate protection and reduction of environmental pollution) are realistic from today's perspective, their realisation depends on the degree to which third parties actually implement geothermal projects as a result of the project's activities. As previously mentioned, the follow-up project FoGeo II will make further contributions to achieving this goal, with a focus on direct use applications.

Furthermore, FoGeo addressed the needs of women for improved economic and social participation. It aimed to provide suitable training opportunities by fostering the participation of women in the programmes by using inclusive language in the training announcements and invitations and through proactive identification of suitable female participants. It also aimed to improve career opportunities for women through a four-day gender workshop in El Salvador in December 2019, which was cofunded and jointly organised by GIZ and the World Bank and aimed at geothermal companies from the region. One man and one woman from every company were trained on gender equality (gender bias, misconceptions, inclusive corporate culture) with the intention that they pass this knowledge on within their companies, thereby improving respect, consideration and professional opportunities for women. This workshop built on the findings from a report by the World Bank's Energy Sector

Management Assistance Program (ESMAP) which concluded that geothermal direct applications can be particularly beneficial for women (who in the region often tend to be less educated). They open up new possibilities for income and employment such as drying fruit or making candles to sell (Int_2 with donors). Against this background, the project did a good job of considering the specific needs and concerns of women. In fact, one interview partner even found the support given to women to be 'one of the project's greatest strengths' (Int_2 with partners).

The project can also contribute to opportunities for additional income generation for the poor and rural population, especially through its support to direct use applications and the fact that geothermal resources are usually located in rural areas. However, the FoGeo project team was always careful not to create false hopes since it could not directly influence the actual implementation of geothermal projects, and this in fact has not yet resulted in an impact of FoGeo. However, local population groups were always informed through public hearings and meetings and considered in the scope of the socio-environmental assessments that formed part of the feasibility studies for the pilot projects. In this respect it was ensured that their interests and concerns were properly taken into account and the ways the projects could benefit them identified. While the project was not specifically designed to reach particularly disadvantaged groups, the Leave No One Behind principle as described in Agenda 2030 was followed (Int_1 with private actors; WS_1 with GIZ).

In summary, the project matched the needs of the target groups to a large degree. Target groups did cite isolated weaknesses such as lack of involvement in elaborating terms of reference for consultancy services and occasional lack of consideration for the local and regional context, as well as insufficient support in accessing finance for pilot projects. However, it must be stated that it was not possible for the project to address all existing needs due to time and budget restrictions. Assessment dimension 2 is scored with 25 out of 30 possible points.

Relevance dimension 3: Is the project adequately designed to achieve the chosen project objective?

Through document review and stakeholder interviews (GIZ 2015; Int_4,9 with partners, Int_2,3 with partners) the evaluation team identified the following main obstacles that limit the use of geothermal energy in the region:

- Due to the technical requirements of geothermal resource exploration, projects are perceived as having high financial risks and long implementation times, which discourages project developers and investors.
- Relevant actors (ministries, energy institutions, companies, education sector) lack knowledge and professionally qualified personnel.
- On the government level, this lack of knowledge and capacities is seen as the main cause for insufficient legal and regulatory framework conditions that further hinder geothermal development in the region.

The project tackled these primary limiting factors through an integrated multilevel approach, which includes the macro, meso and micro levels across five different priority areas. The exploratory risks were addressed particularly by elaborating georeferenced maps of geothermal suitability for pilot projects as well as offering advice on obtaining financial risk mitigation instruments (through the GDF) in priority area 2. However, it is also worth mentioning that the exploratory risk is much lower for low-enthalpy geothermal projects (FoGeo focuses on them in PA 2) since they do not require deep and costly bore holes to access the resource (GIZ 2020b). Furthermore, the project made efforts to communicate the main advantages of geothermal energy, namely that it can ensure independence from energy imports and that it can be used when it is needed, since it is continuously available (as opposed to intermittent renewable energies like solar and wind energy) (WS_1 with GIZ). The lack of knowledge and capacities was approached through training measures under PA 3, the promotion of regional dialogue processes (PA 4) and establishing a network of experts (PA 5). Finally, the insufficient legal and regulatory framework was addressed directly through the activities of PA 1.

Several interview partners confirmed that there was a good balance between the project's five priority areas (FG_4 with partners, Int_7 with partners). It was also largely confirmed that the project's activities, instruments

and outputs were adequately designed to achieve the project objective and this opinion is shared by the evaluation team. Aspects that stood out particularly in partners and stakeholder opinions were the project's approach to fostering and improving information exchange, coordination and synergies among stakeholders in the countries and in the region, particularly but not only in terms of political dialogue (FG_4 with partners; Int_3 with donors, Int_2, 5 with partners). They also cited the project's activities in the area of awareness raising, sensitisation and building capacities on all levels (FG_4 with partners, Int_1 with partners, Int_2 with private actors). These activities are considered an important contribution to a better understanding of the potentials and challenges of geothermal energy and for learning on how to best approach these.

Since several Central American countries are well advanced in use of geothermal energy for electricity generation (covering 28.5% of demand in El Salvador, 17.2% in Nicaragua and 8.5% in Costa Rica) the project focused on direct use applications from the very beginning (GIZ 2020b). This focus seems appropriate from the evaluation's perspective because the enormous potential for direct use applications remains largely untapped, despite the benefits it can bring for local economic development and environmental protection. This is where the least experience was available and therefore where most support was needed. However, some discussion and persuasion was needed to establish the project's focus on direct use applications since the energy ministries of several countries were initially not open to unfamiliar geothermal applications (WS_1 with GIZ). The focus on direct uses was most evident in PA 2 where only low-enthalpy pilot projects were supported, but it was also reflected in the other PAs. However, this was not an exclusive focus and the project provided support to the promotion of high-enthalpy geothermal electricity generation as well, wherever necessary. For example, the geothermal policy developed for Honduras under PA 1 aims at all kinds of geothermal uses.

The project's objective to increase the demand for geothermal energy and improve the climate for investment in geothermal projects is realistic from today's perspective. The underlying results hypotheses of the project seem plausible and will be analysed in more depth in the following chapter on effectiveness.

In designing the project concept, participants assumed the following main risks and potential developments/changes in its framework conditions (GIZ 2015):

- Political and economic interest in developing geothermal energy could be reduced or lacking in the face of continuously low or even falling fossil fuel prices (medium risk mainly for outputs A and B).
 - ➔ In the course of the project's implementation, prices of fossil fuels in the region tended to decrease. However, no negative impact on political support to geothermal energy has been observed as a direct consequence. The national energy policies of all partner countries (exception for Panama), as well as the regional sustainable energy strategy for Central America up to 2030, build upon a diversification of energy sources and specifically include geothermal energy among them (WS_1 with GIZ).
- A strong economic recession could lead to a decrease in energy demand, which could delay the need for investments in geothermal projects (medium risk mainly for outputs A and B).
 - ➔ No such recession occurred during the implementation period of the project. Even the Covid 19 pandemic and its economic effects did not have any noticeable direct impact on the project's implementation. However, it is possible that implementation of some of the pilot projects supported under PA 2 may be delayed (WS_1 with GIZ).
- There could be resistance from isolated population groups that would delay or block the implementation of geothermal projects (medium risk for all outputs, particularly output B).
 - ➔ This risk concerns predominantly high enthalpy projects, which were not directly supported by the project (GIZ 2015). Direct use projects, the focus of FoGeo, could furthermore provide new job opportunities even for unskilled members of the population and increases acceptance (KfW, GIZ, BGR 2020). No resistance to the implementation of geothermal projects was observed in the course of the project (WS_1 with GIZ).

- The procedural framework for obtaining authorisations or selecting partners is vulnerable to corruption. Such cases of corruption could harm the investment climate (medium risk for all outputs).
 - ➔ The project mitigated this risk through transparent management and participatory involvement of a wide range of stakeholders. No cases of corruption were observed while the project was in progress (WS_1 with GIZ).
- There could be opposition or lack of interest (at governmental or entrepreneurial level) in creating a regional energy agency for geothermal energy (medium risk for output E).
 - ➔ This risk fully materialised since in 2015 when the Regional Geothermal Office stopped its operations. This will be further elaborated below under relevance dimension 4.
- Violence from organised crime and gangs could pose a security risk for technical cooperation projects, which makes it difficult or impossible to access some regions of the project (medium risk for all outputs).
 - ➔ This risk did not materialise, not least since implementation of pilot projects in rural areas has not begun. However, the project contributed to mitigating such risks through dialogue processes and participative inclusion of communities, which aimed to identify potential for conflicts at an early stage (GIZ 2015; WS_1 with GIZ).
- Trained technical personnel could migrate (due to violence and fragility in their home countries, for example) and acquired knowledge could be lost (medium risk for all outputs, particularly for output C).
 - ➔ The loss of knowledge and capacities (not only due to migration) is considered a common risk of cooperation projects in general and a simple fact of the labour market. In 2014/2015 for instance, LaGeo in El Salvador laid off a number of experts who then partially migrated to Nicaragua or Japan for new employment possibilities in geothermal energy. These processes could not be influenced by the project, which based its cooperation on institutions and not individuals (WS_1 with GIZ).

All in all, the project design addressed several risks and potential changes in its framework conditions and made plausible assumptions. The initial project proposal however did not specifically address a comparatively high risk for alterations in framework conditions in the form of governmental change in partner countries, although the project team did identify this early on. Under these conditions political priorities, ownership and personnel could also change. Political instabilities could also occur, which would affect the cooperation. This will be elaborated in relevance dimension 4 below.

As a regional project, FoGeo operated in a complex environment covering six different countries with varied political priorities and strategies in the energy sector. However, the project team already had many years of experience of working in this area from the previous regional project for supporting renewable energies and energy efficiency in the region which had a total of three implementation phases. The project approached national differences and regional complexity with a double-tracked method.

On one hand, the project worked closely with the individual partner country authorities in to understand and address their particular situation and necessities (particularly in PA 1). On the other hand, the project cooperated on a paramount level with SICA, which aims as a regional institution to integrate and align the member country policies (along with other regional institutions like CECACIER and CEPAL). SICA's objectives include coordination of member energy sectors, which is documented in the sustainable energy strategy for Central America, which defines common higher intermediate goals and steps for implementation. Regional differences did not play such a decisive role in PA 2, which mainly involved bilateral cooperation with companies in the respective countries. In PA 4 and 5 (but partially also in PA 3) the project worked primarily with a regional approach and made use of national differences by promoting dialogue processes and the exchange of knowledge and expertise among them. This approach to learning from each other was a core element of the project's methodology; it can be understood as converting the project's complexity into something useful and beneficial for all partner countries (WS_1 with GIZ).

In conclusion, the project concept was to a large extent adequately designed to achieve the chosen project objective. However, potential risks due to political changes and conflicts that could significantly impact the cooperation were not sufficiently considered in the initial project proposal to BMZ. These cases will be elaborated more in relevance dimension 4 below. Against this background, relevance dimension 3 is scored with 17 out of 20 possible points.

Relevance dimension 4: Was the project concept adapted to changes in line with requirements and readapted where applicable?

As mentioned above in relevance dimension 3, a risk not included with the initial project proposal is that partner governments could change. This could potentially lead to shifting political priorities, decreased interest in geothermal energy and corresponding changes in the degree of involvement and commitment on the part of the project's national counterpart institutions. This could lead to disruptions and delays in the cooperation. Such changes of government occurred on several occasions, for instance in Panama and Costa Rica. While the project obviously had no control over political alignments in the member countries it could make an appropriate response. The case of Panama showcases how the project responded to a change in government and made positive use of the situation by convincing the new government officials to include geothermal energy in their strategic planning, which was not the case with the previous government (see also explanations given in assessment dimension 2 in Chapter 4.2 on effectiveness). Furthermore, while the governments and priorities of individual countries could change, which could complicate cooperation particularly in PA 1, the cooperation with SICA on the regional level represented an anchor of stability where topics remained on the agenda independent of national political developments (WS_1 with GIZ).

Another significant change on the political level consists in the public protests in Nicaragua that began in April 2018. The demonstrations were directed against the social security reforms decreed by President Daniel Ortega that increased taxes and decreased benefits. The demonstrations, which were declared illegal by the president in September 2018, turned into a civil conflict that has destabilised the country significantly. In this new situation the project had to carefully assess the type of assistance it gave to Ortega's government. Although the project's activities in Nicaragua were on a technical rather than political level, this had a certain impact on planning the project's operations in Nicaragua from 2018 onwards. Following a careful evaluation of the situation and planned activities, the project responded by shifting its focus towards the private and academic sector in order to avoid getting involved in political problems. Particularly, the project focused on a feasibility study for a pilot peanut-drying facility in cooperation with a private company and the Universidad la Salle. The political situation did have its repercussions – as a precautionary measure the university preferred not to take on a leading role as initially planned in a process that required field visits and visible activities. However, the project navigated the situation well by taking on a more active coordinating role (Int_7 with partners, WS_1 with GIZ).

A positive political change on the other hand occurred in Honduras with the creation of the Energy Secretariat. The project took advantage of this new player, which turned into a very important counterpart and contributed significantly to developing a policy to promote geothermal energy (FG_1 with partners, Int_10 with partners WS_1 with GIZ).

Another change mentioned above under assessment dimension 3 is that in 2015 the Regional Geothermal Office stopped its operations and was not available for cooperation. Since the initial idea was to develop the office (which at the time was limited to El Salvador) into a regional energy agency, the project had to work with an alternative approach. It reacted by successfully supporting the establishment of a regional network of experts led by CECACIER that now fulfils similar functions to those of an energy agency, although under a different organisational structure (KfW, GIZ, BGR 2020).

Finally, internal changes took place in the project, especially with regard to the fact that there were a total of four heads of project along the five-year implementation period. While this did not affect the responsibilities

within the project team (which had assigned responsibility for each PA and country), this did require personal adaptation on the part of the project team members and especially the counterparts, not least because each head of project had their own ideas and priorities (WS_1 with GIZ).

In summary, the project experienced several shifts in its environment but reacted quickly and adequately to the negative changes and made good use of helpful changes. Significant adaptations to the project design itself were not required. However, it would have been positive to ensure a higher degree of continuity in the project's internal leadership. Relevance dimension 4 is therefore scored with 18 out of 20 points.

Table 2: Rating of OECD/DAC criterion: relevance

Criterion	Assessment dimension	Score and rating
Relevance	The project design ⁴ is in line with the relevant strategic reference frameworks.	28 out of 30 points
	The project design matches the needs of the target group(s).	25 out of 30 points
	The project is adequately designed to achieve the chosen project objective.	17 out of 20 points
	The project design* was adapted to changes in line with requirements and re-adapted where applicable.	18 out of 20 points
Overall score and rating		Score: 88 out of 100 points Rating: Level 2: successful

4.2 Effectiveness

Evaluation basis and design for assessing effectiveness

The evaluation matrix includes three effectiveness dimensions that are discussed below:

Effectiveness dimension 1 asks if the project achieved its objective (outcome) on time and in accordance with the project objective indicators.

During the inception mission, the five indicators on the outcome level (one in each priority area) were checked according to the SMART criteria to analyse if they are specific, measurable, achievable, relevant and time-bound. Jointly with the project team, adaptations were carried out to all indicators in order to formulate these as specifically and unambiguously as possible, without changing the level of aspiration agreed upon with the commissioning party. All indicators are achievable, relevant and time-bound – therefore no changes were made in this regard. The initial indicators, the findings from the SMART assessment, as well as the adapted indicators are represented in the following table:

⁴ The 'project design' encompasses project objective and theory of change (ToC = GIZ results model = graphic illustration and narrative) with outputs, activities, instruments and results hypotheses as well as the implementation strategy (methodological approach, CD-strategy).

Table 3: SMART assessment of outcome indicators

Project objective indicator according to the offer/original indicator	Assessment according to SMART criteria	Adapted project objective indicator
<p>In two Central American countries, the responsible authorities or parliaments have received for approval a total of three new or adapted political strategies, laws or norms that promote the implementation of geothermal projects.</p> <p>Base value: No strategies laws or norms in any of the countries Target value: Three new or adapted strategies, laws or norms in two countries</p>	<p>The indicator required adaptation in order to be more about the number of countries and the type of geothermal projects.</p>	<p>In at least two Central American countries, the relevant authorities or parliaments have received for approval a total of three new or adapted political strategies, laws or norms that promote implementation of geothermal projects for electricity generation and for heat in direct use applications.</p> <p>Base value: No strategies laws or norms in any of the countries Target value: Three new or adapted strategies, laws or norms in at least two countries</p>
<p>In two Central American countries, financing institutions (such as GDF) have received a total of four funding applications for investments in new geothermal plants (such as exploratory drilling or constructing plants).</p> <p>Base value: No funding applications in any of the countries Target value: Four funding applications in two countries</p>	<p>The indicator adaptation in order to be more specific in terms of the number of countries and the type of geothermal plants.</p>	<p>In at least two Central American countries, financing institutions (such as GDF) have received a total of four funding applications for investments in new geothermal plants for electricity generation as well as for the use of heat in direct use applications (such as exploratory drilling or the construction of plants or direct use applications).</p> <p>Base value: No funding applications in any of the countries Target value: Four funding applications in at least two countries</p>
<p>100 specialists and executives (including 20 multipliers) from relevant sector institutions confirm that the quality of their activities in relation to geothermal energy (planning, concession procedures and operation of geothermal plants or activity as multipliers) has improved due to the newly acquired knowledge.</p> <p>Base value: No specialists and executives Target value: 100 specialists and executives (including 20 multipliers)</p>	<p>The indicator required adaptation in order to be more specific about who the multipliers are (specialists, not executives) and concerning the type of geothermal energy.</p>	<p>100 specialists (including 20 multipliers) and executives from relevant sector institutions confirm that the quality of their activities in relation to geothermal energy for electricity generation as well as for the heating in direct use applications (planning, concession procedures and operating geothermal plants or activity as multipliers) has improved due to the newly acquired knowledge.</p> <p>Base value: No specialists and executives Target value: 100 specialists (including 20 multipliers) and executives</p>
<p>In three Central American countries, a total of six activities that were initiated as part of regional dialogue forums have led to the promotion of geothermal energy use (such as mediation processes, cross-border project development).</p> <p>Base value: No activities in any of the countries Target value: Six implemented activities in three countries</p>	<p>The indicator required adaptation in order to be more specific about the number of countries and the type of geothermal energy. Furthermore, it was adapted to specify that the actual promotion of geothermal energy through the activities lies outside of the direct influence of the project.</p>	<p>In at least three Central American countries, a total of six activities that were initiated as part of regional dialogue forums could serve to promote the use of geothermal energy for electricity generation as well as for heat in direct use applications (such as mediation processes, cross-border project development, technical cooperation processes).</p> <p>Base value: No activities in any of the countries Target value: Six implemented activities in at least 3 countries</p>

<p>A regional specialist agency or a regional network of institutions has delivered a total of 100 consulting, training or information services (geoscientific information, permitting procedures, technical-scientific information, socio-economic and ecological risks) for three different types of customer (project developers, government institutions, investors, plant operators).</p> <p>Base value: No services Target value: 100 services for a total of three types of customers</p>	<p>The indicator required adaptation in order to be more specific about who delivers the services and how this is coordinated.</p>	<p>A regional network of experts and researchers from institutions, coordinated by a regional implementing organisation of the project, has delivered a total of 100 consulting, training or information services (geoscientific information, permitting procedures, technical-scientific information, socio-economic and ecological risks) for three different types of customers (project developers, government institutions, investors, plant operators).</p> <p>Base value: No services Target value: 100 services for a total of 3 types of customers</p>
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The level of achievement with the outcome indicators was analysed in detail during the evaluation mission, mainly by using information and sources of verification provided by the project team. These include the combined Excel-based tool for operational planning and results-based monitoring, which includes links to verification documents in GIZ's document management system as well as the annual progress reports to BMZ. This was cross-checked and confirmed by information contained in a presentation at the project's closing event, the end-of-project report and interviews with representatives from partner institutions.

In the context of this relevance dimension, an additional evaluation question raised during the inception phase was pursued – namely which outcomes were realised through the project's regional approach that would not have been achievable such through a bilateral project or projects. This was complemented by the question of whether the project made use of the special potentials of a regional endeavour. These include structures and institutions like those provided by SICA plus the challenges this could have posed in terms of coordination of cooperation at different levels (regional, national, local).

Effectiveness dimension 2 intends to find out if the activities and outputs of the project contributed substantially to achieving the project objective (outcome).

The intention here is to prove or plausibly demonstrate a causal relationship between the project measures and intended outcomes. This contribution analysis was carried out in an exemplary way in regard to the main hypotheses for PA 1, PA 2 and PA 3.

In analysing these hypotheses, the evaluation team attempted to isolate the contribution of the project from other facilitating or hindering factors such as public policy or projects from other donors. It also tried to answer the question: what would have happened without the interventions from GIZ? In this context, additional evaluation issues were raised during the inception mission: how the project was perceived by the partner countries, how their level of ownership could be described over the course of the project and how this influenced the achievement of the project's objectives. The team pursued the required information about these factors and identified GIZ's contribution primarily through interviews with partners and stakeholders.

Effectiveness dimension 3 intends to reveal if the occurrence of additional (not formally agreed) positive results has been monitored and additional opportunities for further positive results have been seized. It also aims to confirm that no project-related (unintended) negative results have occurred – and if any negative results occurred, the project responded adequately.

These questions were pursued using a double-tracked approach. For one, the evaluation team used the interviews and discussions with partners, stakeholders and target groups to identify any additional positive or unintended negative results which the project may have brought about. For another, the evaluation team discussed

with the project team and reviewed the project's progress reports and monitoring tools to understand how the project reacted to such additional/unintended results. In the case of unintended negative results, the evaluation team also analysed to which extent corresponding risks were already known during the conceptual phase of the project and how these were monitored.

Analysis and assessment regarding effectiveness

Effectiveness dimension 1: Did the project achieve the objective (outcome) on time in accordance with the project objective indicators?

The indicator achievement is described for each area of intervention below.

PA 1: Advice on improving legal and regulatory framework conditions for the use of geothermal energy

The following new or adapted political strategies, laws or norms that promote the implementation of geothermal projects for electricity generation and the use of heat in direct use applications have been elaborated with the help of the project on the national level:

- **El Salvador:** The project supported the Ministry of Environment (MARN) in elaborating procedures for assessing the environmental impact of geothermal projects below 5 MWe. The procedures were approved by the ministry in February 2018.
- **El Salvador:** The project developed a proposal for an adapted regulation that grants geothermal concessions and submitted to MARN. However, this proposal was never requested by the ministry or other authorities but based on a consultant's recommendation. Consequently, the proposal was rejected.
- **Panama:** The project elaborated a regulation for the use of near-surface geothermal heat that has been handed over to the Energy Secretariat for approval. While the secretariat is in favour of promoting geothermal energy, it has decided to delay the approval process until it demonstration projects have provided proof that geothermal energy can be used reasonably in Panama. Once this is the case, the regulation will be included as part of the national energy policy.
- **Honduras:** The project supported the advancement of a policy to promote geothermal energy, which was submitted to the Department for Renewable Energy within the Energy Secretariat. The secretariat is taking more general parts of the proposed policy and including them in the overall national energy policy that is currently under development. The more specific aspects will form the basis of a future geothermal law.
- **Costa Rica:** The project supported the elaboration of a proposed law to promote geothermal direct use applications, which was handed over to the Ministry of Environment and Energy. It is in the process of validation within the ministry and will then be passed on to parliament for legislative implementation.

Apart from these five national initiatives, the project also contributed to an important regional political development by providing support to a proposal to include geothermal energy as a pillar of energy transition within the sustainable energy strategy for Central America up to 2030. This proposal was elaborated together with CEPAL and presented to the Council of Energy Ministers within SICA. At this point, the Geosciences Technical Group created by SICA's Energy Coordination Unit played an important role. As a regional working group that supports the Council of Energy Ministers (and therefore wields a high level of political influence) it discussed the proposal at regional workshops organised under priority area 4. This contributed to the approval of the energy strategy – including the promotion of geothermal energy – by the council in June 2019. Publication is expected at the end of 2020. The new sustainable energy strategy represents a regional political compromise, which lays an important foundation for advancing geothermal energy use in Central America. It can be seen as the project's most significant outcome on the regional level, which would not have been achieved through a bilateral approach (Int_4 with partners).

In summary, although one of the proposals in El Salvador had not been requested and was consequently re-

jected, the indicator is clearly overachieved.

PA 2: Demonstration of technical feasibility and profitability of geothermal technologies

The following projects submitted funding applications for geothermal energy projects to the GDF, which were prepared with the help of FoGeo:

- **Costa Rica:** Pocosol Conelectricas project, geothermal power plant with a capacity between 10 and 20 MW;
- **Costa Rica:** Pocosol project of the Corrales family, geothermal electricity generation and direct use;
- **Guatemala:** Geothermal Project San Michkael, direct geothermal use for drying of agroindustrial products;
- **Honduras:** Geothermal project of the National Electricity Company (Empresa Nacional de Energía Eléctrica), geothermal electricity generation with a capacity of 10 MWe.

However, only one of these projects (San Michkael) had previously been supported by FoGeo through a feasibility analysis, while the others approached GIZ through other channels in order to receive financial support. Three of the four projects were not able to pass to the second round of the GDF's approval process, deemed ineligible mainly for their small size. Only the first project could have moved to the second round but opted not to do so because of unfavourable feasibility analyses, which were not carried out by FoGeo (WS_1 with GIZ).

In summary, the indicator was fulfilled formally. However, there is a decoupling between the project's main activities in PA 2 (carrying out feasibility analyses for geothermal pilot projects) and the indicator, which was largely measured on the basis of other projects. The funding applications were also not very successful due to a mismatch between the projects and the eligibility criteria of the GDF, and none of the projects actually received financing from the facility in the end.

PA 3: Capacity building on geothermal energy

The project trained a total of 416 people, which included 287 specialists and executives. These 287 individuals were sent a survey asking for their feedback on their training obtained; 206 of them responded and 187 of the 206 (which corresponds to 91%) confirmed that the training helped them to improve the execution of their professional functions. Of these positive responses, 37 came from people who function as multipliers. Hence, the indicator is clearly overachieved (WS_1 with GIZ).

PA 4: Support to national and regional dialogue processes to intensify technical exchange, promote learning across borders and foster greater market development

The following activities for promoting the use of geothermal energy were initiated as part of the regional dialogue forums, which were supported by the project:

- BGR and the Costa Rican Institute of Electricity (ICE) ensured their assistance to the Empresa Nacional de Energía Eléctrica (National Electricity Company of Honduras) in the analysis of gas probes.
- ICE offered its experience to the Ministry of Energy and Mining of Nicaragua to analyse thermal gas probes for contaminants like arsenic.
- The Universidad Nacional Autónoma de México participated in meetings of the National Energy Secretariat of Panama, contributing its direct use experience in the process of elaborating Panama's geothermal road map.
- LaGeo of El Salvador and the World Bank agreed to carry out a workshop on geothermal energy and gender in El Salvador in December 2019.
- The Geosciences Technical Group of UCE-SICA decided to prepare a position paper on the geothermal potential in Central America.

- Chile's experience with direct use (particularly with heat pumps) was incorporated in the webinars produced by CECACIER.

Hence, the indicator for PA 4 has been fulfilled.

Regional exchange among the member countries forms the core of the dialogue forum concept. Therefore, the above-mentioned outcomes constitute examples that could not have been achieved through a purely bilateral cooperation approach.

PA 5: Promote a network of experts who provide information and advice for geothermal investors, project developers, academia and governments

Under the leadership and coordination of CECACIER and with the support of the project, a regional network consisting of experts and researchers from institutions was established and provided the following advisory and information services to project developers, government institutions, investors, plant operators and other users: 37 expert talks, 21 events to exchange technical-scientific information, 13 scientific studies, 12 articles, 12 webinars, 9 podcasts, 9 events for exchange on socio-economic topics, and 4 audio-visuials. In total, 115 such services were provided with facilitation from the project, therefore the indicator is overachieved.

Similar to the outcomes of PA 4, the regional approach here was also a central element of the project's activities. Gathering the same breadth of expertise and making it available to such a broad audience would not have been possible with a bilateral cooperation project.

Conclusion on effectiveness dimension 1:

The regional concept of the project proved to be appropriate considering that several outcomes were achieved that would not have been possible under a purely bilateral cooperation approach. Apart from the inclusion of geothermal energy in the Sustainable Energy Strategy for Central America 2030 under PA1, the project's approach to promoting regional exchange of information and expertise under PA 4 and 5 was seen as one of its greatest strengths (FG_4 with partners; Int_3 with donors; Int_2,5 with partners). Nonetheless, the project's regional nature did not exclude focused bilateral cooperation, particularly in PA1 and 2; therefore, it combined the best of two worlds (Int_5 with partners).

The evaluation team finds that the indicators on the outcome level were well chosen to measure achievement of the project's overall objective. Additional indicators were not required. All indicators were fulfilled or even overachieved (some considerably). However, the indicator for PA 2 was fulfilled in a formal rather than in a meaningful and effective way. Therefore, effectiveness dimension 1 is scored with 32 out of 40 possible points.

Effectiveness dimension 2: Did the activities and outputs of the project contribute substantially to the project objective achievement (outcome)?

In the following, a contribution analysis was carried out for selected priority areas of the project. As a first step, the evaluation team assessed the achievement of the respective outputs and their indicators. Then, in a second step the main hypothesis for PA 1, PA 3 and PA 5 was analysed to see if the causal links described within could be confirmed. This was complemented by an analysis of the contributing and hindering internal and external factors.

PA 1: Advice on the improvement of legal and regulatory framework conditions for the use of geothermal energy

The intended output in this PA is formulated as follows (output A): Decision-makers from relevant institutions

react to recognised political and legal needs for action and act in relation to the introduction or improvement of technical norms in the field of geothermal energy. Achievement is measured by the following indicators:

Indicator A1: Three interinstitutional and intrainstitutional working groups come together at national or regional level every six months.

→ Such working groups were created in Costa Rica, El Salvador, Guatemala, Honduras and Panama. Some of the working groups meet more or less regularly every six months (Honduras, Panama), while others meet on a more sporadic basis (Guatemala) (KfW, GIZ, BGR 2020). The indicator can be considered as overachieved.

Indicator A2: Detailed analyses are available for four countries in Central America, describing the political and legal framework conditions in the field of geothermal energy and identifying the need for action.

→ Such detailed analyses were elaborated for Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama, and consequently consulted with the working groups mentioned above (KfW, GIZ, BGR 2019). The indicator has therefore been overachieved.

Indicator A3: Three recommendations for the content of new or existing political, legal or normative documents are the result of the activities in the working groups.

→ Proposals 1, 3, 4 and 6 listed under effectiveness dimension 1 are a direct result of the efforts of the working groups in El Salvador, Panama, Honduras and Costa Rica. Proposal 2 was elaborated independently of the working group by a consultant of the project and proposal 5 was developed in cooperation with CEPAL (Int_8 with partners). The working group in Guatemala produced no results. The indicator is slightly overachieved.

Against this background, the main hypothesis for PA 1 (see Chapter 2.2.) will be analysed:

In a first step, the project laid the basis for the formation of the working groups by hiring a consulting firm to carry out a detailed analysis of the framework conditions for implementing geothermal projects (for electricity generation as well as direct use applications) in the six partner countries of the project. The results of this analysis (which also identified gaps as well as recommendations for improvement) were shared and discussed with decision-makers at the political level in the countries. This eventually led to the creation of the working groups in the countries that bring together leading technical and legal cadres from central organisations – national ministries, regulatory authorities and other stakeholders such as geothermal firms, professional associations such as the Colegio de Geólogos and Colegio de Ingenieros, universities and civil society organisations. These groups worked towards analysing the legal and regulatory framework conditions for using geothermal energy and elaborating proposals for improvements (GIZ 2020b). The level of communication and cooperation that was achieved by the working groups would have been unlikely without GIZ's intervention (Int_5 with partners).

Depending on the country, the working groups met more or less regularly. In some of the working groups (for example, Panama), the project played an active role as moderator. In others it participated only as an observer (Costa Rica, Honduras). The project contributed professional expertise to support the content-related work of the groups by presenting alternatives and proposals for policies, laws and regulations elaborated by hired consultants and lawyers, based on experiences from Germany and other countries. The project also enabled and accompanied the regional exchange of ideas and experiences related to the geothermal framework through the dialogue forum under PA 4 (Int_1 with partners). In fact, participation in the dialogue forums at the GeoLAC conferences was seen as the 'key to success' by one of the interview partners, thereby giving a good example of how the activities of the project's different priority areas were interrelated and complemented each other. (Int_6 with partners).

Against this background, it can be confirmed that the preparatory analysis and subsequent creation of the working groups along with the provision of consultancy expertise led to proposals for improving framework conditions in the geothermal sector (KfW, GIZ, BGR 2020). This could have been delayed without the support provided by GIZ's project (Int_1 with partners, FG_3 with universities).

So far, only one of the proposed improvements has been approved by the corresponding authorities – procedures for assessing the environmental impact of geothermal projects below 5 MWe in El Salvador. The approval of the other draft policies, laws and regulations that were developed with the project's help depends on the political will of the respective parliaments and assemblies, which can be considered as the main external contributing factor (Int_5, 9 with partners). At the same time it is evident that once adopted, the political and legal framework conditions for implementing geothermal projects will be enhanced. Hypothesis H1 can therefore be fully confirmed.

As mentioned above, the working group in Guatemala did not produce any results, it is therefore worth analysing the hindering factors. The work in this group focused on creating a road map for putting the country's geothermal resources to use. This process was pushed by the private sector. However, the Ministry of Energy and Mines as the responsible authority in the energy sector did not support the initiative and therefore did not take on a leading role in the working group to move the process forward. The ministry said that it sees its responsibility in the energy sector only in the field of electricity generation and it is not in charge of geothermal heat; this seems odd considering that geothermal resources can be used for producing electrical energy. In any case, the failure of the working group in Guatemala to deliver results was primarily due to lack of commitment on the part of the main participating government institution (WS_1 with GIZ). Possibly, this lack of ownership could have been mitigated at an earlier stage through a cooperation agreement with the ministry. The evaluation team does not know if this was the case, but it was mentioned during the evaluation mission interviews that such agreements were not established with all partner ministries (Int_7 with partners).

Another potential obstacle to progress on the political level lies in changes of government, which can always occur and lead to a change of priorities. This was the case in Panama, where the project experienced a change of government marked by a U-turn from complete rejection of a geothermal energy policy to its conditional acceptance (depending on successful demonstration of feasibility). The efforts of GIZ played a role in this turnaround, amid concerns of being left behind in comparison to other countries in the region. A similar process was observed in Costa Rica, where interest and ownership in direct uses increased when a new government was more receptive to the topic (WS_1 with GIZ).

PA 2: Demonstration of technical feasibility and profitability of geothermal technologies

The intended output in this PA is formulated as follows (output B): The technical, economic and administrative feasibility of using geothermal energy, especially in the low temperature range, has been proven. Achievement of this output is measured by the following indicators.

Indicator B1: Three cooperation agreements with project developers for the implementation of pilot projects have been signed.

→ A total of seven cooperation agreements were signed: four in Costa Rica and one each in El Salvador, Guatemala, Honduras and Nicaragua (GIZ 2020b). The indicator is therefore clearly overachieved.

Indicator B2: Feasibility studies for three geothermal pilot projects (particularly for the use of low temperature geothermal resources) have been prepared.

→ The seven cooperation agreements mentioned above all resulted in a feasibility study for pilot projects on the use of low temperature geothermal resources. The pilot projects include a greenhouse for tomatoes, hot water for recreational purposes in a hotel, and a dryer for agricultural products in Costa Rica; a coffee dryer in El Salvador; a fruit and vegetable dryer in Guatemala; a pasteuriser for milk products in Honduras; and a peanut dryer in Nicaragua) (GIZ 2020b). This indicator is also clearly overachieved.

Against this background, the main hypothesis for PA 2 (see Chapter 2.2.) will be analysed:

In addition to limited financing options, the initial scenario was characterised by a lack of previous feasibility

studies and actual showcase projects for geothermal direct use applications due to little know-how in the low-enthalpy field. Guatemala was the only country that already had industrial direct-use projects implemented by private firms. Therefore, the project started by hiring an international consultancy to develop georeferenced maps of geothermal suitability for pilot projects in order to help identify promising sites. For direct use applications, the analysis was based (among others) on combining information on the geothermal potential with that of energy demand. As a result, the geothermal database and favourability maps were made available to decision-makers in Central America, which provided an important tool for identifying promising projects (GIZ 2020b).

Following a public-private partnership approach, on this basis the project supported the formation of seven cooperation agreements with private companies, aiming to work together in developing direct use pilot projects. The project's main contribution under these cooperation agreements consisted of providing international consultancy expertise for feasibility studies and in scrutinizing and accepting the final study results (FG_1 with private actors, GIZ 2017-2019).

For five projects the feasibility studies recommended the investment while two of them were shown not to be economically viable (GIZ 2020b). The final studies were handed over to the partner companies and presented in each the corresponding countries through a series of webinars in September 2020, and the results shared regionally through a presentation of all seven projects to the Geosciences Technical Group in October 2020. Some of the preliminary and final results were also presented at the GeoLAC Conference in Chile and at the International Geothermal Conference of the International Energy Association (both in 2019). Finally, it is expected that SICA and CECACIER will publish all seven studies on their web-platforms to make them accessible to the general public (WS_1 with GIZ). The project therefore used its regional structures to share the findings and conclusions from the feasibility studies with the other countries in the region, and to increase the corresponding lessons and potentials for replication.

Following this analysis, it can be concluded that the project made significant contributions to broadening the available information base for developing geothermal projects in the region. Several interview partners from the private companies confirmed this was an important contribution to improving the investment climate for geothermal projects, therefore the hypothesis as formulated above can be confirmed.

One criticism made during the evaluation mission interviews is that there was no capacity building in the course of the feasibility study (Int_3 with partners) and the evaluation team shares the opinion that such studies offer a great opportunity for integrating the counterparts and training them on the job, which could have amplified the positive effects.

Another critique suggested that some of the contracted consultants lacked knowledge of the local reality and framework conditions and that more local/regional knowledge and expertise should have been involved in elaborating the studies (Int_3, 4 with partners, FG_2 with partners, FG_1 with private actors).

Furthermore, many interview partners also expressed that they would have required more support in identifying financing options in order to take their projects to the next step towards implementation (FG_1 with private actors, Int_3 with partners). Although the cooperation agreements also included support for the companies in the search for financing the projects, this occurred only with the pilot project in Guatemala – which was supported by FoGeo in applying to GDF. However, this application was rejected by GDF in the first application round because the project did not meet the funds eligibility criteria (Int_2 with private actors, WS_1 with GIZ).

Against this background, hypothesis H2 would have to be adapted to include support for obtaining finance as an important piece to the puzzle of improving the investment climate for the private sector. This urgent requirement for support was not provided by the project in a satisfactory and sufficient manner. Not only did many pilot projects not receive financing support at all, but where it was delivered it addressed the wrong financing instrument. In one of the interviews with private companies, the opinion was expressed that this might

not have happened in a bilateral approach where deeper cooperation on a national level with individual pilot projects could have been possible. The broader regional approach of FoGeo was seen as ‘diluting’ the support given to individual geothermal projects (Int_2 with private actors). However, it must also be noted that there were not many financing instruments available for geothermal direct use applications, therefore limiting the corresponding options.

PA 3: Capacity building on geothermal energy

The intended output in this PA is formulated as follows (output C): Qualification measures for experts and managers in the geothermal sector are implemented. Achievement is measured by the indicators below.

Indicator C1: A concept for the institutional anchoring of training offers and qualification of lecturers (training of trainers) on relevant technical topics is available.

→ A concept for anchoring training measures in institutions, especially in regard to qualification of lecturers, was elaborated in 2018 and presented to educational institutions in the region in the first quarter of 2019. At its core, the concept aimed to convert sporadic training measures into permanent offers (KfW, GIZ, BGR 2019). The indicator is fulfilled.

Indicator C2: A total of 300 specialists (including 20 multipliers) and executives participate in qualification offers in the geothermal sector.

→ The project trained 416 people through a total of 13 training courses in the region; 287 of the participants were specialists and executives. This fell slightly short of the indicator. Of the total 416 individuals trained, 114 were multipliers (such as teachers and professors). At least 37 of those multipliers belonged to the group of specialists and executives (see evaluation dimension 1). Therefore, this part of the indicator was overachieved (GIZ 2020b, WS_1 with GIZ).

Against this background, the main hypothesis for PA 3 (see Chapter 2.2.) will be analysed:

At the beginning of the cooperation, geothermal training offers in the region were available for high enthalpy uses for electricity generation, but barely existing for direct use applications. The project responded by cooperating with institutions and firms in the region that had existing geothermal training programmes (such as LaGeo, universities, the Chamber of Industry of Costa Rica and CECACIER) and expanding its training offers to include topics related to low-enthalpy. As a first step, the project identified strategic counterparts (the institutions above as well as others) and established a working group with them to elaborate a concept that described how the training measures could be sustainably anchored within their structures and programmes. This implied transforming sporadic training measures into a continuous offer and focusing on developing knowledge multipliers, or training the trainers. Together, training topics for different target groups were identified and prioritised and the project contributed to designing new training concepts such as blended learning, which combines classroom courses with digital formats. Furthermore, the project supported the institutions in developing training materials such as course manuals and exercises (FG_2 with universities, GIZ 2020b, WS_1 with GIZ).

In the design and implementation of the training measures, the project cooperated with German institutions and made use of their knowledge and experience. One example is a three-day introductory geothermal training module offered by CICR, with BGR contributing expertise on geology and geothermal applications (both high and low enthalpy). Another example is the five-day course Direct Use of Geothermal Energy in Central America, which was designed by the University of Bochum and being implemented by LaGeo. The University of Bochum also carried out a training measure in Germany for 13 selected multipliers (GIZ 2020b).

Interview partners confirmed that the training was an essential component to improving the investment climate in geothermal projects, given that developing and implementing projects is not possible without corresponding knowledge. There is a broad consensus that today’s level of geothermal knowledge in the region would not

exist without the support of the project (FG_1 with private actors, FG_2 with universities, FG_2 with partners).

On the basis outlined above, hypothesis H3 can be confirmed. In the evaluation team's view, the main contributing factor was the project's approach to cooperation with institutions and companies in the region – and from Germany as well – therefore combining and complementing existing knowledge and expertise. The project built on what already existed and made use of potentials for synergies, instead of creating something completely new. Although one interview partner offered critical input and suggested that the training should have included stronger practical elements such as the use of demonstration equipment like heat pumps (Int_1 with private actors), practical components (such as visits to geothermal projects) did form around 90% of all training delivered. This was seen as another factor contributing to the general high level of satisfaction among participants (WS_1 with GIZ, FG_2 with universities).

Finally, interview partners provided individual criticisms during the evaluation mission concerning the content of the training measures and their connection to the project's activities in PA 2. The interview partners suggested that the training did not sufficiently cover the operation of geothermal projects and cited this as a major obstacle to their implementation (Int_3 with partners). However, the evaluation team believed that such specific technology-dependent training cannot easily be provided as part of a more general training programme; these measures are better delivered by the equipment providers themselves on a business basis. Another point was that local and national banks have not yet developed financing mechanisms for geothermal direct use applications due to lack of understanding of the technology and risks (GIZ 2020b). It was suggested that the activities under PA 3 should have included corresponding training measures for banks in order to lay the basis for suitable financing instruments (Int_1 with private actors). This criticism is shared by the evaluation team.

PA 4: Support to national and regional dialogue processes to intensify technical exchange, promote learning across borders and foster greater market development

The intended output in this PA is formulated as follows (output D): A dialogue forum on the subject of geothermal energy with the participation of relevant actors is initiated in close coordination with the GDF Technical Assistance Forum. Achievement of this output is measured by the following indicators:

Indicator D1: A working format and programme of contents for the dialogue forum coordinated with participants (energy and environment ministries, regulatory authorities, energy suppliers, project developers, universities) is available.

→ A working group with participants from selected institutions was established and a working format and programme were jointly elaborated in 2017 (GIZ 2020a). The indicator is fulfilled.

Indicator D2: The dialogue forum meets every six months to exchange ideas.

→ Assuming that two forums took place per year from 2018 (the year after the working format and programme were elaborated), this amounts to a total of six. In reality, meetings took place at the following five events:

- 2018: GeoLAC Conference Mexico,
- 2019: GeoLAC Conference Chile,
- 2019: International Geothermal Conference of the International Energy Association Costa Rica,
- 2020: Exchange in Guatemala, Honduras and Panama; and
- 2020: Virtual GeoLAC Conference.

The indicator was therefore slightly underachieved. However, some compensation for the lack of a second conference in 2018 was offered through the realisation of a workshop that included discussions and dialogue among the group's participants. However, this workshop was not counted as a dialogue forum in the strict sense (WS_1 with GIZ).

The following process and activities in PA 4 took place:

Previously, there was no regional forum for cross-border dialogue on geothermal energy. Together with CECACIER in a coordinating role, the project supported the conceptualisation and establishment of such a forum for participants from the public and private sectors and defined its thematic areas of interest. It aimed to provide a format that allows mutual learning by sharing experiences, discussing questions and finding solutions with experts from the region (Int_4 with partners). This would also motivate participants without geothermal experience to reduce barriers to the use of geothermal energy in their countries (KfW, GIZ, BGR 2017).

As a first step, in 2016 GIZ and CECACIER carried out workshops in Mexico and Costa Rica, with participation of geothermal experts from the project's six partner countries, to discuss opportunities and benefits of geothermal direct use applications in Central American countries. Due to positive feedback from the participants, a permanent group of experts was established consisting of representatives from geothermal companies and political institutions in the region such as ENEL (Nicaragua), ICE (Costa Rica), LaGeo (El Salvador), and the Ministry of Environment in Honduras as well as CECACIER itself (KfW, GIZ, BGR 2017).

In 2017, the group of experts elaborated a working format and programme of contents for the dialogue forum, which includes meetings roughly every six months at the regional GeoLAC conferences and other events (GIZ 2020a). The meetings were carried out in separate groups, one focusing on high enthalpy uses, the other on low enthalpy applications (GIZ 2020b). The project facilitated the exchange with other Latin American experts within the Technical Assistance Forum (TAF) of KfW's Geothermal Development Facility (GDF), which also met at the GeoLAC conferences and enabled the exchange among decision-makers in the geothermal sector (WS_1 with GIZ; GIZ 2020b).

At these meetings, numerous participants have identified technical needs and opportunities for collaboration and entered into corresponding agreements as presented under effectiveness dimension 1. The evaluation mission interviews confirmed that this has strengthened regional know-how and contributed to improving the investment climate for geothermal energy. They pointed out that there would have been less communication and cooperation among institutions in the region without the project's support, and awareness and knowledge about geothermal energy (especially low enthalpy) would be significantly lower (Int_4,8 with partners).

The main contributions from GIZ included technical and organisational support to CECACIER in putting together the group of experts that elaborated the working format and programme for the dialogue forum, and cooperation with KfW in establishing the link to TAF that provided additional value to the exchange (Int_8 with partners). A significant factor towards achieving positive results in this PA was the strong commitment and initiative of CECACIER, which played a key role in managing the dialogue forum and ensured its effectiveness by following up on meetings and agreements made between the participants (GIZ 2020b).

PA 5: Promotion of a network of experts who provide information and advice for geothermal investors, project developers, academia and governments

The intended output in this PA is formulated as follows (output E): A regionally coordinated concept to cover the need for advice and information as well as for the regular technical exchange of relevant target groups in the field of geothermal energy in Central America exists. Achievement is measured by the following indicators:

Indicator E1: A needs assessment has been carried out in three countries with five relevant institutions (regional geothermal office, chambers of industry, business development agencies) in each country.

→ Needs assessments with the involvement of at least five relevant institutions per country were carried out for Guatemala, Honduras and Panama (KfW, GIZ, BGR 2019). The indicator is fulfilled.

Indicator E2: Major players in the field of geothermal energy from three Central American countries present a

coordinated regional concept to meet information needs.

→ In 2018, CECACIER together with key players from the project's partner countries elaborated a regional concept for meeting geothermal information needs (KfW, GIZ, BGR 2019). The indicator is fulfilled.

The following activities were carried out in PA 4:

To complement the capacities transmitted through the training measures in PA 3, the project aimed to promote the provision of information services to participants in the geothermal sector (GIZ 2020b). These were aimed primarily at public institutions, energy providers, academia, and the private sector and its associations (WS_1 with GIZ). In contrast to the activities in PA 3, the project started almost from scratch. There were no concepts to detect needs or approaches to solve them and little interest or capability on the part of the implementing partners to create a regional agency to take on this role as initially planned. Hence the project chose to pursue an alternative approach that uses synergies with the structures established under PA 4 (WS_1 with GIZ).

In 2017 an analysis of the needs for information and advisory services in the geothermal sector was carried out by the project in cooperation with the business school INCAE, and this analysis continues to be updated annually by the group of experts created under PA 4. CECACIER, with support from FoGeo and the group of experts, led on developing a coordinated regional concept to meet information requirements on the basis of the needs assessment. The concept consists of information provision through webinars, podcasts and publications and complemented by physical events that provide the opportunity to tap into the knowledge of the expert group participating in events under PA 4 (GIZ 2020b). All of the outputs are uploaded to CECACIER's special web-based knowledge platform. This guarantees that the information is publicly accessible and not lost over time, which is seen as a major priority (Int_8 with partners).

Apart from the information needs assessment, the project provided material, technical and logistical inputs to producing and compiling technical and scientific papers and podcasts as well as the implementation of webinars, regional workshops and events. The establishment of CECACIER's web platform was also supported with the provision of IT expertise; the project also assisted CECACIER in developing a communication campaign to make the information platform publicly known (WS_1 with GIZ). These contributions were seen as essential to ensuring the maximum outreach and a high demand for the information and advisory services (Int_4 with partners).

One of the main benefits of the information services provided in PA 5 is that they complemented the capacity building measures of PA 3 very well. In addition to the availability of general information, access to the group of experts was provided, networks were established and contacts were improved so users know where to find further advisory support for solving specific problems (FG_2 with universities).

As in PA 4, the successful achievement of the intended outputs and outcomes in PA 5 depended also on the leading role taken over by CECACIER and its coordination with the group of experts under PA 4.

Conclusion on effectiveness dimension 2:

Having analysed the activities and outputs in all PAs, it can be concluded that only two output indicators have been slightly underachieved while four were fulfilled and five were clearly overachieved. The achievement of the project's intended outputs was therefore evaluated as successful. No additional output indicators were required. The hypothesis-based contribution analysis largely confirmed that the activities, instruments and outputs of the project contributed to the achievement of the project objective. Stakeholders held a large consensus that without the project, developments in the geothermal sector would have been strongly delayed (particularly in PA 1 and 2). An important internal contributing factor was seen in GIZ's approach to coordination and cooperation with institutions and companies from the region. Also, the inclusion of BGR (in PA 3) and

KfW (through TAF in PA 4) contributed to successful outputs. One main external factor resided with the commitment of the counterparts, which in some cases was very strong and conducive (as in the case of CECACIER) and in others hindered achievement of results (as in PA 1 with Guatemala). Although the latter was outside of the project's influence, it might have been identified at an earlier stage through a cooperation agreement. Further criticism involved the lack of on-the-job training during the elaboration of feasibility studies and an occasional lack of local knowledge from the consultants in PA 2; others suggested that the pilot projects under PA 2 received insufficient support to access financing. In this context, it may have also been conducive to offer training to local banks on geothermal energy in order to pave the way to establishing appropriate finance instruments in the region; however, this was not provided. In summary, effectiveness dimension 2 was scored with 25 out of a possible 30 points.

Effectiveness dimension 3: Did any project-related (unintended) negative results occur and did the project respond adequately? Was the occurrence of additional (not formally agreed) positive results monitored and have additional opportunities for further positive results been seized?

The project produced the following not (formally) agreed positive results at the output and outcome level. These results were not the project's primary aim and not reflected in the project's logical framework, but they can be considered as positive collateral results:

- As the project started working in PA 2 it became clear that identifying pilot projects would require intervention one step earlier with analysis of the geothermal potential. The project therefore produced maps of geothermal suitability in order to identify promising locations and pilot projects. This positive by-product was utilised by the establishment of a regional database that provides public information on geothermal potential, particularly for future demonstration and productive projects. The process was monitored by the project and reported to BMZ (WS_1 with GIZ).
- In terms of gender, the initial project proposal envisioned training programmes that were attractive for female participants and cooperating with educational institutions to make engineering careers more attractive for women. However, the gender workshop that resulted from the activities in PA 4 – implemented jointly by the project and the World Bank – went beyond that by bringing topics of gender equality into geothermal companies with a training of trainers approach (see relevance dimension 2 in Chapter 4.1). By doing so, a stronger boost was given to gender issues in the geothermal sector that had not been planned as such initially (Int_2 with donors, WS_1 with GIZ). This unintended activity and output was monitored and reported to BMZ (KfW, GIZ, BGR 2020).
- Also in PA 4 experiences and knowledge from Central America were presented at international events, which resulted in increased interest in direct use applications in other countries and within international institutions also outside of the region (WS_1 with GIZ). This project by-product was monitored and utilised by establishing increased cooperation. Together with the World Bank, International Renewable Energy Association and the Economic Commission for Latin America and the Caribbean (CEPAL), the project positioned geothermal direct use applications as a central topic at the annual regional energy conference (Congreso Regional de Energía) in San Salvador in 2019 (KfW, GIZ, BGR 2020).

But an unintended negative result was also identified when some counterparts were left confused about the respective projects and roles of GIZ and BGR, which were not clearly distinguishable for them. This partially created the impression of insufficient coordination and duplication of efforts that had negative impact on the perception of German technical cooperation (FG_3 with partners, Int_9,10 with partners). This risk had not been identified during the project's conception phase; however, the projects of GIZ and BGR perceived these difficulties while implementing their projects and understood that the similarities in outputs and indicators could cause confusion. Over a year into implementation of the projects, GIZ and BGR started carrying out their planning workshops jointly with the project partners – which contributed to a greater level of clarity (Int_1 with donors, WS_1 with GIZ).

In summary, the project took advantage of the unintended positive results and responded in an adequate manner to the negative one just described. However, the evaluation team believes that a clearer delineation between the projects of GIZ and BGR would have been possible from early on and that further efforts in this context are required while the follow-up project FoGeo II is implemented. Therefore, effectiveness dimension 3 is scored with 26 out of a possible 30 points.

Table 4: Rating of OECD/DAC criterion: effectiveness

Criterion	Effectiveness dimension	Score and rating
Effectiveness	The project achieved the objective (outcome) on time in accordance with the project objective indicators. ⁵	32 out of 40 points
	The activities and outputs of the project contributed substantially to the project objective achievement (outcome). ⁶	25 out of 30 points
	No project-related (unintended) negative results have occurred – and if any negative results occurred the project responded adequately.	26 out of 30 points
	The occurrence of additional (not formally agreed) positive results has been monitored and additional opportunities for further positive results have been seized.	
Overall score and rating		Score: 83 out of 100 points Rating: Level 2: successful

4.3 Impact

Evaluation basis and design for assessing impact

For impact (as for effectiveness), the evaluation matrix includes three assessment dimensions that ask similar questions and are discussed below.

Impact dimension 1 seeks to determine if the intended overarching development results have occurred or if they are foreseen (should be plausibly explained).

The project aimed to achieve the following impacts, with the corresponding Sustainable Development Goals (SDGs) indicated in parentheses:

- Through an increased use of renewable energies greenhouse gas emissions are reduced (SDG 13).
- Reduced energy costs and improved energy security improve local industry competitiveness (SDG 7).
- Market growth in the renewable energy sector opens possibilities for local companies to participate in the value chain that leads to job creation (SDG 8 and 9).
- Through job creation, strengthening the industrial sector and reducing in energy costs, a contribution to poverty reduction is made (SDG 1).

The intended impacts are in line with the partner countries' SDGs and plans to implement Agenda 2030. In theory, conflicts could exist between the impacts related to SDG 8 and 9 (promoting inclusive and sustainable economic growth and industrialisation) and SDG 13 (aiming to combat climate change). However, the project's

⁵ The first and the second effectiveness dimensions are interrelated: if the contribution of the project to the objective achievement is low (second effectiveness dimension) this must also be considered for assessing the first dimension.

⁶ The first and the second effectiveness dimensions are interrelated: if the contribution of the project to the objective achievement is low (second effectiveness dimension) this must also be considered for assessing the first dimension.

expected impact on job creation and participation from local firms are based on a renewable energy technology so they likely to go hand-in-hand with the project's primary goal of CO₂ reduction.

The evaluation team could only attempt an estimate of intended impacts in future, given that no impact indicators have been formulated and the impact level was not included in the project's monitoring system. Furthermore, most of the impacts described above are linked to the actual implementation of geothermal projects, which will depend on third party actions and will only occur with considerable delay after the project is finalised.

The estimate was conducted on one hand by reviewing documents such as the project's progress reports as well as sectoral documents describing recent developments in the geothermal sector of the partner countries. On the other hand, it also drew on interviews with stakeholders, particularly the energy ministries of the partner countries along with public and private energy firms developing and investing in geothermal projects.

Impact dimension 2 asks if the project objective (outcome) of the project contributed to the actual or foreseen overarching development results.

To what extent have the project's improvements to the investment climate for geothermal projects in Central America led – or will lead – to the actual construction of geothermal power plants or direct use applications and their related impacts, particularly the reduction of greenhouse gas emissions? Given that the actual implementation of geothermal projects depends on actions from third parties (such as financiers and investors), GIZ's interventions can only be considered as a contributing factor among others. However, based on the feedback gathered from stakeholder interviews the evaluation attempted to qualitatively describe this contribution.

Impact dimension 3 intends to establish if the occurrence of additional (not formally agreed) positive results at impact level has been monitored and opportunities for further positive results have been seized. It also aims to confirm that no project-related (unintended) negative results have occurred – but if so, that the project responded adequately. This assessment was carried out in the same methodological way as described for the same assessment dimension related to effectiveness in Chapter 4.3.

Analysis and assessment regarding impact

Impact dimension 1: Have the intended overarching development results occurred or is this foreseen for plausible reasons?

According to the initial project proposal, the following impacts are expected:

- Through an increased use of renewable energies greenhouse gas emissions are reduced.
- Reduced energy costs and improved energy security improve competitiveness of local industries.
- Market growth in the renewable energy sector opens possibilities for local companies to participate in local companies in the value chain, which leads to job creation.
- Through job creation, strengthening the industrial sector and a reduction in energy costs, a contribution to poverty reduction is made.

This is in line with the overarching goal of the joint development cooperation engagement of GIZ, KfW and BGR to reduce CO₂-emissions and contribute to improved energy security in Central American countries, which can therefore be considered the primary intended impacts. However, no specific or quantified impact indicators have been formulated for the joint development cooperation engagement and the impact level is not included in the project's monitoring system.

Since the project's impacts depend on the actual implementation of geothermal energy projects, the underlying question here is if the project has led to the construction of geothermal power plants or direct use applications

– or if this is expected in the foreseeable future. None of the stakeholders interviewed during the evaluation mission could confirm that this has been the case so far. This would require time and it will therefore take place with some delay after the project's intervention, depending on project developers and investors.

Particularly in PA 2, no pilot projects that were supported by the project have yet been implemented. However, five of seven feasibility studies carried out by the project came to positive conclusions recommending the investment. The project sponsors interviewed during the evaluation mission intend to proceed down this road but still have obstacles to overcome, particularly in regard to securing finance (FG_1 with private actors, Int_1,2 with private actors). With further support to these projects from FoGeo II, a good number of direct use pilots are likely to be realised. It is also expected that these pilot projects will serve as models for other investors to reproduce, hence multiplying the project's expected direct impact (FG_1 with private actors, Int_3 with partners). In fact, one pilot project was said to already fulfil this function – though it has not yet been built – due solely to presentations of the feasibility study results at regional events (Int_2 with private actors).

In PA 1, the only national regulatory proposal that has so far been put into practice is the procedure for assessing the environmental impact of geothermal projects below 5 MWe in El Salvador, which was approved in February 2018. So far no concrete projects have come out of this, but it is expected that the new procedures provide guidelines will facilitate the development of such projects in the future (Int_1 with partners). The same can be said concerning the policies and regulations that have not yet been approved or published but are expected for the near future, such as those in Panama and Honduras (FG_1,4 with partners).

The activities in PA 3, 4 and 5 related to improving capacities, dialogue and making information available have contributed to implementing geothermal projects through a more indirect mechanism, but they are considered as essential factors that will facilitate their actual construction (Int_9 with partners).

There is therefore a broad consensus anticipating an increased implementation of geothermal projects in the foreseeable future in the region as a consequence of the project's activities and the intended impacts will occur to some degree. Most of these – such as reduced energy costs, improved energy security and job creation – are relevant particularly for the indirect target group consisting of the end-users of energy (private households, industry and commerce) who are likely to be affected by the project's impacts. Considering that the project focused on geothermal direct use projects that tend to be smaller in terms of their energy output, the resulting impacts will likely be fewer than if the project had primarily supported large-scale electricity generation projects (Int_3 with partners). However, the repercussions on marginalised groups such as the poor rural population (considered in developing the feasibility studies for pilot projects) can be expected to be greater since they offer more opportunities for additional rural income generation (WS_1 with GIZ). In this sense, many of the project's impacts are expected in relation to the Leave No One Behind principle.

In conclusion, it is expected that the overarching results will be achieved, although the degree depends on the implementation of geothermal projects by project developers and investors and factors such as their ability to access suitable sources of finance. Overall positive impacts can be expected to be less than if the project had focused on large geothermal power plants, which would produce more energy for more people. However, direct use projects are expected to offer more potential benefit for the rural population in the vicinity of the project while having fewer negative environmental and social effects. In addition, due to lack of a systematic impact monitoring impact dimension 1 is scored with 34 out of a possible 40 points.

Impact dimension 2: Did the project objective (outcome) contribute to the occurred or foreseen overarching development results?

The main hypothesis for impact (HI) was defined in Chapter 2.2. Considering that the intended impacts (particularly the reduction of CO₂ emissions) are an automatic result of the use of geothermal energy, this dimension can be condensed to the question of how the project's outcomes contribute to the realisation and opera-

tion of geothermal energy projects through third parties (such as project developers, investors and utilities).

In PA 1, the project's results on the outcome level are proposals for new or adapted political strategies, laws or norms that promote the implementation of geothermal projects for electricity generation as well as for the use of heat in direct use applications. It is without doubt that a clear and conducive political, regulatory and legal framework is a precondition for any kind of economic investment activity. Particularly in regard to low enthalpy geothermal energy projects, none of the six project partner countries had a specific framework before the intervention of FoGeo. Instead, the general regulations on energy and mining were applied. For instance, in Honduras, the national plan between 2012 and 2022 includes the goal of covering 80% of the country's energy needs through renewable energies by 2038. While the document focuses on hydro power and mechanisms to support public and private investments, no mention was made of geothermal direct use applications (GIZ 2020b). The project therefore elaborated a policy for promoting geothermal energy that will form part of a future geothermal law, which is expected to facilitate investments in geothermal projects (Int_10 with partners).

Proposals for a specific geothermal framework were also made in other countries, which would not have happened to such an extent without the project (Int_5 with partners). Therefore, there is an obvious link between the project outcomes in PA 1 and the expected increased implementation of geothermal energy projects. However, the willingness of the partner countries to adopt the project's proposals and turn them into prevailing strategies, policies and regulations is the main external influencing factor. So far, this has only happened in El Salvador and on the regional level with the Sustainable Energy Strategy for Central America 2030, but other countries like Panama and Honduras are likely to follow suit.

In PA 2, the project's outcomes were funding applications for geothermal projects that were presented to financing institutions (in this case the GDF). Obviously, geothermal projects can only be realised if the development and investment costs can be covered – as underlined by several interview partners during the evaluation mission, obtaining finance was seen as one of the main obstacles to their implementation. However, the support the project provided to funding applications to the GDF did not succeed due to a mismatch between the projects and the GDF eligibility criteria (Int_2 with private actors, WS_1 with GIZ). The lack of suitable finance instruments for geothermal direct use applications through local and national banks could be considered an important external factor that creates difficulties for financing such projects in the region. Hence, while in PA 2 the project made important contributions to assessing the technical and financial feasibility of geothermal direct use pilot projects, the outcomes as measured by funding applications have not made a contribution to actually implementing such projects.

The project's result on outcome level in PA 3 was shown in the improvement of executives' abilities to perform their tasks in relation to geothermal energy through training and capacity building measures. This was confirmed largely by a survey carried out by the project itself; the evaluation mission also confirmed this through statements from training participants who were very pleased with the contents and the knowledge gained. Participants from private and public companies particularly confirmed that their capability to assess and develop geothermal projects has improved as a result (FG_1 with private actors, Int_1 with private actors). Although it is difficult to establish an empirical relation between the project's capacity building measures and the actual implementation of geothermal projects in the future, qualified human resources are an essential prerequisite and therefore it is very likely that these measures made a significant contribution. The training of trainers multiplied knowledge in the region, which could be one of the project's main contributions to widespread impact. A significant contributing external factor can be seen in the willingness and capability of the project's partner institutions to enlarge and complement their existing training offers (FG_3 with universities). However, this too was largely supported by the project. As one group of interviewees put it, without the project 'we would not have had the motivation to continue providing geothermal training as we now do' (FG_6 with universities).

In PA 4 the project outcomes consisted of several concrete activities, agreed among those participating in the dialogue forums, which could promote the use of geothermal energy (see evaluation dimension 1 in Chapter

4.2). All these activities were suited to advance development and implementation of geothermal projects in the respective countries (Int_4 with partners). The regional dialogue processes established by the project fostered the exchange of experiences between institutions and countries and enabled mutual learning from experiences, which is likely to make a lasting contribution to accelerating the development of geothermal energy in the region (Int_8 with partners). Therefore, there are indications that the specific outcomes of PA 4 may foster the future implementation of geothermal projects.

The outcomes in PA 5 involved a large number of specific consulting, training and information services that were (and continue to be) delivered to companies, government institutions and other stakeholders through a regional network of geothermal experts established by the project. Since new formats were used in this context (such as webinars and podcasts), this outcome is considered an important contribution to innovation in the region (FG_5 with universities). In fact, the network itself is seen as an innovative approach since the initial intention of fostering a regional energy agency did not work out (Int_9 with partners). The outcomes of PA 5 are interrelated with improving capacities under PA 3 and fostering regional geothermal dialogue under PA 4. The evaluation team sees these measures, along the provision of previously unavailable offers in information and consultancy, as fundamental to bringing geothermal projects to fruition. In fact, one interview partner during the evaluation mission described the network of experts and its services as the 'strongest link in the project' since it represents the main source of knowledge and information for companies in the geothermal sector and thereby contributes to market growth. This will result in implemented projects (Int_4 with partners).

In summary, the project's multi-level approach – which integrates interventions on the macro, meso and micro levels across five different priority areas – has covered most of the activities needed to improve the investment climate for geothermal projects. It is therefore held that the project made a significant contribution to facilitating the actual implementation of geothermal projects in the region and prepared the groundwork for achieving the expected impacts. As one interview partner put it: 'Without the project we would have seen much less growth in the geothermal sector of many Central American countries. Knowledge on its uses and applications would be scarce and limited on electricity generation and public policies and support would hardly exist, thereby increasing environmental and social imbalances (FG_1 with universities).'

An external factor that also contributes positively to the geothermal investment climate is the support of other donor agencies such as the World Bank, Inter-American Development Bank and Japan International Cooperation Agency, which are providing financial and technical assistance in the geothermal sector (Int_1 with partners), thereby complementing the German contributions of GIZ, BGR and KfW. Examples of how the project exploited such potentials for synergies are given in assessment dimension 3 in the previous chapter on effectiveness. However, the project did not sufficiently tackle the issue of financing geothermal projects that presented an important obstacle particularly to direct use applications, which faced a lack of suitable financing instruments. This could delay or even hinder the implementation of a number of projects together with their resulting impacts. Project finance should be addressed in a more targeted manner in the follow-on project Fo-Geo II. Evaluation dimension is scored with 25 out of 30 possible points.

Impact dimension 3: Have any unintended negative or formally not agreed positive results at impact level occurred? If so, did the project respond adequately to negative results and were positive results monitored and additional opportunities for further positive results seized?

As described in impact dimension 1, the project's impacts have yet to occur; they will be the result of implemented geothermal projects. Since this has not yet occurred as a direct result of the project, no unintended positive or negative impacts in this strict sense could yet be identified. However, several potential negative impacts had been identified in the project's conceptional phase, which were described in the chapter on relevance. The implementation of geothermal projects – as with all industrial plants that require space and have visual effects at the very least – could be met by resistance in the local population, possibly leading to protests and violence. Although this risk was mitigated through dialogue processes and participative inclusion of com-

munities aimed at identifying potential conflicts at an early stage, such negative impacts could not be ruled out entirely.

One interview partner pointed out that non-fulfilment of geothermal projects was in fact the cause of ‘a high level of frustration’. This was seen in the project’s insufficient support to establishing contact with suitable sources of finance (FG_1 with private actors). Although such negative perceptions were not the norm, it could be regarded as an unintended negative impact that affected individual partner motivation to work in the geothermal sector. In this context, FoGeo could have communicated more clearly with its partners and stakeholders that actual implementation was beyond its scope to avoid raising false expectations. In any case, the project responded appropriately by designing a follow-up project that focuses on bringing pilot projects to life.

Along these lines, a broader interpretation of unintended impacts beyond those resulting from actual implementation of geothermal projects may point to a positive example: the German contribution has wielded a leverage effect that has acted as a catalyst to the promotion of geothermal energy in the region. It has attracted and channelled further contributions from other donors such as the Inter-American Development Bank, International Renewable Energy Agency, Japan International Cooperation Agency, the Nordic Development Fund and the World Bank (KfW, GIZ, BGR 2020). Although this was not an intended result of the project, as described in earlier chapters it did make good use of synergies that presented themselves.

Finally, as described under effectiveness dimension 3 (see Chapter 4.2), a specific workshop gave a stronger boost to the issue of gender in the geothermal sector. This was not planned as such at the beginning of the project. Since this workshop covered general topics such as gender equality and stereotypes (not only in relation to the energy or geothermal sector), it is likely that the intended changes in mindset may have their impact not only in the business world but also on the personal lives of participants. Since the workshop was based on a training of trainers approach these results may continue to spread (Int_2 with partners).

The project did not carry out systematic monitoring at the impact level including any unintended positive or negative impacts and their ecological, economic and social dimensions. The project simply observed and reacted to some of the unintended impacts, as described above. Others (such the potential impact on gender behaviour) are fairly anecdotal, as received through comments from the project’s counterparts.

Impact dimension 3 is scored with 22 out of a possible 30 points.

Table 5: Rating of OECD/DAC criterion: impact

Criterion	Impact dimension	Score and rating
Impact	The intended overarching development results have occurred or are foreseen (plausible reasons). ⁷	34 out of 40 points
	The outcome of the project contributed to the occurred or foreseen overarching development results. ⁸	25 out of 30 points

⁷ The first and the second impact dimensions are interrelated: if project outcome’s contribution to the impact is low or not plausible (second impact dimension) this must be considered for assessing the first impact dimension as well.

⁸ The first and the second impact dimensions are interrelated: if project outcome’s contribution to the impact is low or not plausible (second impact dimension) this must be considered for assessing the first impact dimension as well.

Criterion	Impact dimension	Score and rating
	<p>No project-related (unintended) negative results at impact level have occurred – and if any negative results occurred the project responded adequately.</p> <p>The occurrence of additional (not formally agreed) positive results at impact level has been monitored and additional opportunities for further positive results have been seized.</p>	22 out of 30 points
Overall score and rating		<p>Score: 81 out of 100 points</p> <p>Rating: Level 2: successful</p>

4.4 Efficiency

Evaluation basis and design for assessing efficiency

For efficiency, the evaluation matrix includes two efficiency dimensions that are discussed below.

Assessment dimension 1 analyses the project's production efficiency (if the project's use of resources is appropriate with regard to the outputs achieved).

The analysis of production efficiency is based assigning costs to project outputs using the GIZ efficiency tool. As one input for the efficiency tool, a breakdown of the project's incurred costs and open commitments (Kostenträger-Obligobericht) dated 28 May 2020 was provided to the international evaluator by the project team. The other input is the Excel sheet assigning working months of staff to outputs. Both inputs were integrated into the efficiency tool by the international evaluator.

The analysis of the data in the efficiency tool followed the questions in the evaluation matrix, which are based on the follow-the-money approach; it will give first indications on the relation of resources to outputs. It was then examined more deeply by gathering feedback from partners and stakeholders through interviews. The central question was whether greater positive changes could have been achieved by the development measure with the same resources (maximum principle).

Assessment dimension 2 takes a look at the project's allocation efficiency – if the project's use of resources is appropriate with regard to achieving the project's objective/outcome).

Since the GIZ efficiency tool focuses on assigning costs to outputs (as opposed to outcomes), the analysis of allocation efficiency is based primarily on the questions in the evaluation matrix and not on cost data. The evaluation questions aim at:

- the maximum principle (mentioned above),
- asking if the outcome-resources ratio was considered during the initiation and implementation process, and
- finding out if better results were possibly achieved by leveraging resources through third parties. In this context, an additional evaluation question was raised during the inception mission. This aimed to evaluate the cooperation with KfW and whether the project made good use of potentials for synergies, since the success of technical cooperation often depends on the availability of financing offers to carry out investments. Answers to these questions were pursued through interviews with the project's implementing partners as well as representatives from GIZ and other donors, particularly KfW.

Analysis and assessment regarding efficiency

Efficiency dimension 1: Was the project's use of resources appropriate with regard to the outputs achieved?

The cost data provided to the evaluation team for the efficiency analysis was made available during the inception mission and dates from 28 May 2020, five months before the project ended. At this point, the cumulated actual costs of the project amounted to EUR 5,406,532 while there was an open cost commitment of EUR 401,725 (mainly for the project's own experts as well as third party personnel). Actual costs and commitments therefore added up to EUR 5,808,257 which is roughly EUR 192,000 short of the total project budget.

However, updated figures from December 2020 were received on 5 January 2021, which show that the remaining budget was then roughly EUR 59,000. Although the project itself finished on 31 October 2020, its accounts had not yet been closed due to the ongoing evaluation, with costs to be covered by the project itself. In terms of those costs, the remaining funds were estimated at EUR 30,000, which corresponds to 0.5% of the project's total budget. It could therefore be concluded that there were only insignificant deviations between the projected and actual costs, and the project effectively managed its resources in accordance with the planned costs.

Based on the analysis carried out with the efficiency tool, the project's total costs were distributed across the four PA and overarching costs as follows:

PA 1	PA 2	PA 3	PA 4	PA 5	Overarching
14%	22%	20%	16%	16%	12%

If the 88% of total costs that are not attributable to overarching costs were distributed evenly across all five priority areas, each PA would have had at its disposal exactly 17.6% of the total costs. Comparing this number with the actual costs per PA and the corresponding outputs achieved allows drawing the following conclusions:

What stands out is that the lowest share of costs (14%) is related to the activities in PA 1, where all three output-indicators have been over-achieved:

- Five instead of three working groups were established.
- Detailed analyses describing the political and legal framework conditions for geothermal energy and identifying the need for action were elaborated for six instead of only four countries.
- The working groups brought forth a total of four recommendations for the content of new or existing political, legal or normative documents instead of only three as initially planned.

Considering that the creation of a conducive political, regulatory, and legal framework is an essential prerequisite for developing geothermal energy projects in the region, a significant contribution could be made using only a limited amount of resources. The project's activities in PA 1 can therefore be characterised as particularly efficient. Nonetheless, a possibility for maximising outputs further with the same resources could have taken place in a more careful early assessment of the interest and ownership of the Ministry of Energy and Mines in Guatemala, where no output had been achieved by the working group. Had it been possible to identify these problems at an early stage, the resources used for cooperation with Guatemala could have been redirected to another country. A potential candidate might have been Nicaragua; participants report feeling more like spectators than partners to the project despite the country's need for assistance in elaborating a law on low-enthalpy geothermal uses (Int_7 with partners).

The over-achievement of output indicators was even more significant (and higher than in all other priority areas) in PA 2. Instead of three feasibility studies based on cooperation agreements with project developers, seven such studies were eventually produced. This large amount of outputs corresponded to the biggest share in total costs at 22%. Still, the actual costs on PA 2 were only 25% higher than they would have been with an even distribution across all priority areas, while the actual outputs were roughly 130% more than initially intended. Therefore, in PA 2 the project operated very efficiently. A potential for a further maximisation of outputs in PA 2 might have existed if the project had drawn more on existing local and regional expertise (as mentioned in the chapters on relevance and effectiveness), which could have provided the same or even better results at lower cost.

In PA 3 the project's outputs were the development of a concept to institutional anchor training offers and qualification of lecturers as well as targeted participation in the qualification offers by specialists, executives and

multipliers. Both outputs were practically fulfilled (without any significant over-achievement or under-achievement). Considering a share in total costs of 20% (compared to 17.6% under an even distribution among all priority areas), this could be understood as an indication of slight inefficiencies. However, the evaluator believes that the slight relative elevation in costs in PA 3 is perfectly justified due to the high level of expected sustainability and continued outputs (more people will be trained in the future), resulting from policies that anchor the training within educational institutions in the region. The project's approach to making use of existing structures and building up their existing training offers (instead of establishing something completely new) is seen as an efficient way of implementing the activities in PA 3. A potential for higher outputs using the same resources is not seen.

The project's intended outputs in PA 4 resulted in a working format and programme of contents for the dialogue forum, which should meet every six months to exchange ideas. The working format was established in 2017 and regular high-level meetings took place since 2018; this is one meeting less than expected with the six-month schedule. However, this a workshop (instead of a dialogue forum in the strict sense) provided some compensation. Therefore, the outputs in PA 4 could be considered as practically fulfilled. With a cost share of 16% (slightly lower than in a scenario of evenly distributed costs), the relation between outputs and resources in PA 4 is considered adequate. The evaluation could not identify any potentials for further output maximisation with the same amount of resources.

In PA 5, the project's planned outputs involved an assessment of needs for information and advisory services in three countries and elaboration of a coordinated regional concept to meet those needs. Both indicators were perfectly fulfilled while at 16% of total costs the use of resources was slightly lower than in a case of even cost distribution. Hence, the project's activities in PA 5 can also be seen as implemented in an efficient manner. As in PA 3, the result sustainability and continued usage were secured well by establishing a web platform as part of the concept – a further contribution to the project's efficiency in PA 5. Again, no potentials for further output maximisation could be identified.

Finally, the overarching costs of 12% are considered slightly high in comparison to the costs for achieving the project's outputs. This gives an indication of relatively high administrative requirements. However, this could be caused by the project's regional nature, which may have required a higher level of coordination than purely bilateral cooperation projects. However, throughout the entire project and particularly in PA 4 and 5, the regional concept allowed for improved efficiency by enabling the transfer and exchange of experiences among the participating countries (Int_4 with partners, WS_1 with GIZ). Therefore, a slightly higher share of overarching costs seems justified.

In summary, the project's production efficiency is assessed as very high. A potential to maximise outputs with given resources could be identified only for PA 1, where a good ratio of outputs to resources could be achieved. The differences in costs per PA stayed within reasonable margins, indicating that the different levels of intervention all received adequate attention and the project's intended design was successfully implemented. In the evaluation's view, the resources were allocated appropriately between the different outputs and no further maximisation of outputs could have been achieved by a different weighting. Only the overarching costs were seen as slightly on the high side, although this might be justified with the project's regional approach. Against this background, evaluation dimension 1 is scored with 65 out of 70 points.

Efficiency dimension 2: Was the project's use of resources appropriate with regard to achieving the project's objective (outcomes)?

In the project outcome for PA 1, responsible authorities or parliaments received for approval three new or adapted political strategies, laws or norms that promote the implementation of geothermal projects. This is similar to the third output under PA 1; however, at the outcome level all such proposals were counted, not only those produced by the working groups. In total, six such proposals were presented to the responsible authorities rather than three (although one in El Salvador was not requested by the counterpart). Against this background, the conclusion about PA 1 above in efficiency dimension 1 counts also for the outcome level, namely that the project operated very efficiently. However, greater outcomes could have possibly been achieved by redirecting resources allocated to Guatemala to another country (Nicaragua).

In PA 2 the intended outcome involved the presentation of four funding applications for geothermal projects to finance institutions. With four such applications made to GDF, the outcome indicator was formally achieved. However, only one of the funding applications was actually for a pilot project that was previously supported by GIZ with a feasibility study. None of the funding applications were successful, due mainly to a mismatch between the fund's eligibility criteria and the characteristics of the projects. Against this background, the ratio between outcomes and resources in PA 2 cannot be considered as very successful and efficient. As previously discussed, numerous partner companies complained that the project did not support them sufficiently in identifying and accessing suitable sources of financing for their projects. Finance was seen as one of the major obstacles that the companies need to overcome.

Demonstration projects were described as wielding paramount importance in developing and replicating geothermal direct use applications in the region, which could not be achieved during the duration of the project (FG_4 with partners, FG_6 with universities, Int_4,6 with partners, Int_2 with private actors). It is possible that this milestone could have been passed if the project had allocated more resources to supporting pilot projects in securing finance. These resources could have been made available by financing a smaller number of feasibility studies (this output was far over-achieved as previously explained) in order to deepen the cooperation on the remaining projects and provide them with further assistance on the path to implementation. However, it must also be taken into account when initiating feasibility studies that it is not possible to know in advance which ones will have positive outcomes. With this in mind, FoGeo I focused on assessing project feasibility rather than reaching the point of implementation.

The outcome indicator in PA 3 – confirmation by training participants that the quality of their activities in relation to geothermal energy has improved – was clearly overachieved by 87%. The outcome/resource ratio therefore indicated a high level of efficiency and no potentials for maximising outcomes were seen. Concerning the expected continuation of outcomes in PA 3 through anchoring the training concept within institutions, the same applies as written above in efficiency dimension 1.

In PA 4, the project's outcome was fully achieved by producing six activities that were initiated as part of the regional dialogue forums. In PA 5 a slight overachievement by 15% was reached by delivering more consulting, training or information services through the network of experts than initially planned. Considering that the project used fewer resources than would have resulted under an even distribution in both priority areas, the implementation of activities in these two areas was seen as efficient. As with the output level, no possibilities for increasing outcomes with the given resources could be identified.

Regarding use of synergies and/or leverage of resources with other donors, the assessment focused on the project's cooperation with KfW and BGR – given that GIZ's project was part of a larger German development cooperation engagement with KfW's Geothermal Development Facility and BGR's technical cooperation module Identification of Geothermal Resources in Central America. The nature of this cooperation was described in more detail in chapter 4.1 on relevance, therefore only aspects related to efficiency will be summarised here.

It must be reiterated that the financing mechanisms of GDF, primarily aimed at larger geothermal projects for electricity generation, and the direct use pilot projects supported by FoGeo were not complementary. As one interview partner put it: 'If KfW assigned just a small portion of GDF's funds to direct use projects, the outreach and impact of FoGeo could be transcendental for the region' (Int_2 with private actors). Therefore, it must be concluded that on this level and in relation to PA 2, the cooperation with KfW did not produce synergies or leveraging of resources. This was different in PA 4 where the project's group of experts interacted closely with GDF's Technical Assistance Forum in discussing geothermal trends and topics in the region, which benefited both sides (Int_3 with donors). Although it is not known to the evaluation team if any of the project's outcomes under PA 4 can be traced back to the cooperation with TAF, it is clear that the cooperation enhanced the dialogue processes and the resulting synergies are likely to have made an impact on the project's efficiency.

The project's relationship to BGR was based on a broader spectrum of similarities. However, it was described as a complementary collaboration rather than an intense cooperation (Int_1 with donors). Nonetheless, some leverage of resources could be identified. Capacity building was closely coordinated between both organisations and BGR participated in designing and implementing a three-day introductory training on geothermal energy organised by FoGeo under PA 3. Both projects also supported the activities of the regional Geoscienc-

es Technical Group of SICA's Energy Coordination Unit and they promoted regional dialogue processes. In fact, one of the agreed activities resulting from the project's dialogue forums under PA 4 includes a contribution from BGR, which has agreed to support the National Electricity Company of Honduras in analysing gas probes. Despite these leverage effects, the coordination of both projects was described as complex and not always easy (FG_3 with partners, Int_1 with donors, WS_1 with GIZ). However, this has improved over time, especially since both projects started in 2019 to carry out their planning workshops jointly with project partners, which is said to have improved the effectiveness as well as the efficiency of the cooperation (Int_1 with donors, WS_1 with GIZ). Due to the existing synergy potential, intensified cooperation with BGR in implementing the follow-up project FoGeo II is expected (WS_1 with GIZ).

Due to the described potentials for maximising outcomes in PA 1 and particularly PA 2, as well as the limited complementarity with GDF and initial difficulties in coordinating work with BGR, effectiveness dimension 2 is scored with 20 out of 30 points.

Table 6: Rating of OECD/DAC criterion: efficiency

Criterion	Effectiveness dimension	Score and rating
Efficiency	The project's use of resources is appropriate with regard to the outputs achieved. (Production efficiency: resources/outputs)	65 out of 70 points
	The project's use of resources is appropriate with regard to achieving the projects' objective (outcome). (Allocation efficiency: resources/outcome)	20 out of 30 points
Overall score and rating		Score: 85 out of 100 points Rating: Level 2: successful

4.5 Sustainability

Evaluation basis and design for assessing sustainability

The criterion of sustainability aims to assess the durability, stability and long-term resilience of the results at outcome level (discussed in the section on effectiveness in Chapter 4.3). Overarching results (see Chapter 4.4 on impact) do not form part of this analysis.

For sustainability, the evaluation matrix includes the following two assessment dimensions.

Sustainability dimension 1 analyses the prerequisite for ensuring the long-term success of the project by considering if the results are anchored in (partner) structures.

Here, the focus of the evaluation rests in assessing if and how the advisory contents, approaches, methods or concepts of the project have been institutionalised in the partner systems and what the project has done to ensure that the results can be sustained in the medium to long term by the partners themselves. The analysis also looked into the available resources and capacities on the part of partners and target groups to ensure the continued use and further development of achieved results. These questions were pursued primarily in the interviews with the project's implementing partners and the GIZ project team.

Assessment dimension 2 attempts to carry out a forecast of durability in the results of the project, specifically asking if they are permanent, stable and resilient in the long term.

This dimension was evaluated by means of a plausibility analysis, which sought to find out whether the project's outputs and outcomes were likely to be sustained in the future. Risks for the durability of the results were analysed, along with the steps taken by the project to reduce them. Data collection methods included interviews and discussions with the project's implementing partners and stakeholders as well as a review of secondary data on the overall context of the project results (particularly progress reports).

Analysis and assessment regarding sustainability

Evaluation dimension 1: What are the prerequisites for ensuring the long-term success of the project? Were the results anchored in (partner) structures?

As explained in the effectiveness section (see Chapter 4.2), in PA 1 the project facilitated the creation of in-trainstitutional and interinstitutional working groups in Costa Rica, El Salvador, Guatemala, Honduras and Panama with the intention of elaborating recommendations for political, legal or normative documents. The working groups had a limited purpose – to develop those proposals – and they were not designed to be long term. However, they did contribute to creating awareness about geothermal energy and its direct uses, in particular those that could be seen as institutionalised in the partner structures.

One partner institution in PA 1 formulated it this way: 'imagine, we are the energy ministry but did not even talk about geothermal direct use before GIZ's project. We saw it as something very distant to our reality, but now we understand that it can be used for example even for cooling purposes... something we were completely unaware of.' (Int_7 with partners). The proposals that resulted from the working group efforts have been adopted and therefore anchored in the political system in El Salvador and on the regional level in form of the Sustainable Energy Strategy 2030 for Central America. Further policies and regulations are expected to be approved in Costa Rica, Honduras and Panama in the near future, since 'here is a true interest in continuing to develop geothermal energy and its direct use applications in the region' (Int_9 with partners).

In PA 2, the feasibility studies elaborated by the project helped in taking investment decisions for implementing pilot projects (Int_1,2 with private actors). While this can be considered a long-term result in itself, the feasibility studies were not accompanied by capacity building or on-the-job training so the partner companies were not enabled to independently carry out such studies in the future (Int_3 with partners). Due to the complexity of feasibility analyses, this seemed an unrealistic expectation in the eyes of the evaluation. However, the companies' abilities to contract such studies and assess their results was said to have improved. This can be applied in future projects (Int_2 with private actors), which could be seen as an anchoring of knowledge. However, required knowledge on financing options has not been provided sufficiently for use by the partner companies. This has resulted in delays or even halts in the implementation process of several pilot projects. Information on geothermal potential and corresponding maps used to identify suitable sites were put at the disposal of Central American decision-makers as a geothermal database on an internet platform of SICA; the same platform is expected to host publication of the feasibility studies themselves (WS_1 with GIZ). Therefore a permanent tool is provided within the structures of SICA that facilitates the identification of promising sites and projects.

The concept of institutional anchoring was a central element of the capacity building activities carried out under PA 3, which is reflected in a corresponding output indicator of the project (see effectiveness dimension 2 in Chapter 4.2). An important component in this was the training of trainers approach. Out of a total 416 training participants, 114 were multipliers – including 13 who went through a special training-to-train programme in Bochum, Germany (WS_1 with GIZ). As a result, six training programmes on geothermal direct uses were developed as a continuous offer by universities in Costa Rica, Guatemala, Honduras and Panama; FoGeo was seen as a 'strategic ally' in this process (FG_3, 5 with universities). These classroom training programmes were complemented by an online offer through the Technical University La Salle (ULSA) in Nicaragua (GIZ 2020b). The anchoring of the training modules as an expansion of existing geothermal learning programmes established a sustainable basis for continuously training specialised personnel. This was seen as essential to

continuously meeting the growing demands for human resources in the geothermal sector (Int_2 with partners).

The group of experts established with the project's help under PA 4, which composes the dialogue forums, will continue to meet regularly in order to discuss geothermal topics and share knowledge and experiences (Int_9 with partners). As it was put by one interview partner during the evaluation mission: 'Its reason of being transcends beyond just the GIZ project' (Int_3 with partners). Another project partner stated: 'The group has its own life and dynamics' and added that the group is expected to grow, having recently included also Colombia and Chile (Int_4 with partners). Finally, a third interview partner underlined that 'the regional dialogue has been institutionalised and is providing important inputs to SICA's Council of Energy Ministers' (Int_5 with partners). The sustainability of the group is ensured to a large degree by CECACIER, which will continue to coordinate and support it by proposing and following up on its discussion topics along with the agreements for cooperation which come out of it (GIZ 2020b).

The regional concept developed under PA 5 to cover the regional information needs on geothermal energy was also designed as a long-term project that will continue to exist beyond the duration of GIZ's project. The information providers have been identified and continue to offer their services and products to sector participants in the region (Int_4 with partners). As described under effectiveness dimension 2, the assessment of information needs is regularly updated by the expert group established under PA 4, which will provide inputs for new informational offers. The outputs like podcasts, articles and webinars are uploaded to a CECACIER website that has been established as a knowledge platform (Int_4 with partners). As with PA 4, sustainability is ensured primarily through CECACIER by its coordination of the group of experts, and provision and operation of the web platform (Int_9 with partners). Finally, the project assisted CECACIER in developing a communication campaign to make the knowledge platform widely known and to ensure continuous interest in the information it provides (WS_1 with GIZ).

Since several project activities will be continued (although with a different focus) through the follow-up project FoGeo II, an exit strategy was not needed. Nonetheless, in November 2020 the project organised a virtual closing event to present its results and lessons learned to a large group of project partners and other stakeholders. A project closing report as well as one summarising lessons learned from the project were elaborated and distributed among the same group. It is expected that these final outputs will be shared within GIZ in order to contribute to institutional learning (WS_1 with GIZ).

In summary, the evaluation considers that the project's results have been anchored very well in the partner structures and continue to be used by them and other stakeholders in the geothermal sector. This is particularly the case for anchoring the concept of training measures under PA 3. In PA 4 and 5 sustainability is ensured to a large degree through CECACIER as the lead institution. Certain shortcomings could be identified in a lack of capacity building in the scope of the feasibility studies under PA 2 as well as insufficient anchoring of knowledge on securing finance for pilot projects within the partner companies. Finally, knowledge and lessons learned by the project were effectively shared with its stakeholders. Evaluation dimension 1 is therefore scored with 44 out of a possible 50 points.

Sustainability dimension 2: Forecast of durability – are the results of the project permanent, stable and resilient in the long term?

The new or adopted policies, strategies and regulations developed under PA 1 lead to clearer visions of how geothermal energy can be used and promoted by bringing forth a specific "road map" as well as a set of rules for the (direct) use of geothermal energy with consideration of each country's circumstances (Int_3 with partners). This is particularly the case for El Salvador, where the procedures for assessing the environmental impact of geothermal projects below 5 MWe have already been approved and the direct use of geothermal energy now forms an integral part of the national energy policy (Int_1 with partners). Likewise, this can be said of the Sustainable Energy Strategy 2030 for Central America, which now includes geothermal energy as an im-

portant pillar of the region's energy transformation. These strategies and policies, which have already been put into practice, have 'reorganised the priorities of the countries' energy matrix' (Int_5 with partners). They are therefore expected to provide a valid framework in the long term. This will equally be the case for policies yet to be approved in Costa Rica, Honduras and Panama. A risk is seen in potential changes of government, which could bring about new priorities in the energy sector (FG_6 with universities). However, this is a risk that could not be mitigated by the project.

With regard to the feasibility studies for pilot projects produced under PA 2, it is expected that these will continue to be used for approaching financial institutions (Int_9 with partners). There is a risk that such efforts will not be successful since knowledge on identifying and accessing suitable financing instruments is lacking on the part of the companies. Financing institutions could also have bankability criteria that are not fulfilled by the feasibility studies. These risks will be addressed to a large degree by the follow-up project FoGeo II. Once the pilot projects are implemented, the experiences gained will be assessed by other companies wishing to replicate similar projects (FG_2 with partners). In one case it was stated that the project's feasibility results are already perceived 'as an example of what can be done with geothermal direct use applications' and the project sponsor believes that the project will turn into a 'centre of demonstration' receiving international attention (Int_2 with private actors). Finally, it was confirmed that some of the project's partner companies intend to apply their acquired experience and knowledge, along with the geothermal database on SICA's website, in future projects (Int_2 with private actors, Int_5 with partners).

There is a risk that the capacities and knowledge transmitted under PA 3 could be lost if they are not applied in practice (FG_6 with universities). However, as described under effectiveness dimension 1, over 90% of training participants confirmed that their training helped them improve the execution of their professional functions, which shows that the knowledge is in fact being used. This was also confirmed individually in the evaluation interviews; for instance, one recipient who stated that the capacities are being put into practice in developing geothermal projects (Int_1 with partners). The project influenced this by supporting the design of training schemes so that they meet the actual needs of participants in the sector (WS_1 with GIZ). It is particularly through the multiplier approach that the dissemination of practical capacities will continue. This allows the possibility to refresh knowledge and contribute to its durability over time (FG_6 with universities).

A main factor that contributes to the current continuity of the dialogue forums under PA 4 is seen in the participants' common interests and goals (Int_4 with partners). This has been largely influenced by the project, which managed to put geothermal energy (and especially direct use) 'on the agenda' of many actors in the region's energy sector. These common goals are also expressed in the sustainable energy strategy for Central America up to 2030 (Int_8 with partners). CECACIER's active coordinating and managing role keeps the discussions in the dialogue forums alive. Against this background, the evaluation believes that it is likely that the dialogue forums will continue to exist and operate in the long term.

Finally, the information and advisory services provided under PA 5 are expected to prove durable. Not only has the provision of these services been established with a long-term perspective, as described above under sustainability dimension 1, but the accessibility and usability of the information has been secured sustainably through its publication on CECACIER's knowledge platform. This will guarantee the applicability and continued relevance of the information provided on topics related to geothermal energy (GIZ 2020b). Since the increased use of the region's geothermal potential (particularly at the low-enthalpy level) is a long-term project that has only just begun with the implementation of FoGeo – and continues to be supported through the follow-up project FoGeo II – it is expected that demand for information and advice will remain high over the coming years thereby (Int_4 with partners).

In summary, the evaluation concludes that the project's results will be durable, stable and resilient in the long term under the given conditions. Where possible, risks to the durability of results have been addressed adequately by the project. However, some risks such as changed priorities in the energy sector due to political

shifts could not be mitigated. The overall rating for evaluation dimension 2 is 46 out of 50 possible points.

Table 7: Rating of OECD/DAC criterion: sustainability

Criterion	Assessment dimension	Score and Rating
Sustainability	Prerequisite for ensuring the long-term success of the project: results are anchored in (partner) structures.	44 out of 50 points
	Forecast of durability: results of the project are permanent, stable and long-term resilient.	46 out of 50 points
Overall score and rating		Score: 90 out of 100 points Rating: Level 2: successful

4.6 Key results and overall rating

Relevance

With its objective of improving the climate for investment in geothermal projects in Central America, the project concept was fully in line with the relevant strategic reference frameworks, defined particularly by BMZ's policies and strategies for the energy sector and Latin and Central America, as well as the region's sustainable energy strategy. The project's implementing partners confirmed that the project was subsidiary to their efforts and complemented their own activities to promote geothermal energy.

The project matched the needs of the target groups to a large degree. It did a good job of considering the specific needs and concerns of women. While it was not specifically designed to reach disadvantaged groups, the Leave No One Behind principle as outlined in Agenda 2030 was also followed. Some target groups cited sporadic weaknesses: non-involvement in the terms of reference for consultancy services, inadequate consideration of the local and regional context, and insufficient support in accessing finance for pilot projects.

With its integrated multilevel approach including the macro, meso and micro levels across five different priority areas, and combining methods of bilateral cooperation (particularly in PA 1 and 2) with regional approaches aimed at promoting the exchange of knowledge, experiences and information, the project concept was to a large extent adequately designed to achieve the chosen project objective. Considering that several Central American countries are advanced in using geothermal energy for electricity generation, the evaluation considers the project's general focus on direct use applications appropriate. The enormous potential for direct use applications remains largely untapped and this is where the least experience was available.

Potential risks due to political changes and conflicts that could significantly affect the cooperation were not sufficiently considered in the initial project proposal to BMZ, but identified early by the project team. The project experienced several changes in its environment but reacted quickly and adequately to the negative changes (such as political unrest in Nicaragua) and made good use of positive ones (such as the creation of the Energy Secretariat in Honduras). Significant adaptations to the project concept itself were not required.

Effectiveness

All five indicators on the project's outcome level were fulfilled or even overachieved (some of them considerably), therefore, the project's objective was largely achieved. However, the indicator for PA 2 (funding applications for geothermal projects) was fulfilled in a formal rather than a meaningful and effective way. For one, the pilot projects that were supported in their funding applications to GDF, were different from those that had received support in developing their feasibility studies. For another, there was largely a mismatch between the

projects and the GDF eligibility criteria, which resulted in unsuccessful applications.

The regional concept of the project proved appropriate considering that several outcomes were achieved that would not have been possible under a purely bilateral cooperation approach. This could apply particularly to the inclusion of geothermal energy in the sustainable energy strategy for Central America up to 2030 and the improved regional exchange of expertise and information on geothermal energy.

The hypothesis-based contribution analysis largely confirms that the project's activities, instruments and outputs made an important contribution to achieving its objective. Regarding hypothesis H1, it can be confirmed that the preparatory analysis and subsequent creation of the working groups – together with the provided consultancy expertise – led to the development of proposals for improving framework conditions in the geothermal sector. Hypothesis H2 can also be confirmed, since the evaluation found that the project broadened the available information base for geothermal projects by elaborating potential maps and feasibility studies. Finally, it was found that the project's support to developing and institutionalising geothermal training offers constituted an important prerequisite for improving capacities and strengthening participants in the geothermal sector, thereby confirming hypothesis H3. All three outcomes were confirmed as important components of an improved investment climate for geothermal projects.

Points of criticism focused on the lack of on-the-job training during the feasibility studies and an occasional lack of local knowledge on the part of the consultants in PA 2. Furthermore, the pilot projects under PA 2 received insufficient support for accessing finance. In this context, it may have been conducive to offer training to local banks on geothermal energy in order to pave the way to establishing appropriate financial instruments in the region. However, this was not provided.

Generally, there is a large consensus among stakeholders that developments in the geothermal sector would have been strongly delayed (especially in PA 1 and 2) without the project. A major contributing internal factor is seen in GIZ's approach to coordination and cooperation with institutions and companies from the region. One of the main external factors is the willingness and commitment of the counterparts, which in some cases was very conducive (as with CECACIER) and in others hindered achievement (as in PA 1 with Guatemala).

Unintended positive results brought about by the project include its production of a regional geothermal database and maps indicating geothermal suitability; these were initially not foreseen. Other unintended positive results include the push given to gender issues in the geothermal energy through a special workshop, along with knock-on effect leading to more interest in direct use applications in other countries and within international institutions outside of the region. An unintended negative result manifested in confusion from some counterparts about the respective projects and roles of GIZ and BGR, which were not clear to them. This created the impression of insufficient coordination and a duplication of efforts in the German technical cooperation. However, the project took advantage of the unintended positive results and responded in an adequate manner to the negative one.

Impact

The project's primary intended impacts were a reduction in CO₂ emissions and a contribution to improved energy security in Central American countries. Since these depend on the actual implementation of geothermal energy projects, the underlying question is whether the project has contributed to the construction of geothermal power plants or direct use applications or if this is expected in the foreseeable future. None of the stakeholders interviewed during the evaluation mission could confirm that this has been the case so far, but that this requires time and will happen with some delay after the project's intervention.

Considering the improvements made by FoGeo to the investment climate for geothermal projects, it can be expected that the overarching results will be achieved. However, the degree to which this happens depends on

project developers and investors as third parties implementing the geothermal projects. The project did not sufficiently tackle the topic of financing the projects, presenting an obstacle particularly to direct use applications. This could delay or even hinder the realisation of a number of projects, along with their desired impacts.

In fact, an unintended negative result at impact level could be seen in the lack of fully realised geothermal pilot projects so far, which has caused frustration for some participants and decreased their motivation to work in the geothermal sector. In this context, FoGeo could have communicated more clearly to its partners and stakeholders that actual implementation of geothermal projects was beyond its scope, thus avoiding false expectations. In any case, the project responded appropriately by designing a follow-up project that focuses on bringing pilot projects to life.

An unintended positive impact can be seen in the German contribution resulting in a leverage effect to promoting geothermal energy in the region. By acting as a first mover it has attracted and channelled further contributions of other donors, particularly the Inter-American Development Bank, International Renewable Energy Association, Japan International Cooperation Agency, the Nordic Development Fund and the World Bank. Such additional technical and financial support to developing geothermal energy is seen as another important external factor, which also contributes positively to the geothermal investment climate in the region and increases the implementation prospects of projects and the likelihood of corresponding impacts.

Efficiency

The project's production efficiency (use of resources in relation to outputs achieved) was assessed as very high. Potential for maximising outputs with given resources could be identified only for PA 1, since in Guatemala no output was achieved by the working group due to lack of involvement and commitment by its energy ministry. Had it been possible to identify these problems at an early stage, the resources used for cooperation with Guatemala could have been redirected to another country. For example, Nicaragua reported that it felt more like a 'spectator' than a partner in the project despite its need for help in framing a law on low-enthalpy geothermal uses.

The differences in costs for each PA fell within reasonable margins, indicating that the different levels of intervention all received adequate attention and that the project's intended design was successfully implemented. In the evaluation's view, the resources were allocated appropriately between the different outputs and no further maximisation of outputs could have been achieved by a different weighting. The overarching costs were seen as slightly on the high side, although this might be justified with the project's regional approach.

In terms of resource use in relation to outcomes achieved, the project was somewhat less efficient. This was particularly due to the fact that numerous partner companies stated that the project provided insufficient support in obtaining finance for geothermal pilot projects in PA 2 and the funding applications that obtained support remained unsuccessful (see effectiveness above). In this context, the allocation efficiency could have worked better had the project elaborated fewer feasibility studies (they were made for seven pilot projects instead of three as initially planned) and had instead concentrated on the remaining projects by providing them with further assistance on the path to implementation, particularly in financing. However, it is not possible to know in advance when initiating feasibility studies which ones will have positive outcomes likely to recommend implementation. With this in mind, FoGeo I focused on assessing project feasibility rather than reaching the point of implementation.

Nonetheless, achieving financing applications for geothermal projects was a success indicator of the project on the outcome level. In this context, cooperation with KfW did not produce any synergies or leverage of resources because GDF is not designed for financing small direct use pilot projects. This proved different in PA 4, where the project's group of experts interacted closely with GDF Technical Assistance Forum in discussing geothermal trends and topics in the region – to the benefit of both sides. More potential for cooperation and

synergies with BGR existed and were used, particularly in the areas of capacity building and dialogue. However, the coordination of both projects was described as complex and not always efficient.

Sustainability

The evaluator considers that the project results have been anchored very well in the partner structures and continue being used by them and other stakeholders in the geothermal sector. This is particularly the case for anchoring the concept of training measures under PA 3. In PA 4 and 5, sustainability is ensured to a large degree through CECACIER as the lead institution. Certain shortcomings could be identified in a lack of capacity building in the scope of the feasibility studies under PA 2 as well as insufficient anchoring of knowledge on securing finance for pilot projects within the partner companies. Finally, knowledge and lessons learned by the project were effectively shared through corresponding events and publications with the project stakeholders.

The evaluator believes that the project results will be durable, stable and resilient in the long term under the given conditions. Where possible, risks for the durability of results have been addressed adequately by the project and the follow-up project FoGeo II is engaging with the 'financing risk' in particular.

Table 8: Overall rating of OECD/DAC criteria and assessment dimensions.

Evaluation criteria	Score	Rating
Relevance	88 out of 100 points	Level 2: successful
Effectiveness	83 out of 100 points	Level 2: successful
Impact	81 out of 100 points	Level 2: successful
Efficiency	85 out of 100 points	Level 2: successful
Sustainability	90 out of 100 points	Level 2: successful
Mean score and overall rating	85 out of 100 points	Level 2: successful

Table 9: Rating and score scales.

100-point scale (score)	6-level scale (rating)
92-100	Level 1 = highly successful
81-91	Level 2 = successful
67-80	Level 3 = moderately successful
50-66	Level 4 = moderately unsuccessful
30-49	Level 5 = unsuccessful
0-29	Level 6 = highly unsuccessful

5 Conclusions and recommendations

5.1 Factors of success or failure

In this section the main internal factors (for instance concerning project design and management) as well as external factors (beyond the project's immediate scope of responsibility) which had significant positive or negative impact on the project's quality of implementation and results are summarised.

Firstly, the project could draw on the following internal strengths related to its concept, methodological approach and management, which contributed to the overall successful results:

- The project pursued an integrated multilevel concept with interventions on the macro, meso and micro levels across five priority areas. This holistic approach ensured that all necessities and stakeholders were covered and considered.
- The different priority areas of the project were very well interrelated and coordinated, thereby making use of synergy potentials. The project enabled and aided the regional exchange of ideas and experiences related to the geothermal frameworks (promoted under PA 1) through the dialogue forum under PA 4. Furthermore, results of feasibility studies elaborated under PA 2 were shared at international events in PA 4.
- The project combined bilateral and regional cooperation approaches very well. The project worked closely with the individual partner countries, thus improving the political and regulatory framework conditions and developing pilot projects. The project also made use of regional institutions (SICA, CECACIER) and structures for coordination on the political level, and for further exchange of knowledge, expertise and information among countries in the region.
- Experiences from the previous project Promoting A Regional Energy Market in Central America were taken into account in relation to the regional concept.
- The project's approach to learning from each other was a core element of its methodology and can be understood as converting the project's complexity into useful and beneficial element for all partner countries, with strengthen individual and collective knowledge and creativity.
- The project's advisory interventions were often preceded by and based on a thorough analysis of the actual situation in order to build a solid foundation for the project's activities. This was the case in PA 1 where a detailed analysis of the framework conditions for implementing geothermal projects was carried out and gaps identified. In PA 2, the project kicked off with an assessment of geothermal potentials before identifying partners for pilot projects. In PA 4, an analysis of the need for information and advisory services in the geothermal sector was carried out.
- Particularly in PA 3 the project built on what was already there by expanding and enhancing existing training offers instead of creating them from scratch, which contributed to effectiveness and efficiency.
- The project team consisted of motivated, committed and professional members who listened to the needs of their counterparts.

However, several points were identified where the project could have been implemented in a better way:

- Over the roughly five-year implementation period there was a total of four project managers. This required personal adaptation on the part of the project team members and especially the counterparts, not least because each project manager had their own ideas and priorities.
- Cooperation agreements were not signed with all implementing partners. In these particular cases, this left some irritation as well as uncertainties concerning the aims of the cooperation.
- Not all counterparts were involved in elaborating the terms of reference for consultancy assignments.
- The selected consultants sometimes lacked knowledge of the local context, which could have been avoided by corresponding eligibility criteria.
- The cooperation with other German development institutions (particularly BGR) could be improved and better communicated to counterparts.

The following external factors contributed positively to the project's results:

- While the governments and priorities of individual countries could change, with possible complications for cooperation particularly in PA 1, the work with SICA on the regional level represented an anchor of stability where topics remained on the agenda independent of national political developments.
- CECACIER showed strong ownership and initiative in PA 4 and 5 by managing the dialogue forum and coordinating the group of experts.
- Other donor agencies also provide technical and financial support to developing geothermal energy in the region, thereby complementing the German contributions of GIZ, BGR and KfW.

Finally, several external factors could also be identified as complicating the project's activities and results:

- There was an initial lack of interest in geothermal direct use applications on the part of several national ministries due to insufficient knowledge on potential and uses.
- A continuous lack of interest and ownership from MEM in Guatemala for supporting the development of geothermal direct use applications resulted in no outputs of the Guatemalan working group in PA 1.
- There are not enough suitable financing instruments available for geothermal direct use projects through local or regional banks.
- Large electricity generation companies like LaGeo and ICE have only limited interest in geothermal direct use projects and see them as corporate social responsibility objectives rather than business ventures.

5.2 Conclusions and recommendations

The following conclusions and recommendations are divided into general ones relating to GIZ as a whole and more specific ones regarding the follow-on project FoGeo II and requirements for further support. Several of the general recommendations result from the factors of success or failure identified above and may therefore appear repetitive. The general recommendations are equally applicable to the follow-on project.

General conclusions and recommendations to GIZ and its Sectoral Unit:

- Simple awareness raising stood out as one of the most important benefits and contributions of the project. This indicates that one of the main obstacles to development often consists in a lack of basic knowledge and misconceptions that need to be removed before all else.
- Stakeholders repeatedly pointed out that demonstration projects must convince decision-makers of the feasibility of geothermal direct use applications. It is likely that this can be said of many technologies and for other regions of the world as well. With this in mind, technical cooperation should aim not to produce only 'studies that end up on shelves', but provide the full range of support needed to bring pilot projects to their realisation. This could be summarised with this recommendation: do more for fewer projects rather than less for more projects. However, this might require longer project durations.

- The terms of reference for consultancy services should always be prepared jointly with the counterpart that will benefit from them in order to ensure that their true needs are addressed in the best possible way. Furthermore, the terms of reference and the deliverables themselves should be made available in the main language of the recipients to avoid difficulties in coordination and understanding
- It should always be ensured that consultants have a good understanding of the local reality and that they do not simply fall back on general schemes and solutions that may not be applicable to the project's specific context. Local and regional knowledge and skills should be utilised wherever possible and international expertise brought in wherever necessary.
- The development of feasibility studies (or other consultancy assignments) should be complemented by integrated training for counterparts to increase their learning on the job and ensure that capacities as well as results are transmitted.
- It is recommendable to follow up on recipients of training measures and create a databank of their capacities and concrete applications of their knowledge with the intention of improving networking and making those capacities accessible to others.
- Wherever possible, capacity building measures should be institutionalised through the strategy of training the trainers rather than an approach limited to individual training opportunities.
- Cooperation agreements should be signed with all counterparts to ensure their interest and ownership, and to clarify goals, tasks and responsibilities.
- Cooperation agreements should include the intention of ensuring a 'nucleus' of professionals on the side of counterparts in order to reduce the chances that external factors such as job changes, retirement and lack of interest affect the continuity of knowledge and results.
- Similarly, GIZ should aim in its cooperation projects to ensure continuity in the project's key personnel.
- Support should be provided only when it has been requested by and agreed upon with the counterpart. Otherwise, unilateral initiatives might be rejected resulting in a waste of resources.
- Presentation of results should make use of international events whenever possible, thereby raising interest in other institutions/ donors and spreading knowledge and experience to other countries.
- In order to be able to adapt to a changing environment, cooperation projects should remain flexible instead of implementing 'by force' concepts or approaches that might not make sense anymore (for example, in Nicaragua where the project responded by shifting its focus in response to public unrest).
- Projects of GIZ and KfW should be better matched to ensure that technical and financial cooperation truly complement each other, particularly when it comes to implementing demonstration projects.
- Joint planning workshops should be carried out with other institutions of (German) development cooperation to ensure best possible coordination and reduce redundancies.

Specific conclusions and recommendations regarding the ongoing follow-on project and needs for further support:

- Given that awareness raising for geothermal topics was considered one of the great benefits of FoGeo I by many of its partners, it is recommended to carry out an information campaign on geothermal potentials and applications (particularly direct uses) for the general public.
- Financing of pilot projects remains one of the main hurdles in the region. Against this background, it is advisable to provide support to local and regional banks towards understanding geothermal technologies and assessing associated risks. This would facilitate the creation of new financing offers, particularly for geothermal direct use applications.
- The project should investigate possibilities for cooperation with the recently created Regional Center for Renewable Energies and Energy Efficiency of the SICA countries (Int_8 with partners).
- The project should communicate clearly towards its counterparts the respective scope of action and competencies of GIZ and BGR in order to reduce confusion. At the same time, intensified cooperation and coordination of both institutions should be continued (for example, through joint planning workshops).

- In FoGeo I partners from Nicaragua report that they felt more like spectators than partners to the project when they needed assistance in framing a law on low-enthalpy geothermal uses. Therefore, it is recommended to integrate Nicaragua more actively into the cooperation.
- Representatives from Panama also expressed interest in a closer cooperation since the country has not yet made use of its geothermal resources and continues to explore the possibilities.

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Annex: Evalutaion matrix

OECD-DAC Criterion RELEVANCE (max. 100 points)						
Assessment dimensions	Filter - Project Type	Evaluation questions	Evaluation indicators	Data collection methods (e.g. interviews, focus group discussions, documents, project/partner monitoring system, workshop, survey, etc.)	Data sources (list of relevant documents, interviews with specific stakeholder categories, specific monitoring data, specific work-shop(s), etc.)	Evidence strength (moderate, good, strong)
<p>The project concept (1) is in line with the relevant strategic reference frameworks.</p> <p>Max. 30 points</p>	Standard	Which strategic reference frameworks exist for the project? (e.g. national strategies incl. national implementation strategy for 2030 agenda, regional and international strategies, sectoral, cross-sectoral change strategies, if bilateral project especially partner strategies, internal analysis frameworks e.g. safeguards and gender (2))	Description, no indicator required	Documents; workshop	Project proposal; Progress reports; Workshop with GIZ	strong
	Standard	To what extent is the project concept in line with the relevant strategic reference frameworks?	The project interventions and objectives are related to policy/strategy frameworks in the project region	Documents	Sustainable Energy Strategy 2030 of the Countries of SICA	strong
	Standard	To what extent are the interactions (synergies/trade-offs) of the intervention with other sectors reflected in the project concept – also regarding the sustainability dimensions (ecological, economic and social)?	Evidence of reflection of trade-offs	Documents; workshop	Project proposal; Progress reports; Workshop with GIZ	moderate

Standard	To what extent is the project concept in line with the Development Cooperation (DC) programme (If applicable), the BMZ country strategy and BMZ sectoral concepts?	Compliance with BMZ country strategy and sectoral concept	Documents	BMZ's Regional Strategy for Central America 2017-2022; BMZ's The New Latin America Policy; BMZ's Sector Concept for Sustainable Energy for Development,	strong
Standard	To what extent is the project concept in line with the (national) objectives of the 2030 agenda? To which Sustainable Development Goals (SDG) is the project supposed to contribute?	Nummber of SDGs to which the project contributes	Documents	Regional and national plans for the implementation of the Agenda 2030 (internal fact-sheets of BMZ); Project proposal; Progress reports	moderate
Standard	To what extent is the project concept subsidiary to partner efforts or efforts of other relevant organisations (subsidiarity and complementarity)?	Evidence of subsidiarity	Interviews, focus group discussions	Interviews and focus group discussions with main project partners	strong

<p>The project concept (1) matches the needs of the target group(s).</p> <p>Max. 30 points</p>	Standard	To what extent is the chosen project concept geared to the core problems and needs of the target group(s)?	Extent of alignment and implementation of the project to achieve needs of target group	Documents, interviews, focus group discussions	Project proposal; Progress reports; Interviews and focus group discussions with representatives from direct target group as well as national ministries	strong
	Standard	How are the different perspectives, needs and concerns of women and men represented in the project concept?	Adequacy of project design to address gender-specific needs	Documents, interviews	Gender analysis in preparation of the program; Interviews with national ministries and World Bank	strong
	Standard	To what extent was the project concept designed to reach particularly disadvantaged groups (LNOB principle, as foreseen in the Agenda 2030)? How were identified risks and potentials for human rights and gender aspects included into the project concept?	Adequacy of project design to reach disadvantaged groups	Workshop, interviews	Workshop with GIZ; Interviews with project partners	moderate
	Standard	To what extent are the intended impacts regarding the target group(s) realistic from today's perspective and the given resources (time, financial, partner capacities)?	Expected improvement of living conditions of end-users	Workshop, interviews	Workshop with GIZ; Interviews with	moderate

					project partners	
<p>The project concept (1) is adequately designed to achieve the chosen project objective.</p> <p>Max. 20 points</p>	Standard	<p>Assessment of current results model and results hypotheses (theory of change, ToC) of actual project logic:</p> <ul style="list-style-type: none"> - To what extent is the project objective realistic from today's perspective and the given resources (time, financial, partner capacities)? - To what extent are the activities, instruments and outputs adequately designed to achieve the project objective? - To what extent are the underlying results hypotheses of the project plausible? - To what extent is the chosen system boundary (sphere of responsibility) of the project (including partner) clearly defined and plausible? - Are potential influences of other donors/organisations outside of the project's sphere of responsibility adequately considered? - To what extent are the assumptions and risks for the project complete and plausible? 	Clarity of the results logic; interrelatedness of results in ToC and to overarching goal; easiness to appraise and report risks	Documents; workshop	Project proposal; Progress reports; Revised results model; Workshop with GIZ	strong
	Standard	To what extent does the strategic orientation of the project address potential changes in its framework conditions?	Ability of project to adapt to changes and align to new conditions	Workshop, interviews	Workshop with GIZ; Interviews with project partners	good
	Standard	How is/was the complexity of the framework conditions and guidelines handled? How is/was any possible overloading dealt with and strategically focused?	Strategic focus can be identified	Workshop, interviews	Workshop with GIZ; Interviews with project partners	good
<p>The project concept (1) was adapted to changes in line with requirements and re-adapted where applicable.</p> <p>Max. 20 points</p>	Standard	What changes have occurred during project implementation? (e.g. local, national, international, sectoral, including state of the art of sectoral know-how)?	Description, no indicator required	Documents, workshop, interviews	Progress reports; Workshop with GIZ; Interviews with project partners	good
	Standard	How were the changes dealt with regarding the project concept?	Demonstrated adaptation to changes	Documents, workshop, interviews	Progress reports; Workshop with GIZ;	good

Inter-views with project partners

(1) The 'project concept' encompasses project objective and theory of change (ToC, see 3) with activities, outputs, instruments and results hypotheses as well as the implementation strategy (e.g. methodological approach, CD-strategy, results hypotheses)

(2) In the GIZ Safeguards and Gender system risks are assessed before project start regarding following aspects: gender, conflict, human rights, environment and climate. For the topics gender and human rights not only risks but also potentials are assessed. Before introducing the new safeguard system in 2016 GIZ used to examine these aspects in separate checks.

(3) Theory of Change = GIZ results model = graphic illustration and narrative results hypotheses

(4) Deescalating factors/ connectors: e.g. peace-promoting actors and institutions, structural changes, peace-promoting norms and behavior. For more details on 'connectors' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 55/135.

(5) Escalating factors/ dividers: e.g. destructive institutions, structures, norms and behavior. For more details on 'dividers' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 135.

(6) All projects in fragile contexts, projects with FS1 or FS2 markers and all transitional aid projects have to weaken escalating factors/dividers and have to mitigate risks in the context of conflict, fragility and violence. Projects with FS1 or FS2 markers should also consider how to strengthen deescalating factors/ connectors and how to address peace needs in its project objective/sub-objective?

OECD-DAC Criterion RELEVANCE (max. 100 points)

Assessment dimensions	Filter - Project Type	Evaluation questions	Evaluation indicators	Data collection methods (e.g. interviews, focus group discussions, documents, project/partner monitoring system, workshop, survey, etc.)	Data sources (list of relevant documents, interviews with specific stakeholder categories, specific monitoring data, specific workshop(s), etc.)	Evidence strength (moderate, good, strong)
The project concept (1) is in line with the relevant strategic reference frameworks. Max. 30 points	Standard	Which strategic reference frameworks exist for the project? (e.g. national strategies incl. national implementation strategy for 2030 agenda, regional and international strategies, sectoral, cross-sectoral change strategies, if bilateral project especially partner strategies, internal analysis frameworks e.g. safeguards and gender (2))	Description, no indicator required	Documents; workshop	Project proposal; Progress reports; Workshop with GIZ	strong
	Standard	To what extent is the project concept in line with the relevant strategic reference frameworks?	The project interventions and objectives are related to policy/strategy frameworks in the project region	Documents	Sustainable Energy Strategy 2030 of the Countries of	strong

				SICA	
Standard	To what extent are the interactions (synergies/trade-offs) of the intervention with other sectors reflected in the project concept – also regarding the sustainability dimensions (ecological, economic and social)?	Evidence of reflection of trade-offs	Documents; workshop	Project proposal; Progress reports; Workshop with GIZ	moderate
Standard	To what extent is the project concept in line with the Development Cooperation (DC) programme (If applicable), the BMZ country strategy and BMZ sectoral concepts?	Compliance with BMZ country strategy and sectoral concept	Documents	BMZ's Regional Strategy for Central America 2017-2022; BMZ's The New Latin America Policy; BMZ's Sector Concept for Sustainable Energy for Development,	strong
Standard	To what extent is the project concept in line with the (national) objectives of the 2030 agenda? To which Sustainable Development Goals (SDG) is the project supposed to contribute?	Number of SDGs to which the project contributes	Documents	Regional and national plans for the implementation of the Agenda 2030 (internal fact-sheets of BMZ); Project proposal; Progress	moderate

<p>The project concept (1) matches the needs of the target group(s).</p> <p>Max. 30 points</p>	Standard	To what extent is the project concept subsidiary to partner efforts or efforts of other relevant organisations (subsidiarity and complementarity)?	Evidence of subsidiarity	Interviews, focus group discussions	reports	strong
	Standard	To what extent is the chosen project concept geared to the core problems and needs of the target group(s)?	Extent of alignment and implementation of the project to achieve needs of target group	Documents, interviews, focus group discussions	Interviews and focus group discussions with main project partners Project proposal; Progress reports; Interviews and focus group discussions with representatives from direct target group as well as national ministries	strong
	Standard	How are the different perspectives, needs and concerns of women and men represented in the project concept?	Adequacy of project design to address gender-specific needs	Documents, interviews	Gender analysis in preparation of the program; Interviews with national ministries and World Bank	strong

		Standard	To what extent was the project concept designed to reach particularly disadvantaged groups (LNOB principle, as foreseen in the Agenda 2030)? How were identified risks and potentials for human rights and gender aspects included into the project concept?	Adequacy of project design to reach disadvantaged groups	Workshop, interviews	Workshop with GIZ; Interviews with project partners	moderate
		Standard	To what extent are the intended impacts regarding the target group(s) realistic from today's perspective and the given resources (time, financial, partner capacities)?	Expected improvement of living conditions of end-users	Workshop, interviews	Workshop with GIZ; Interviews with project partners	moderate
	<p>The project concept (1) is adequately designed to achieve the chosen project objective.</p> <p>Max. 20 points</p>	Standard	<p>Assessment of current results model and results hypotheses (theory of change, ToC) of actual project logic:</p> <ul style="list-style-type: none"> - To what extent is the project objective realistic from today's perspective and the given resources (time, financial, partner capacities)? - To what extent are the activities, instruments and outputs adequately designed to achieve the project objective? - To what extent are the underlying results hypotheses of the project plausible? - To what extent is the chosen system boundary (sphere of responsibility) of the project (including partner) clearly defined and plausible? - Are potential influences of other donors/organisations outside of the project's sphere of responsibility adequately considered? - To what extent are the assumptions and risks for the project complete and plausible? 	Clarity of the results logic; interrelatedness of results in ToC and to overarching goal; easiness to appraise and report risks	Documents; workshop	Project proposal; Progress reports; Revised results model; Workshop with GIZ	strong
		Standard	To what extent does the strategic orientation of the project address potential changes in its framework conditions?	Ability of project to adapt to changes and align to new conditions	Workshop, interviews	Workshop with GIZ; Interviews with project partners	good
		Standard	How is/was the complexity of the framework conditions and guidelines handled? How is/was any possible overloading dealt with and strategically focused?	Strategic focus can be identified	Workshop, interviews	Workshop with GIZ; Interviews with project partners	good
		Standard	What changes have occurred during project implementation? (e.g. local, national, international, sectoral, including state of the art of sectoral know-how)?	Description, no indicator required	Documents, workshop, interviews	Progress reports; Work-	good

Max. 20 points					shop with GIZ; Interviews with project partners	
	Standard	How were the changes dealt with regarding the project concept?	Demonstrated adaptation to changes	Documents, workshop, interviews	Progress reports; Workshop with GIZ; Interviews with project partners	good

(1) The 'project concept' encompasses project objective and theory of change (ToC, see 3) with activities, outputs, instruments and results hypotheses as well as the implementation strategy (e.g. methodological approach, CD-strategy, results hypotheses)

(2) In the GIZ Safeguards and Gender system risks are assessed before project start regarding following aspects: gender, conflict, human rights, environment and climate. For the topics gender and human rights not only risks but also potentials are assessed. Before introducing the new safeguard system in 2016 GIZ used to examine these aspects in separate checks.

(3) Theory of Change = GIZ results model = graphic illustration and narrative results hypotheses

(4) Deescalating factors/ connectors: e.g. peace-promoting actors and institutions, structural changes, peace-promoting norms and behavior. For more details on 'connectors' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 55/135.

(5) Escalating factors/ dividers: e.g. destructive institutions, structures, norms and behavior. For more details on 'dividers' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 135.

(6) All projects in fragile contexts, projects with FS1 or FS2 markers and all transitional aid projects have to weaken escalating factors/dividers and have to mitigate risks in the context of conflict, fragility and violence. Projects with FS1 or FS2 markers should also consider how to strengthen deescalating factors/ connectors and how to address peace needs in its project objective/sub-objective?

OECD-DAC Criterion EFFECTIVENESS (max. 100 points)						
Assessment dimensions	Filter - Project Type	Evaluation questions	Evaluation indicators	Data collection methods (e.g. interviews, focus group discussions, documents, project/partner monitoring system, workshop, survey, etc.)	Data sources (list of relevant documents, interviews with specific stakeholder categories, specific monitoring data, specific workshop(s), etc.)	Evidence strength (moderate, good, strong)
<p>The project achieved the objective (outcome) on time in accordance with the project objective indicators.(1)</p> <p>Max. 40 points</p>	Standard	To what extent has the agreed project objective (outcome) been achieved (or will be achieved until end of project), measured against the objective indicators? Are additional indicators needed to reflect the project objective adequately?	Degree of attainment of project objective	Monitoring system, documents	Results-based monitoring tool of project; Progress reports; Closing report to partners	strong

	Standard	To what extent is it foreseeable that unachieved aspects of the project objective will be achieved during the current project term?	Not relevant since project has terminated			
<p>The activities and outputs of the project contributed substantially to the project objective achievement (outcome).(1)</p> <p>Max. 30 points</p>	Standard	To what extent have the agreed project outputs been achieved (or will be achieved until the end of the project), measured against the output indicators? Are additional indicators needed to reflect the outputs adequately?	Degree of achievement of project outputs	Monitoring system, documents	Results-based monitoring tool of project; Progress reports; Closing report to partners	strong
	Standard	How does the project contribute via activities, instruments and outputs to the achievement of the project objective (outcome)? (contribution-analysis approach)	Level of contribution of project to outcome	Interviews, focus group discussions	Interviews and focus group discussions with project partners and stakeholders	good
	Standard	Implementation strategy: Which factors in the implementation contribute successfully to or hinder the achievement of the project objective? (e.g. external factors, managerial setup of project and company, cooperation management)	Interviewees name success factors and hindering of the implementation for the achievement of objectives	Documents, interviews, focus group discussions	Progress reports; Closing report to partners; Interviews and focus group discussions with partners and stakeholders	good
	Standard	What other/alternative factors contributed to the fact that the project objective was achieved or not achieved?	Interviewees state alternative factors for the achievement or non-achievement of the project objective	Interviews, focus group discussions	Interviews and focus group discussions with partners and stakeholders	moderate
	Standard	What would have happened without the project?	Description of possible scenarios	Interviews, focus group discussions	Interviews and focus group discussions with project partners and stakeholders	moderate
	Standard	Which (unintended) negative or (formally not agreed) positive results does the project produce at output and outcome level and why?	Identified (unintended) negative or (formally not agreed) positive results produced by the project	Documents, monitoring system, workshop, interviews	Progress reports; Closing report to partners; Results-based monitoring tool; Workshop with GIZ; Interviews and focus group discussions with partners and stakeholders	good
<p>No project-related (unintended) negative results have occurred – and if any negative results occurred the project responded adequately.</p> <p>The occurrence of additional (not formally agreed) positive results has been monitored and</p>	Standard	How were risks and assumptions (see also GIZ Safeguards and Gender system) as well as (unintended) negative results at the output and outcome level assessed in the monitoring system	Degree to which risk profiling and assessment captured aspects of unintended results.	Documents, monitoring system	Project proposal; Results-based monitoring tool; Workshop with GIZ	moderate

additional opportunities for further positive results have been seized.		(e.g. 'Kompass')? Were risks already known during the concept phase?				
Max. 30 points	Standard	What measures have been taken by the project to counteract the risks and (if applicable) occurred negative results? To what extent were these measures adequate?	Adequacy of project reaction to risks and negative results	Documents, monitoring system, workshop, interviews	Progress reports; Results-based monitoring tool; Workshop with GIZ; Interviews with partners	good
	Standard	To what extent were potential (not formally agreed) positive results at outcome level monitored and exploited?	Level of monitoring and exploitation of potential (not formally agreed) positive results at outcome level	Documents, monitoring system, workshop, interviews	Progress reports; Results-based monitoring tool; Workshop with GIZ; Interviews with partners	good

(1) The first and the second evaluation dimensions are interrelated: if the contribution of the project to the objective achievement is low (2nd evaluation dimension) this must be considered for the assessment of the first evaluation dimension also.

(2) Deescalating factors/ connectors: e.g. peace-promoting actors and institutions, structural changes, peace-promoting norms and behavior. For more details on 'connectors' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 55/135.

(3) Escalating factors/ dividers: e.g. destructive institutions, structures, norms and behavior. For more details on 'dividers' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 135.

(5) Escalating factors/ dividers: e.g. destructive institutions, structures, norms and behavior. For more details on 'dividers' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 135.

(5) Escalating factors/ dividers: e.g. destructive institutions, structures, norms and behavior. For more details on 'dividers' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 135.

(4) All projects in fragile contexts, projects with FS1 or FS2 markers and all transitional aid projects have to weaken escalating factors/dividers and have to mitigate risks in the context of conflict, fragility and violence. Projects with FS1 or FS2 markers should also consider how to strengthen deescalating factors/ connectors and how to address peace needs in its project objective/sub-objective?

(5) Risks in the context of conflict, fragility and violence: e.g. contextual (e.g. political instability, violence, economic crises, migration/refugee flows, drought, etc.), institutional (e.g. weak partner capacity, fiduciary risks, corruption, staff turnover, investment risks) and personnel (murder, robbery, kidnapping, medical care, etc.). For more details see: GIZ (2014): 'Context- and conflict-sensitive results-based monitoring system (RBM). Supplement to: The 'Guidelines on designing and using a results-based monitoring system (RBM) system.', p.27 and 28.

OECD-DAC Criterion IMPACT (max. 100 points)						
Assessment dimensions	Filter - Project Type	Evaluation questions	Evaluation indicators	Data collection methods (e.g. interviews, focus group discussions, documents, project/partner monitoring system, workshop, survey, etc.)	Data sources (list of relevant documents, interviews with specific stakeholder categories, specific monitoring data, specific workshop(s), etc.)	Evidence strength (moderate, good, strong)
The intended overarching development results have occurred or are foreseen (plausible reasons). (1) Max. 40 points	Standard	To which overarching development results is the project supposed to contribute (cf. module and programme proposal with indicators/ identifiers if applicable, national strategy for implementing 2030 Agenda, SDGs)? Which of these intended results at the impact level can be observed or are plausible to be achieved in the future?	Overarching results to which the project contributed to	Documents, interviews	Progress reports; Closing report to partners; Sectoral documents describing recent developments in the geothermal sector of the partner countries; Interviews with project partners and stakeholders	good

	Standard	Indirect target group and 'Leave No One Behind' (LNOB): Is there evidence of results achieved at indirect target group level/specific groups of population? To what extent have targeted marginalised groups (such as women, children, young people, elderly, people with disabilities, indigenous peoples, refugees, IDPs and migrants, people living with HIV/AIDS and the poorest of the poor) been reached?	Degree to which impacts reach marginalised groups	Workshop, interviews	Workshop with GIZ; Interviews with project partners	moderate
<p>The project objective (outcome) of the project contributed to the occurred or foreseen overarching development results (impact).(1)</p> <p>Max. 30 points</p>	Standard	To what extent is it plausible that the results of the project on outcome level (project objective) contributed or will contribute to the overarching results? (contribution-analysis approach)	Level of contribution of project to overarching results	Interviews, focus group discussions	Interviews and focus group discussions with project partners and stakeholders	good
	Standard	What are the alternative explanations/factors for the overarching development results observed? (e.g. the activities of other stakeholders, other policies)	Interviewees state alternative factors for the achievement or non-achievement of the overarching results	Interviews, focus group discussions	Interviews and focus group discussions with partners and stakeholders	moderate
	Standard	To what extent is the impact of the project positively or negatively influenced by framework conditions, other policy areas, strategies or interests (German ministries, bilateral and multilateral development partners)? How did the project react to this?	Mentioning of other key influences and respective consequences	Interviews, focus group discussions, workshop	Interviews and focus group discussions with partners and stakeholders; Workshop with GIZ	good
	Standard	What would have happened without the project?	Description of possible scenarios	Interviews, focus group discussions	Interviews and focus group discussions with project partners and stakeholders	good
	Standard	To what extent has the project made an active and systematic contribution to widespread impact and were scaling-up mechanisms applied (2)? If not, could there have been potential? Why was the potential not exploited? To what extent has the project made an innovative contribution (or a contribution to innovation)? Which innovations have been tested in different regional contexts? How are the innovations evaluated by which partners?	Project documents or interviewees describe the contribution of the project to widespread impact	Documents, interviews, focus group discussions, workshop	Progress reports; Closing report to partners; Interviews and focus group discussions with partners and stakeholders; Workshop with GIZ	moderate
<p>No project-related (unintended) negative results at impact level have occurred – and if any negative results occurred the project responded adequately.</p> <p>The occurrence of additional (not formally agreed) positive results at impact level has been monitored and additional opportunities for further positive results have been seized.</p> <p>Max. 30 points</p>	Standard	Which (unintended) negative or (formally not agreed) positive results at impact level can be observed? Are there negative trade-offs between the ecological, economic and social dimensions (according to the three dimensions of sustainability in the Agenda 2030)? Were positive synergies between the three dimensions exploited?	Identified (unintended) negative or (formally not agreed) positive results produced by the project at impact level	Workshop, interviews	Workshop with GIZ; Interviews and focus group discussions with partners and stakeholders	good
	Standard	To what extent were risks of (unintended) results at the impact level assessed in the monitoring system (e.g. 'Kompass')? Were risks already known during the planning phase?	Degree to which risk profiling and assessment captured aspects of unintended results.	Documents	Project proposal; Workshop with GIZ	moderate
	Standard	What measures have been taken by the project to avoid and counteract the risks/negative results/trade-offs (3)?	Adequacy of project reaction to risks and negative results	Documents, workshop, interviews	Progress reports; Workshop with GIZ; Interviews with partners	good
	Standard	To what extent have the framework conditions played a role in regard to the negative results? How did the project react to this?	Evidence of appropriate action, if the framework conditions were not conducive	Interviews, focus group discussions, workshop	Interviews and focus group discussions with partners and stakeholders; Workshop with GIZ	moderate

	Standard	To what extent were potential (not formally agreed) positive results and potential synergies between the ecological, economic and social dimensions monitored and exploited?	Level of monitoring and exploitation of potential (not formally agreed) positive results and synergies	Documents, workshop, interviews	Progress reports; Workshop with GIZ; Interviews with partners	moderate
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(1) The first and the second evaluation dimensions are interrelated: if the contribution of the project outcome to the impact is low or not plausible (2nd evaluation dimension) this must be considered for the assessment of the first evaluation dimension also.

(2) Broad impact (in German 'Breitenwirksamkeit') is defined by 4 dimensions: relevance, quality, quantity, sustainability. Scaling-up approaches can be categorized as vertical, horizontal, functional or combined. See GIZ (2014) 'Corporate strategy evaluation on scaling up and broad impact: The path: scaling up, the goal: broad impact' (<https://www.giz.de/de/downloads/giz2015-en-scaling-up.pdf>)

(3) Risks, negative results and trade-offs are separate aspects and are all to be considered.

OECD-DAC Criterion EFFICIENCY (max. 100 points)						
Assessment dimensions	Filter - Project Type	Evaluation questions	Evaluation indicators (pilot phase for indicators - only available in German so far)	Data collection methods (e.g. interviews, focus group discussions, documents, project/partner monitoring system, workshop, survey, etc.)	Data sources (list of relevant documents, interviews with specific stakeholder categories, specific monitoring data, specific workshop(s), etc.)	Evidence strength (moderate, good, strong)
The project's use of resources is appropriate with regard to the outputs achieved. [Production efficiency: Resources/Outputs] Max. 70 points	Standard	To what extent are there deviations between the identified costs and the projected costs? What are the reasons for the identified deviation(s)?	Das Vorhaben steuert seine Ressourcen gemäß des geplanten Kostenplans (Kostenzeilen). Nur bei nachvollziehbarer Begründung erfolgen Abweichungen vom Kostenplan.	Documents, workshop	Cost obligo report; Workshop with GIZ	strong
	Standard	Focus: To what extent could the outputs have been maximised with the same amount of resources and under the same framework conditions and with the same or better quality (maximum principle)? (methodological minimum standard: Follow-the-money approach)	Das Vorhaben reflektiert, ob die vereinbarten Wirkungen mit den vorhandenen Mitteln erreicht werden können.	Documents, workshop	Progress reports; Cost obligo report; Efficiency tool; Workshop with GIZ	good
	Standard		Das Vorhaben steuert seine Ressourcen gemäß der geplanten Kosten für die vereinbarten Leistungen (Outputs). Nur bei nachvollziehbarer Begründung erfolgen Abweichungen von den Kosten. Die übergreifenden Kosten des Vorhabens stehen in einem angemessenen Verhältnis zu den Kosten für die Outputs. Die durch ZAS Aufschriebe erbrachten Leistungen haben einen nachvollziehbaren Mehrwert für die Erreichung der Outputs des Vorhabens.			good
	Standard		Die übergreifenden Kosten des Vorhabens stehen in einem angemessenen Verhältnis zu den Kosten für die Outputs.			moderate
	Standard		Die durch ZAS Aufschriebe erbrachten Leistungen haben einen nachvollziehbaren Mehrwert für die Erreichung der Outputs des Vorhabens.			moderate

		Standard	Focus: To what extent could outputs have been maximised by reallocating resources between the outputs? (methodological minimum standard: Follow-the-money approach)	Das Vorhaben steuert seine Ressourcen, um andere Outputs schneller/ besser zu erreichen, wenn Outputs erreicht wurden bzw. diese nicht erreicht werden können (Schlussevaluierung). Oder: Das Vorhaben steuert und plant seine Ressourcen, um andere Outputs schneller/ besser zu erreichen, wenn Outputs erreicht wurden bzw. diese nicht erreicht werden können (Zwischenevaluierung).	Documents, workshop	Progress reports; Efficiency tool; Workshop with GIZ	good
	The project's use of resources is appropriate with regard to achieving the projects objective (outcome).	Standard	Were the output/resource ratio and alternatives carefully considered during the design and implementation process – and if so, how? (methodological minimum standard: Follow-the-money approach)	Das im Modulvorschlag vorgeschlagene Instrumentenkonzept konnte hinsichtlich der veranschlagten Kosten in Bezug auf die angestrebten Outputs des Vorhabens gut realisiert werden.	Documents, workshop	Project proposal; Progress reports; Efficiency tool; Workshop with GIZ	good
		Standard		Die im Modulvorschlag vorgeschlagene Partnerkonstellation und die damit verbundenen Interventionsebenen konnte hinsichtlich der veranschlagten Kosten in Bezug auf die angestrebten Outputs des Vorhabens gut realisiert werden.			good
		Standard		Der im Modulvorschlag vorgeschlagene thematische Zuschnitte für das Vorhaben konnte hinsichtlich der veranschlagten Kosten in Bezug auf die angestrebten Outputs des Vorhabens gut realisiert werden.			good
		Standard		Die im Modulvorschlag beschriebenen Risiken sind hinsichtlich der veranschlagten Kosten in Bezug auf die angestrebten Outputs des Vorhabens gut nachvollziehbar.			moderate
		Standard		Die im Modulvorschlag beschriebene Reichweite des Vorhabens (z.B. Regionen) konnte hinsichtlich der veranschlagten Kosten in Bezug auf die angestrebten Outputs des Vorhabens voll realisiert werden.			good
		Standard		Der im Modulvorschlag beschriebene Ansatz des Vorhabens hinsichtlich der zu erbringenden Outputs entspricht unter den gegebenen Rahmenbedingungen dem state-of-the-art.			good
		Standard	To what extent could the outcome (project objective) have been maximised with the same amount of resources and the same or better quality (maximum principle)?	Das Vorhaben orientiert sich an internen oder externen Vergleichsgrößen, um seine Wirkungen kosteneffizient zu erreichen.	Documents, workshop	Cost obligo report; Workshop with GIZ	moderate

	[Allocation efficiency: Resources/Outcome] Max. 30 points	Standard	Were the outcome-resources ratio and alternatives carefully considered during the conception and implementation process – and if so, how? Were any scaling-up options considered?	Das Vorhaben steuert seine Ressourcen zwischen den Outputs, so dass die maximalen Wirkungen im Sinne des Modulziels erreicht werden. (Schluss-evaluierung) Oder: Das Vorhaben steuert und plant seine Ressourcen zwischen den Outputs, so dass die maximalen Wirkungen im Sinne des Modulziels erreicht werden. (Zwischenevaluierung)	Documents, workshop	Project proposal; Progress reports; Workshop with GIZ	moderate
		Standard		Das im Modulvorschlag vorgeschlagene Instrumentenkonzept konnte hinsichtlich der veranschlagten Kosten in Bezug auf das angestrebte Modulziel des Vorhabens gut realisiert werden.			good
		Standard		Die im Modulvorschlag vorgeschlagene Partnerkonstellation und die damit verbundenen Interventionsebenen konnte hinsichtlich der veranschlagten Kosten in Bezug auf das angestrebte Modulziel des Vorhabens gut realisiert werden.			good
		Standard		Der im Modulvorschlag vorgeschlagene thematische Zuschnitte für das Vorhaben konnte hinsichtlich der veranschlagten Kosten in Bezug auf das angestrebte Modulziel des Vorhabens gut realisiert werden.			good
		Standard		Die im Modulvorschlag beschriebenen Risiken sind hinsichtlich der veranschlagten Kosten in Bezug auf das angestrebte Modulziel des Vorhabens gut nachvollziehbar.			moderate
		Standard		Die im Modulvorschlag beschriebene Reichweite des Vorhabens (z.B. Regionen) konnte hinsichtlich der veranschlagten Kosten in Bezug auf das angestrebte Modulziel des Vorhabens voll realisiert werden.			good
		Standard		Der im Modulvorschlag beschriebene Ansatz des Vorhabens hinsichtlich des zu erbringenden Modulziels entspricht unter den gegebenen Rahmenbedingungen dem state-of-the-art.			good
		Standard	To what extent were more results achieved through cooperation / synergies and/or leverage of more resources, with the help of other ministries, bilateral and multilateral donors and organisations (e.g. co-financing) and/or other GIZ projects? If so, was the relationship between costs and results appropriate or did it even improve efficiency?	Das Vorhaben unternimmt die notwendigen Schritte, um Synergien mit Interventionen anderer Geber auf der Wirkungsebene vollständig zu realisieren.	Documents, interviews, workshop	Progress reports; Efficiency tool; Interviews with project partners and stakeholders; Workshop with GIZ	good
		Standard		Wirtschaftlichkeitsverluste durch unzureichende Koordinierung und Komplementarität zu Interventionen anderer Geber werden ausreichend vermieden.			good
		Standard		Das Vorhaben unternimmt die notwendigen Schritte, um Synergien innerhalb der deutschen EZ vollständig zu reali-			good

		sieren.		
	Standard	Wirtschaftlichkeitsverluste durch unzureichende Koordinierung und Komplementarität innerhalb der deutschen EZ werden ausreichend vermieden.		good
	Standard	Die Partnerbeiträge stehen in einem angemessenen Verhältnis zu den Kosten für die Outputs des Vorhabens.		strong

OECD-DAC Criterion SUSTAINABILITY (max. 100 points)						
Assessment dimensions	Filter - Project Type	Evaluation questions	Evaluation indicators	Data collection methods (e.g. interviews, focus group discussions, documents, project/partner monitoring system, workshop, survey, etc.)	Data sources (list of relevant documents, interviews with specific stakeholder categories, specific monitoring data, specific workshop(s), etc.)	Evidence strength (moderate, good, strong)
Prerequisite for ensuring the long-term success of the project: Results are anchored in (partner) structures. Max. 50 points	Standard	What has the project done to ensure that the results can be sustained in the medium to long term by the partners themselves?	Extent to which the project strategically approached systematically anchoring activities in partner structures	Documents, interviews, workshop	Progress reports; Closing report to partners; Interviews with partners; Workshop with GIZ	good
	Standard	In what way are advisory contents, approaches, methods or concepts of the project anchored/institutionalised in the (partner) system?	Documents and statements verify institutionalization	Documents, interviews, workshop	Progress reports; Closing report to partners; Interviews with partners; Workshop with GIZ	good
	Standard	To what extent are the results continuously used and/or further developed by the target group and/or implementing partners?	Documents and statements verify further use	Documents, interviews	Progress reports; Closing report to partners; Interviews with partners;	good
	Standard	To what extent are resources and capacities at the individual, organisational or societal/political level in the partner country available (long-term) to ensure the continuation of the results achieved?	Qualitative assessment of organizational and human resources in partner institutions	Interviews	Interviews with partners	moderate
	Standard	If no follow-on measure exists: What is the project's exit strategy? How are lessons learnt for partners and GIZ prepared and documented?	Extent to which the project ensured sustainability through documenta-	Documents, interviews	Closing report to partners; Interviews with partners	good

			tion			
Forecast of durability: Results of the project are permanent, stable and long-term resilient.	Standard	To what extent are the results of the project durable, stable and resilient in the long-term under the given conditions?	Narrative assessment of durability	Documents, interviews	Progress reports; Closing report to partners; Interviews with partners	good
Max. 50 points	Standard	What risks and potentials are emerging for the durability of the results and how likely are these factors to occur? What has the project done to reduce these risks?	Description of risks and potentials with regards to durability	Documents, interviews, workshop	Progress reports; Closing report to partners; Interviews with partners; Workshop with GIZ	moderate

(1) Escalating factors/ dividers: e.g. destructive institutions, structures, norms and behavior. For more details on 'dividers' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 135.

(2) Deescalating factors/ connectors: e.g. peace-promoting actors and institutions, structural changes, peace-promoting norms and behavior. For more details on 'connectors' see: GIZ (2007): 'Peace and Conflict Assessment (PCA). Ein methodischer Rahmen zur konflikt- und friedensbezogenen Ausrichtung von EZ-Maßnahmen', p. 55/135.

(3) All projects in fragile contexts, projects with FS1 or FS2 markers and all transitional aid projects have to weaken escalating factors/dividers and have to mitigate risks in the context of conflict, fragility and violence. Projects with FS1 or FS2 markers should also consider how to strengthen deescalating factors/ connectors and how to address peace needs in its project objective/sub-objective?



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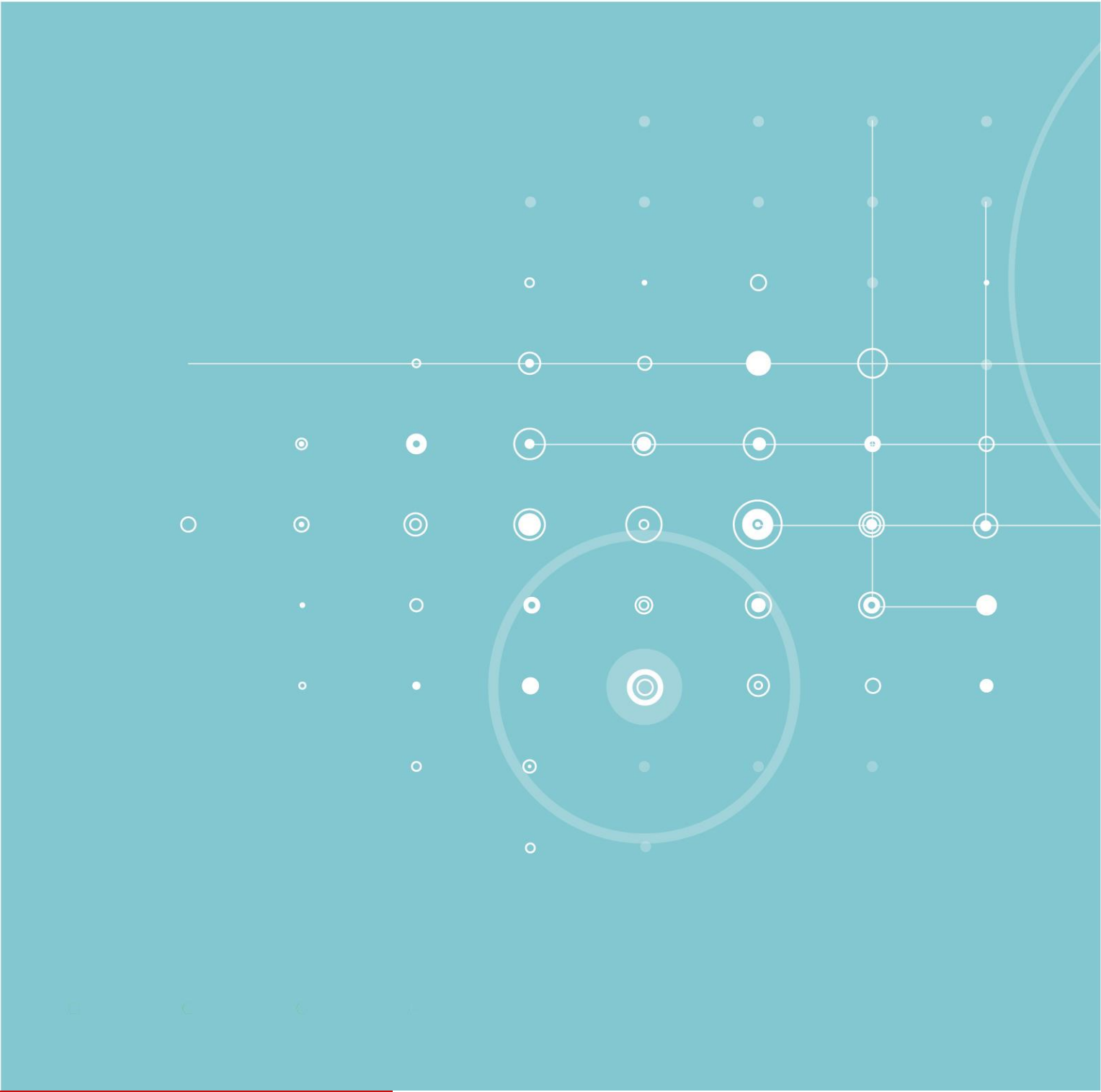
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