Final Evaluation of IFC's Geofund Turkey Project

Draft Final Report

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Economics & Finance

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Table of Abbreviations

BTO	Back-to-office
CPS	Country Partnership Strategy
CTF	Clean Technology Funds
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EOI	Expression of Interest
ESMAP	Energy Sector Management Assistance Program
FiT	Feed-in Tariff
GDF	Geothermal Development Facility
GEF	Global Environmental Facility
GoT	Government of Turkey
GRMI	Geological risk mitigation instrument
GWPI	Geothermal well productivity insurance
IDB	Interamerican Development Bank
IFC	International Finance Corporation
IGA	International Geothermal Association
LAC	Latin America and the Caribbean
M&E	Monitoring and Evaluation
MTR	Mid-term Review
NCG	Non-condensable gas
PCR	Project Completion Report
PE	Private Equity
PSA	Project Services Agreement
PSR	Project Supervision Reports
RE	Renewable energy
REOI	Request for Expressions of Interest
RFP	Request for Proposal
RISE	Readiness for Investment in Sustainable Energy
RMF	Risk Mitigation Fund
STC	Short Term Consultant
TA	Technical assistance
ToR	Terms of Reference
WB	World Bank
WBG	World Bank Group

Executive Summary

DHInfrastructure was asked to conduct a terminal evaluation of the International Finance Corporation's (IFC) Geofund Turkey Project ("the Project"). The purpose of the terminal evaluation is to assess the Project's performance in line with OECD/DAC and Global Environmental Facility (GEF) guidelines. More specifically, the terminal evaluation elaborates on, and synthesizes the lessons learned from the Project that may help improve the selection, design, and implementation of future GEF and IFC activities. The evaluation covers the period from June 2007 to June 2016.

The Project, originally designed in 2003, was part of the multi-country Geofund Program that IFC launched in June 2007 to promote sustainable energy resource use and limit climate change impacts by addressing barriers to renewable energy (RE) and geothermal development in Turkey. The Project was initially implemented in cooperation with the World Bank (IBRD) and funded by the GEF. The Project's strategy evolved over time and stabilized in 2012. It conducted activities (at the firm and sector-level), which were directed at three stakeholders: geothermal developers, insurers, and financial institutions through three components:

- Component 1: Creating and piloting a risk mitigation instrument (or geological risk insurance – GRI),
- Component 2: Diffusing GRI to the wider geothermal community, and
- Component 3: Developing and implementing geothermal exploration best practices.

The Project intended to increase capacity and know-how of project developers and financial institutions, develop a GRI and successfully pilot and replicate insured geothermal projects such that the following impacts would be achieved:

- USD 420 million of direct investment and USD 600 million of indirect investment facilitated in geothermal energy;
- 451.08 thousand tons per year of greenhouse gas production avoided directly by IFC-facilitated projects, and by 644.4 thousand tons per year from projects that were indirectly facilitated; and
- An increase of 840 thousand MWh per year of energy produced from RE by from IFC-facilitated projects, and by 1.2 million MWh per year from projects that were indirectly facilitated.

The total budget for the Project was USD 10.3 million, of which USD 10 million was provided through GEF, and USD 300 thousand was provided through funds from the Iceland/IFC Technical Assistance Trust Fund. USD 8.3 million was set aside for concessional finance, USD 1.7 million was set aside for technical assistance, and USD 300 thousand was set aside as contingency funds that could be applied to the technical assistance or concessional finance component. The budget for technical assistance and contingency funds were fully spent. Because the Project was unable to pilot a project using geological risk insurance, the budget for concessional finance was not used and has been returned to the GEF. The Project's operations ended in June 2016.

The table on the following page summarizes our evaluation of the Project against five OECD/DAC criteria. The text in the remainder of this executive summary expands on the ratings, and summarizes the lessons learned from the Project.

Summary of Evaluation Ratings

Evaluation Criteria	Rating
Relevance	**Moderately satisfactory** ▪ The overall selection of Project components and activities was appropriate to meet the Project's objectives ▪ The Project's design was also well aligned with GEF OP, IFC and World Bank institutional level strategies, and World Bank Group country partnerships from 2008-2015. ▪ The Project also maintains its strategic relevance today because other donors have recently initiated projects that address the same key barriers to geothermal development. ▪ The sequencing of project activities, in the original project design, detracted somewhat from the project's relevance because it failed to include early outreach to banks who might finance geothermal projects.
Effectiveness	**Moderately unsatisfactory** ▪ The Project delivered roughly two-thirds of its planned outputs, and managed to achieve some of its planned outcomes. No impacts were achieved. ▪ The Project achieved the most results in its work targeting geothermal developers and insurers, and fewer results in its work targeting financial institutions.
Efficiency	**Moderately unsatisfactory** ▪ The technical assistance budget allocated to the Project was appropriate to meet its objectives and fully utilized. However, the Project design was not appropriate to meeting its objectives in terms of Project planning (timeframe) and human resources given the highly technical and specialized goal of the project. ▪ The evaluation team was unable to assess the adequacy of the budget set aside for concessional financing because no pilots were realized. ▪ The evaluation team was also unable to evaluate the cost effectiveness of the Project because there were no comparable initiatives ongoing when the Project was being implemented. ▪ The Project ultimately did not offer value-for-money because, despite a generally appropriate budget, the outputs and outcomes planned for the Project were only partially delivered.
Design and implementation of monitoring and evaluation plan	**Satisfactory** ▪ The Project's Monitoring and Evaluation (M&E) plan, at the point of GEF CEO endorsement, (2010) was practical and sufficient. IFC provided a clear and substantiated rationale for GEF involvement and funding.

	▪ the Project's M&E plan was well managed, despite changes to the Project strategy, which also resulted in changes to the Project's logframes and results framework. ▪ The results measurement framework was updated biannually and there were few very small inconsistencies in the results framework.
Sustainability	**Unlikely** ▪ The sustainability of IFC's firm-level work is mixed. IFC advised four developers and one developer incorporated IFC's recommendations to improve its project proposal. ▪ But ultimately, the sustainability of a GRI product—the centerpiece of IFC's work on the Project—is unlikely because banks did not see value in the product and did not want to use it. ▪ IFC's sector-level work is likely to be sustainable. The sustainability of the exploration best practices guide is likely in the medium-term because advancements in geothermal exploration technology typically happen every five years and take about ten to become industry standard.

Relevance (moderately satisfactory)

The Project's design was appropriate to meet its objectives and a timely intervention at its inception…	In 2007, electricity demand in Turkey was growing at about seven percent a year. Without new investment in baseload generation, supply shortages were expected in 2008/2009. Important institutional, legal, and regulatory reforms were also taking place as the energy sector was unbundled and liberalized. The Government of Turkey passed the RE Law in 2005, which established a price floor of USD 55/MWh for power purchases from RE projects. In 2007, the Law on Geothermal Sources and Mineral Waters was passed, facilitating the concession of potential geothermal sites to the private sector, and establishing procedures which would allow developers to explore and develop new sites.
It targeted key barriers to geothermal development…	The regulatory reforms were a step forward, but geothermal specific barriers remained including: limited access to financing, high resource risk, and limited technical capacity of project developers. The Project planned to remove these barriers by developing, launching, and piloting a GRI product and provide advisory services to project developers.
…and was well aligned with GEF OP, IFC, and World Bank institutional level strategies.	The Project was well aligned with IFC and World Bank's high-level strategic commitments to climate change and the GEF-3 operational Program Six, which aimed to promote the uptake of RE by removing barriers and reducing implementation costs.

However, the sequencing of project activities could have been better planned.

The original Project design did not foresee engagement with financial institutions until 2012, plans which largely did not come to fruition because banks were not willing to pay for IFC's advisory services and workshops on financing early stage geothermal development. More importantly, the market assessment conducted in 2008—which could have guided the Project's subsequent interventions—did not sufficiently identify gaps in the investment climate for geothermal exploration. The market assessment acknowledged access to finance as a bottleneck to geothermal development but did not recommend any measures to address it, or to test the hypothesis that GRI would be a sufficient and acceptable de-risking mechanism.

Effectiveness (moderately unsatisfactory)

The Project was unable to facilitate the development of a market for GRI…

IFC hoped that by facilitating early stage geothermal development a market based GRI would become available in Turkey. Because the instrument was never piloted, this objective was not achieved. Nevertheless, the Project managed to achieve some of its planned outcomes.

…but still achieved some of its planned outcomes including: Increasing developer capacity to prepare project proposals…

IFC planned to provide advisory services to developers to increase their technical know-how and project proposal quality. Some of the outcome targets relevant to this work stream were achieved. IFC conducted technical due diligence on eight projects, for five clients, to ensure their project proposals met best practices and were in a format that was acceptable to insurers. Four reports were accepted by the clients, 80 percent of IFC's target of five.

…disseminating and securing wide acceptance of geothermal exploration best practice, and…

The geothermal exploration best practices guide developed by IFC was widely accepted. The guide was endorsed by geothermal industry associations from various countries, academia, developers and technical consultancies. The endorsers agreed that the guide would be beneficial to the global geothermal community and indicated their approval of the vocabulary, description of the key phases in geothermal development, and explanation of data collection and exploration methods used in the report.

…achieving a necessary first step to piloting GRI supported geothermal projects by launching the product.

The outcome target relevant to insurers was to increase the number of projects using GRI and work towards developing a fully market based insurance product. Immediate outcomes targeted at insurers were largely not achieved because the GRI product was not piloted in any geothermal development projects in Turkey. Nevertheless, an insurer launched a GRI product in Turkey in 2015, and prepared a draft GRI policy underwriting one developer's project, a necessary first step towards piloting the product.

The project did not achieve any outcomes in its work with financial institutions because Project activities (apart from pitches made to financial institutions) were not conducted.

Efficiency (moderately unsatisfactory)

The Project's budget was adequate and used efficiently…

The Project was allocated USD 1.7 million to carry out technical assistance (TA) activities and USD 8 million to provide concessional financing to four pilot projects. An additional USD 300 thousand was made available as contingency and could be applied to TA or concessional financing components. We were not able to assess the adequacy of the budget set aside for concessional financing because no pilot projects were realized. The Project used the full TA budget and contingency funds to provide advisory services to insurers and developers, and for developing the best practices component (added after GEF approval). We think the TA budget allocated to the Project was appropriate to meet its objectives, primarily because we do not feel that additional TA would have substantially improved the Project's effectiveness in achieving outcomes or impacts. The evaluation team did not evaluate the cost effectiveness of the Project because there were no comparable initiatives ongoing when the Project was being implemented.

…but IFC underestimated time it would take to realize Project results and...

The original Project plan in 2008 set aggressive deadlines for Project results that were probably unrealistic. It was expected the project would take two years to develop GRI and shortly thereafter pilot projects. In practice, the Project experienced substantial delays. A draft term sheet was developed in 2010, but it was only in 2015 that the Project successfully launched an insurance product together with an insurer. The Project completion date was extended twice, to facilitate its first pilot, but ultimately failed to do so.

…did not have adequate insurance expertise on the team.

The Project's staffing was likely not appropriate given the Project's highly technical and specialized goal of developing GRI. The Project documents recorded four transaction leaders between 2008 and 2010. Day-to-day operations were managed by an Energy Specialist with the transaction leader maintaining communications on a frequent basis. Requirements for technical expertise were outsourced to external consultants or sourced in an ad-hoc manner from IFC's other units. Interviewees said that the Project's efficiency could have been improved by hiring an insurance expert to support developing the insurance product and negotiating with insurers. IFC needed to secure buy-in and provide advisory services to financial institutions, insurers and geothermal developers, but was only able to dedicate a substantial amount of time to the latter two groups.

Monitoring and evaluation plan (satisfactory)

M&E plan at GEF endorsement was practical and sufficient

The Project's M&E plan, at the point of GEF CEO endorsement, (2010) was practical and sufficient. IFC provided a clear and substantiated rationale for GEF involvement and funding. IFC also identified key performance indicators to measure the projects expected impacts and provided a plan for how it would monitor and evaluate the Project's progress and results. The proposed

M&E budget (USD 150,000 or 8.8 percent of the TA budget) also appears to have been adequate because IFC's internal budget from 2010 accounts for M&E costs in its staff line item and there were no records of budgetary problems relating to M&E in other project documents.

M&E was well managed despite changes to the Project's strategy

In our opinion, the Project's M&E plan was well managed, despite changes to the Project strategy, which also resulted in changes to the Project's logframes and results framework. The Project's results framework was updated biannually in the Project Supervision Reports (PSR). Because some Project indicators were replaced or reshuffled to match changes to the Project's components, there is an instance where the Project's achievements were re-recorded well past the original time of implementation. In reviewing the Project documents, the evaluation team also noticed that IFC planned to track megawatt hours of energy produced (a standard IFC indicator) instead of megawatts installed as proposed in the GEF approval document.

Risk to sustainability of Project outcomes and impacts (unlikely)

The sustainability of some Project outcomes are likely.

The Project only achieved planned outcomes in its work targeting developers, which were:

- Increased technical know-how and capacity to develop projects and project proposals that met exploration best practice (at the firm level), and
- Increased awareness/willingness to use GRI (at the firm-level).

The sustainability of firm-level outcomes is mixed. Capacity built through IFC's advisory services is likely to be sustained…

We feel that the sustainability of developers' increased capacity to prepare high quality project proposals and projects is likely. The uniform criteria applied in the due diligence process would have signaled to developers the standards expected by insurers and investors of the information and presentation of survey study results. IFC advised four developers and one developer incorporated IFC's recommendations to improve its project proposal.

…but willingness to use GRI is not.

The sustainability of developers' willingness to use GRI (limited to those with whom IFC worked) is unlikely because, as one developer said: "*Unfortunately, the way banks see it in Turkey, geothermal risk insurance does not have an effect on the bankability of the project.*". In short, GRI did not help address developers' ability to access finance. Another developer said that finance is what's needed in the Turkish market, not insurance.

The sustainability of the Project's sector-level outcomes are likely.

We feel that the sustainability of sector-level outcomes is also likely. The exploration best practices guide is available publicly on the World Bank website and has been adapted into a textbook that is offered by the IGA. According to the geothermal expert who was involved in preparing the guide, advancements in geothermal exploration technology typically happen every five years and take about ten to become industry standard. In short, we can expect that the guide will likely to be useful in the medium term. In the longer-run, the sustainability of the guide's benefits

will be determined by how widely it is disseminated, updated, and used by the geothermal community.

There are no impacts to be sustained or assessed because GRI was never piloted, is not currently being offered in Turkey, and does not appear to be the basis for exploration risk insurance offered in other countries. Financial, sociopolitical, institutional, and environmental risks are not relevant to the sustainability of the Project's outcomes.

Nevertheless, there may be prospects for the replication and scaling up of a project similar to Geofund Turkey.

The Project was the first to attempt to use commercial insurance to facilitate geothermal exploration in an emerging market. Since then, other development partners have developed programs to mitigate exploration risk but few have structured them solely around commercial insurance. There are two exceptions: Interamerican Development Bank (IDB)'s Geothermal Financing and Risk Transfer Program in Mexico, and the multi-donor Geothermal Development Facility in Latin America. These new programs are combining insurance and finance instruments (contingent grants, concessional loans, and commercial insurance) to mitigate geothermal exploration risk. They are discussed in greater detail in section 4.6.5 of the report.

Lessons and recommendations

Demand for GRI was fundamentally limited among:

1.) Developers,

The case for GRI was conceptually relevant in Turkey, but developers' appetite was ultimately limited. Smaller developers with little or no experience in the Turkish geothermal market showed the most interest in the GRI product. The largest developer that IFC engaged during the project (one of the largest geothermal producers in Turkey) proceeded with exploration drilling without GRI. The two projects that came closest to being insured were from small developers who had no experience in geothermal projects. It is also possible that the increasingly favorable enabling environment for geothermal development, coupled with the low drilling costs in Turkey, also limited developers' interest. Lower drilling costs mean lower upfront capital costs, and therefore more limited loss if drilling fails to find any productive resources.

2.) Financial institutions, and

There also appeared to be limited interest from financial institutions. IFC reached out to financial institutions through a market assessment in 2010 and through the IFC Financial Markets team. Financial institutions initially expressed interest in the concept of GRI, and in learning more about financing early stage geothermal development, but they ultimately did not want to pay for IFC advisory services. The one developer who tried to seek financing from local banks using GRI was unsuccessful.

3.) Insurers.

IFC developed and pitched a draft term sheet to 13 of the leading insurers and reinsurers, of which three expressed initial interest. Insurers said they were unwilling to cover exploration drilling because they felt that the risk was related to fundamental lack of understanding of a preexisting condition; a risk better borne by

equity investors. Because geothermal resources are site specific—a new well 100 meters away from a productive well can be dry—many insurers felt that even if publicly available databases on well productivity were available, the risk still could not be assessed or priced. Ultimately, only one reinsurer was willing to offer the product.

The long project cycle of geothermal projects…

The project cycle of geothermal projects (6 to 13 years), of which the exploration phase can take up to 5 years, is long compared to the Project's original timeframe (8 years). The time required to complete a geothermal project, combined with the need to conduct a market assessment, develop a project pipeline, conduct due diligence for potential projects, and design an insurance project that would be offered by a commercial insurer probably limited IFC's chances of facilitating a geothermal pilot.

… and dependence on multiple stakeholder decisions and timetables, posed challenges.

Furthermore, Project results were largely dependent on aligning multiple external stakeholder decisions and timetables. Given that all parties, including IFC, were unfamiliar with the project and learning through experience, there were missed opportunities during the Project. In one instance, a draft term sheet had been drawn up, but IFC had not yet found an insurer that was willing to offer the product. In another instance, IFC had facilitated a deal between an insurer and a developer, but the project failed to secure financing.

A more flexible approach may have helped the Project reach its targets…

In the Project Completion Report, IFC said that it felt a regional or global platform approach and greater flexibility to offer/develop alternative financial products might have been a more appropriate strategy.

We agree with the Project team's assessment, in principle. A platform approach would have enabled IFC to direct its resources to projects with the greatest readiness, given long project lead times and reliance on multiple external stakeholder timetables. We also think that it might have been beneficial for the Project to have the option to offer different financial products. The flexibility in geographic reach and intervention approach can help IFC meet strict M&E impact targets. In practice, however, we also recognize that operational flexibility can have a negative effect on accountability and can introduce challenges to M&E. The administrative and M&E costs are likely to be higher in projects where the ranges of target countries and project outputs are wider.

… but GRI seems fundamentally to be a "tough sell" aimed at a very narrow market segment.

As noted above, GRI appealed mostly to smaller developers for whom balance-sheet financing was not an option (or not an attractive option). GRI also appears to have limited appeal to insurers and potential lenders. Some interviewees have suggested that outreach to other stakeholders—outreach to the Turkish Government for better quality data, or outreach to smaller insurers with higher risk tolerance—could have eventually allowed for a successful outcome. The appeal to developers, however, is likely to have remained limited because,

in the words of one interviewee, Geothermal projects have “oil and gas risk, with utility returns.” Such an investment profile, in our view, makes it fundamentally difficult to attract most investors except those with a relatively low opportunity cost of capital.

1 Introduction

DHInfrastructure has been asked to conduct a terminal evaluation of the International Finance Corporation's (IFC) Geofund Turkey Project ("the Project"). The Project, originally designed in 2003 as part of the multi-country Geofund Program, was launched by IFC in June 2007 to promote private sector led geothermal development in Turkey through the removal of market barriers. The Project was implemented in cooperation with the World Bank (IBRD) and funded by the GEF. The total budget for the Project was USD 10.3 million, of which USD 10 million was provided through GEF, and USD 300 thousand was provided through funds from the Iceland/IFC Technical Assistance Trust Fund. USD 8.3 million was set aside for concessional finance, USD 1.7 million was set aside for technical assistance, and USD 300 thousand was set aside as contingency funds that could be applied to the technical assistance or concessional finance component. The Project's operations ended in June 2016.

Purpose of the evaluation

The purpose of the terminal evaluation is to assess the Project's performance in line with OECD/DAC and GEF guidelines. More specifically, the terminal evaluation elaborates on, and synthesizes the lessons learned from the Project that may help improve the selection, design, and implementation of future GEF and IFC activities.

The IFC Geofund Turkey and evaluation teams have asked us to critically evaluate lessons drawn in IFC's Project Completion Report, and map out the Project's design and intervention logic to identify factors and processes that contributed to the non-achievement of some the Project's objectives and targets.

Overview of our research methodology

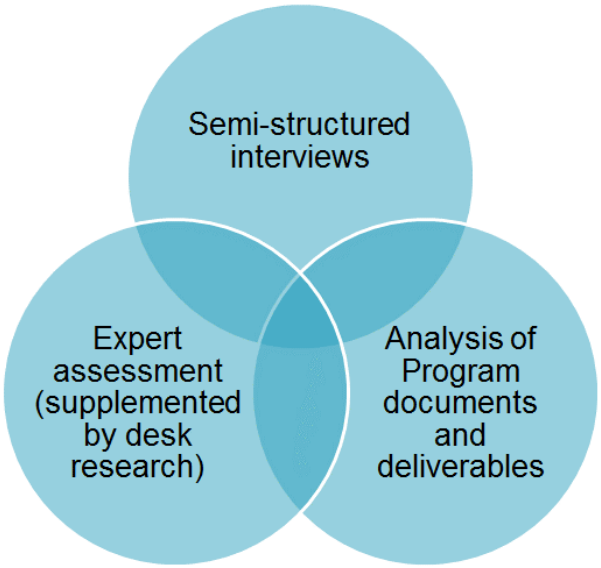
We used a theory-based evaluation approach to evaluate the Project activities. A theory-based approach uses a "theory of change" to determine whether and how interventions planned in a Project's design are likely to have contributed to results or how the interventions are likely to contribute to the achievement of expected future results.

We tested the theory of change against actual evidence using three methods:

- Semi-structured interviews with Project staff, clients and development institutions/partners
- An analysis of Project documents and deliverables, and
- Expert assessment of the evaluation team, supplemented, as necessary, by desk research. Some of the desk research will also include developing an understanding of "expert consensus", in other words, the views of other experts on, for example, the operational environment in Turkey.

We triangulated our findings using each of these methods to arrive at a set of conclusions about the Project's relevance, efficiency, effectiveness, impact, sustainability, and work quality. Figure 1.1 illustrates our approach.

Figure 1.1: Evaluation Methods



Because the Geofund Turkey Project is funded by GEF, it is our understanding that the terminal evaluation must comply with GEF evaluation guidelines. IFC and GEF both use OECD DAC criteria to evaluate projects, but use different rating scales. We have used GEF's rating scale in the evaluation.

Structure of the report

The remainder of the report is structured as follows:

- Section 2 describes our understanding of the project context;
- Section 3 contains the theory of change;
- Section 4 contains the Geofund Turkey project evaluation, using OECD/DAC criteria;
- Section 5 describes lessons and recommendations; and
- Appendices A through I provide supplementary material to support and provide context for the evaluation.

2 Understanding of the Project Context

The Geofund Turkey Project is a sub-project of the Geofund Program (designed in 2003) that was launched by IFC and IBRD in June 2007 and approved by the GEF in 2010 with an implementation budget of USD 10.3 million. The objective of the Project—similar to the Geofund Program—was to promote sustainable energy resource use and limit climate change impacts in Turkey by addressing barriers to RE and geothermal development in the country.[1]

Country context at the Project's Inception

Turkey has substantial geothermal potential – about 4,500 MW_{el} and 31,500 MW_{th} – but much of it was untapped when the Project began. Installed geothermal generation capacity was just 30 MW_{el} for electricity and 1,350 MW_{th} for thermal applications. The energy sector was not conducive to private sector investment and energy security was a challenge. From 2002 to 2007, electricity demand grew by an average of seven percent per year, outpacing supply. It was expected that electricity shortages were imminent unless investments in baseload capacity were made. Structural reforms to unbundle and liberalize the electricity sector to facilitate private sector investments and decrease contingent government liabilities were ongoing but incomplete. Retail heat and electricity tariffs were below cost and the only RE incentive available was a price floor of USD55/MWh. The Government of Turkey (GoT) had also set ambitious targets to increase RE in its 9th Development Plan (2007-2013). By 2013, 565MW_e of geothermal electricity generational capacity, 1,350MW_{th} of thermal capacity for residential district heating, 680MW_{th} for greenhouse heating, and 560MW_{th} for balneological facilities had to be developed. To support the GoT meet its RE targets, close the imminent power supply gap, and facilitate private sector investments in RE, IFC and IBRD designed and included Turkey as a sub-project under the Geofund Program.

Geothermal specific barriers in Turkey at project inception

At the Project's inception, IFC and IBRD characterized the general barriers to RE development in Turkey as: limited expertise about renewable energy among decision makers at all levels, market distorting energy polices such as below cost tariffs or subsidies for fossil fuels, and relatively high transaction costs for RE projects compared to conventional fuel projects.

On one hand, the drilling costs for geothermal development in Turkey are two to three times lower than other countries –the resource tends to be relatively close to the surface and the local market for drilling services is well developed – but other geothermal technology barriers in Turkey exist including: low to medium resource temperatures which necessitate high investment costs, exploration and operating risks, environmental risk, and limited access to financing. Because of the low to medium temperature of most geothermal resources in Turkey, capital intensive technologies for combined heat and electricity production is required. The low resource temperature may also mean higher operating cost to deal with potential scaling of pipes. Exploration risk refers to the risk that a chosen site might not have

[1] Appendix B includes an overview of the scope and rationale of the umbrella Geofund Program.

sufficient or any resources to permit development. Geothermal exploration and test drilling can take up to five years and make up 30 percent of total investment costs. When the resource development phase is included (once there is indication of a viable resource) the upfront investment cost can be to as much as 50 percent of the total investment, and the time required to complete geothermal development can take as long as six to thirteen years. Because of the uncertainty of revenue streams, developers often have difficulty attracting debt financing, meaning that most of the upfront costs must be financed with equity. The long lead times and high upfront costs dampen the return-on-equity achievable under a given offtake tariff.

Operating risk refers to risk of premature depletion of the resource. Even if sufficient resources are found at the testing stage, the life and productivity of geothermal wells is unpredictable, and premature depletion of the resource is common. In Turkey, well depletion is a concern because well maintenance technology is not consistently implemented. Geothermal development also poses unique environmental risks such as increased seismic activity, water contamination, and CO_2 emissions from electricity generation. Finally, there is limited access to long-term financing required for geothermal investments. Commercial banks are hesitant to lend because of technical and geological risks. At the Project's inception, all existing geothermal projects had been financed on the basis of collateral provided by the project developer. Banks were unaccustomed to lending to geothermal projects on a limited recourse or non-recourse basis.

The Project's original intervention strategy and evolution over time

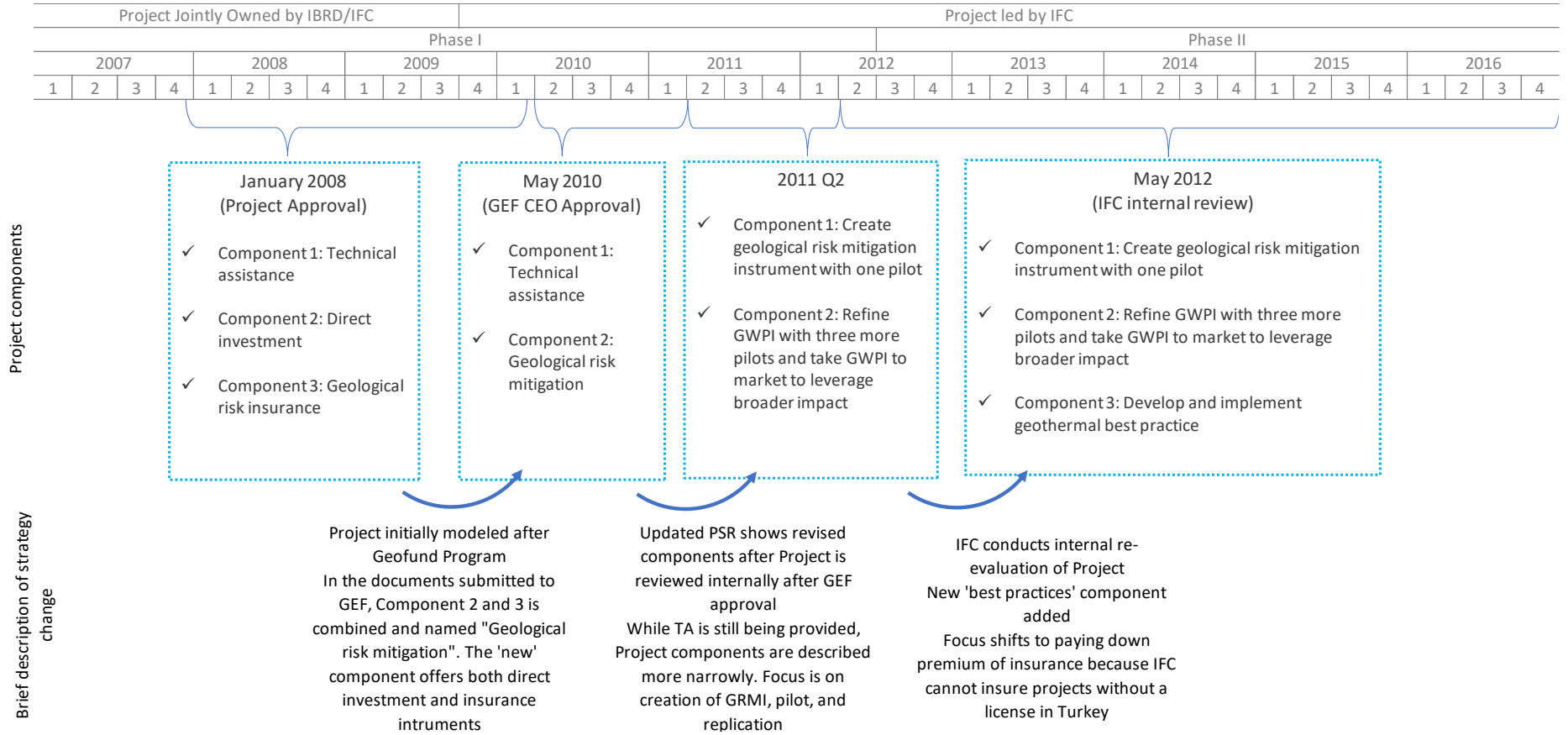
The Project aimed to remove these barriers by using three instruments (the same three instruments offered under the Geofund Program):

- **Component 1: Technical assistance.** The proposed TA to be provided under the Project included capacity building, policy reviews, and project preparation and implementation support. IFC would provide specific assistance, which included: improving resource databases; providing training to project developers and financial institutions to increase their capacity and knowledge to develop geothermal projects; conducting pre-feasibility, feasibility, due diligence; and preparing business plans for potential projects.
- **Component 2: Direct investment.** The Project proposed a direct investment funding window, to provide concessional loans, grants, and contingent grants to buy down the capital costs for geothermal drilling, reinjection wells, and post-drilling project implementation. Pilot projects with limited resources —out of date or poor resource data, limited availability of commercial financing, limited capacity of project sponsors—were priority candidates for grants or concessional financing.
- **Component 3: GRI (compensation scheme).** The Project proposed a GRI window to mitigate geothermal exploration risks (low resource yield at test site) and operations risk (early resource depletion). Projects participating in the facility would be appraised to determine key indicators of exploration/operation success such as well head temperature and flow rate. The parameters would be used to determine

the extent of success/failure of the project and associated value of compensation (up to 85 percent of allowed testing, drilling, exploration, and operations costs). Project sponsors pay a premium for the insurance product and the payout would be contingent on the occurrence of a risk event (failure to meet defined and agreed parameters from the project appraisal stage).

The Project's design, and the Project's strategy was recast and refined three times since inception in 2007. In May 2010, component 2 and 3 were combined (in the documentation submitted to the GEF CEO for approval) as a component called "Geological risk mitigation". By the second fiscal quarter in 2011, the Project's components were recast to focus on creating and piloting geothermal well productivity insurance (GWPI) (component 1), and refining and replicating GWPI in additional projects (component 2). In May 2012, after an internal re-evaluation of the Project, a third component "Develop and implement geothermal best practice" was added to the Project. The new component focused on developing best practice principles and standards for geothermal development exploration and providing advisory services and trainings to improve the quality of developers and project proposals, and increase financial institutions' know-how to appraise geothermal projects. Figure 2.1 illustrates changes in Project's strategy over its lifetime.

Figure 2.1: Changes in the Project's Strategy



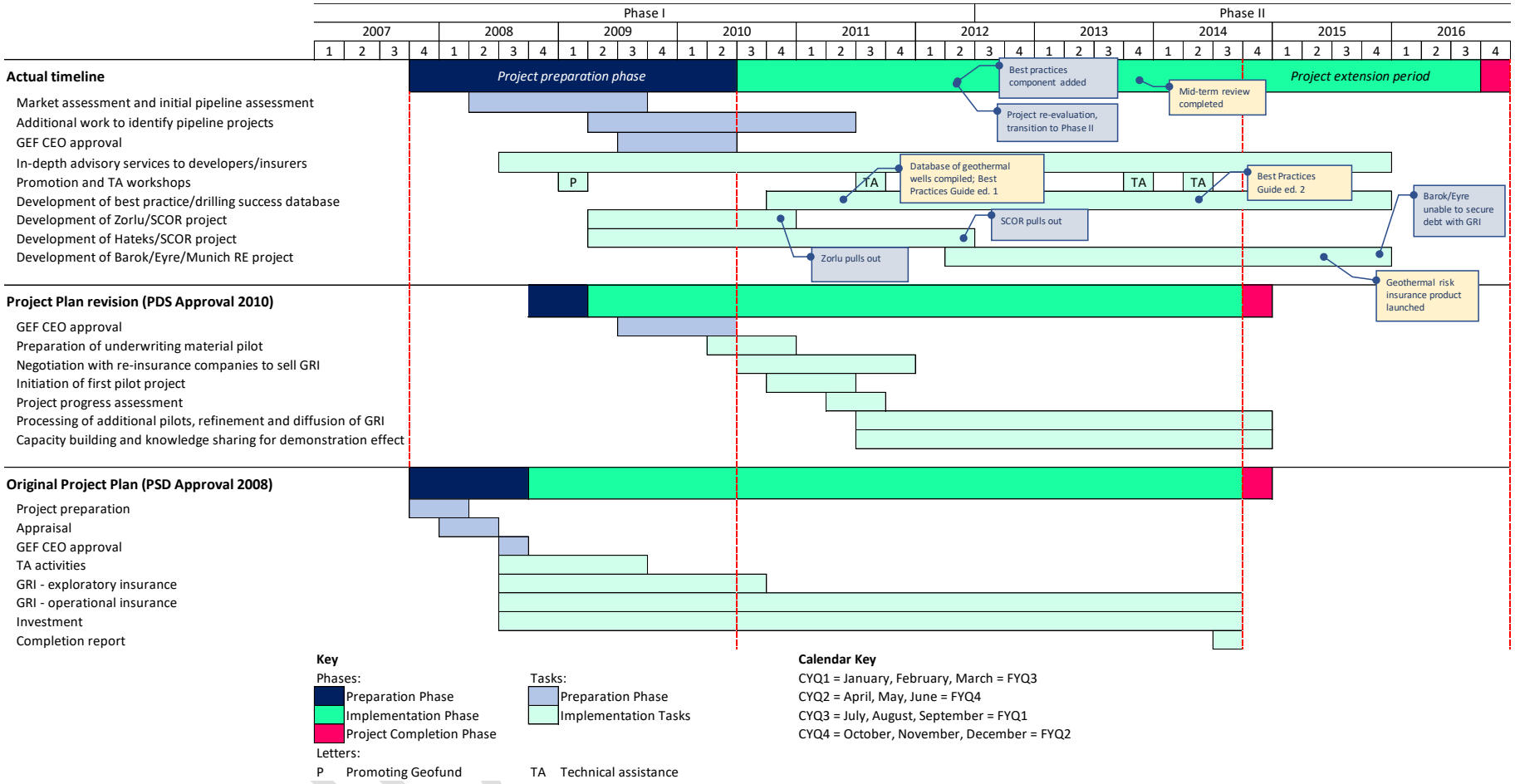
Note: The Project was originally a joint effort between IFC and IBRD, with IBRD being the lead agency. The IBRD team leader retired in July 2009 with no appointed successor and subsequently the regional Geofund Program was cancelled. The Geofund Turkey Project continued operations under IFC.

The redefined scope of the project was intended to increase capacity and know-how of project developers and financial institutions, developing a GRI and successfully piloting and replicating insured geothermal projects that the following impacts would be achieved:

- USD 420 million of direct investment and USD 600 million of indirect investment facilitated in geothermal energy;
- 451.08 thousand tons per year of greenhouse gas production avoided by directly from IFC facilitated projects, and by 644.4 thousand tons per year from projects that were indirectly facilitated through the Project; and
- An increase of 840 thousand MWh per year of energy produced from RE by from IFC facilitated projects, and by 1.2 million MWh per year from projects that were indirectly facilitated through the Project.

However, there were substantial delays and setbacks over the Project's lifetime. The Project Completion Report (PCR) concluded that direct impacts were not achieved because the GWPI was not piloted. Figure 4.1 shows the timing of the activities planned under the Project as compared to the timing of actual activities, and key milestones.

Figure 2.2: Project Plan and Key Milestones Compared to Actual Achievements



Source: Actual timeline based on Consultant's understanding of PSRs. Planned timelines from Project Approval reports.

For the purposes of the evaluation, we divided the Project into two phases: Project preparation (June 2007 to December 2010), Project implementation (January 2011 to June 2016). The Project preparation phase begins at the Project's inception in June 2007, and ends in December 2010 when the Project was approved internally by IFC. This distinction follows language in PSR FY2011 Q2 (8). In this supervision period, the Project received GEF funds and endorsement (May 2010), allowing the Project to begin implementation activities. The Project implementation phase refers to all Project activities after GEF CEO approval and subsequent IFC internal approval processes are conducted.

Project preparation phase

There were substantial delays during Project preparation, but the Project team managed to advance work on other activities, namely:

- Presenting at a geothermal conference in February 2009 to promote the Geofund Turkey project.
- Initiating a procurement process to identify potential pilot project sponsors and develop a pipeline of projects.
- Identifying two potential projects by developers Zorlu Eletrik and Hateks.
- Hiring consultants to conduct technical due diligence and draft an underwriting report for them.
- Pitching the draft insurance structure to insurers. The plan was to work with Zorlu Eletrik to pilot a project at the Kizildere site in Western Turkey.

Outputs from these Project activities are summarized in Appendix Table D.1.

According to Project data sheet approvals in 2008, the Project was supposed to begin implementation activities in 2008 Q4. Project preparation was extended to 2009 Q2 in the 2010 PSD approval report. In practice, the Project preparation phase ended in 2010 Q2 after GEF CEO approval was obtained in May 2010 (Figure 4.1). More specifically, there were delays in preparation of the market assessment and initial pipeline screening (component 1). Projects in the initial pipeline had either been completed, cancelled or were considered to be unfeasible. In 2009, IFC undertook its own procurement process to identify potential project sponsors (component 1).

Project implementation phase

After obtaining GEF CEO approval of the Project and completing IFC's own internal approval processes, project activity ramped up.[2] Substantial efforts were made to develop and pilot an insurance product. IFC initiated a rolling process to identify potential sponsors to build up a pipeline of potential projects. From 2010 to 2016, the Project team made three attempts to pilot a geothermal project that uses GRI. The first potential pilot project with Zorlu Eletrik was unsuccessful because Zorlu proceeded with drilling before IFC could secure an interested insurer (2010 Q4). The second potential pilot project was the with geothermal developer Hateks. IFC

[2] The key activities listed are not exhaustive. We are aware the IFC produced other deliverables such as a report on the emissions related to geothermal energy production and conducted outreach to industry stakeholders such as insurers, financial institutions, and developers during this phase.

managed to secure an insurer SCOR for the project, but SCOR eventually pulled out (2012 Q2). The third potential pilot project was with geothermal developer Barok/Eyre. IFC managed to secure an insurer Munich RE for the project and together pilot a geothermal risk insurance product in 2015. In 2015 Q4, after having extended the project timeline in hopes to close the deal, Barok/Eyre was still unable to secure debt using the insurance product as collateral.

The Project team had more success providing advisory services and developing geothermal exploration best practices for developers. From 2010 Q4 to 2015 Q4, the first and second editions of "Geothermal Exploration Best Practices" reports were produced. IFC worked with GeothermEx to produce the first edition of the best practices (2011 Q2), and the International Geothermal Association Services to produce a revised second edition (2014 Q4). The report was endorsed by more than ten geothermal industry associations, technical experts, and industry players. In 2011 Q2, IFC facilitated the development of the largest global database on geothermal well productivity. The database compiled information on about 70 percent of all commercial geothermal wells globally, to support estimations of drilling success. Over the course of the Project's life time, IFC provided advisory services and training for developers/insurers in the form of workshops (various workshops were conducted at two conferences during this period), review of project proposals and models for compliance with best practice principles and standards (conducting technical and integrity due diligence), and support in collection and presentation of project data to financial institutions and insurers. Outputs from these Project activities are summarized in Appendix Table D.2.

3 Theory of Change

As described in the report's introduction, we used a theory-based evaluation approach to evaluate the Project activities. A theory-based approach uses a "theory of change" to determine whether and how interventions planned in a Project's design are likely to have contributed to results or how the interventions are likely to contribute to the achievement of expected future results.

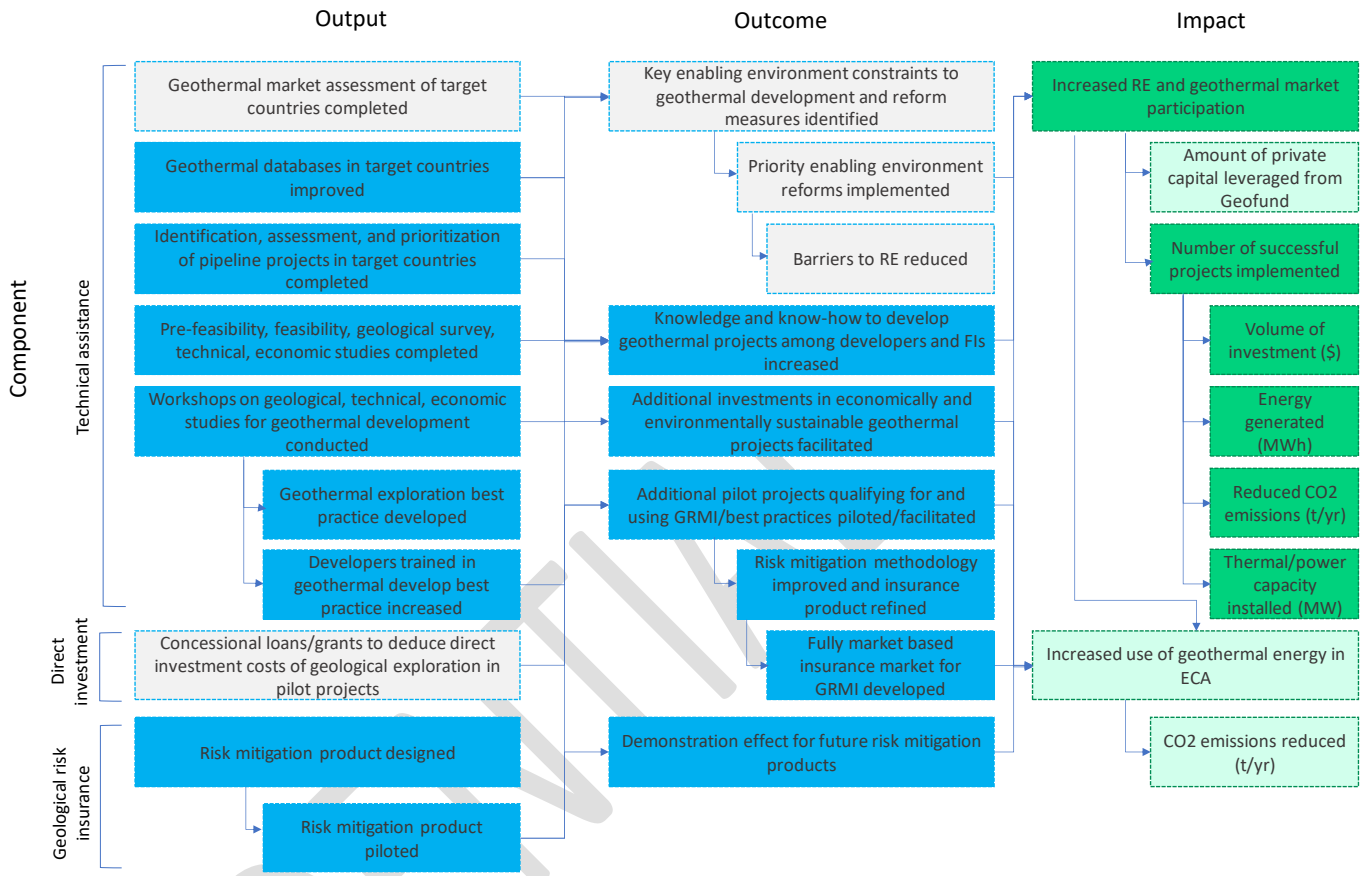
3.1 Original Theory of Change for the Project

Figure 3.1 illustrates our understanding of the intervention logic of the Geofund Program, which was the basis for the Geofund Turkey Project.[3] The outputs and expected outcomes of the Geofund Turkey Project are shown within this logframe in blue, and the expected impacts in dark green. The other outputs and outcomes, and expected impacts (in light green) were part of the logframe of the Geofund Program, but were not part of IFC's activities under the Geofund Turkey Project.

It is our understanding that IFC's interventions were to be focused in the TA and GRI windows, while IBRD would provide policy support and direct investment. The TA component of the Project's original design involved training to sector stakeholders to increase capacity to develop high quality projects through the introduction of best practices for geothermal exploration; conducting pre-feasibility and feasibility studies, due diligence, and preparing business plans for potential projects. The expected outcome (objective) of this component was to increase knowledge of how to develop geothermal projects among developers and financial institutions, and facilitate geothermal investments that are economically and environmentally sustainable. Interventions in the geological risk insurance window would involve developing and piloting a GRI product. The expected outcome of the component was to demonstrate the use of GRI in facilitating geothermal development. As the technical know-how of developers increased from IFC's sector- and firm-level training on best practices, it was expected that a pipeline of additional projects would emerge that were of high enough quality to be underwritten by insurers. This would, in turn, allow the GRI product to be replicated, refined, and eventually become a fully market-based offering.

[3] The Geofund Program's components are described in Appendix B.

Figure 3.1: IFC Interventions Within the Overall Logic of Intervention for the Geofund Program



Note: Boxes in blue and dark green are areas indicate IFC interventions within the overall logic of the Geofund Turkey Project

Strategic change in 2011

As described in Section 2, the Project's original strategy was recast in May 2010, FY 2011 Q2, and May 2012 (Figure 2.1 summarizes the key changes). Figure 3.2 illustrates our understanding of those changes in terms of the Project's logic of interventions, outcomes, and impacts.

In 2011, the Project began to focus more narrowly on creating and piloting a risk mitigation instrument (with IFC as co-underwriter), and diffusing geological risk mitigation instrument (GRMI) to the wider geothermal developer community as the means to reduce exploration and operations risk, and key barriers to geothermal development in Turkey (blue and dark blue boxes in Figure 3.2). As shown in Figure 3.2, the outputs in the Project component to diffuse GRMI to the wider geothermal developer community were contingent on the successful development and piloting of an insurance product. As part of the work to create and pilot a risk mitigation instrument, IFC also continued to provide advisory services to support project preparation and implementation. These activities were a continuation of the TA component described above and illustrated in Figure 3.1. The expected outcome of continued TA and work to develop and pilot a risk mitigation instrument was to pilot additional projects using GRI.

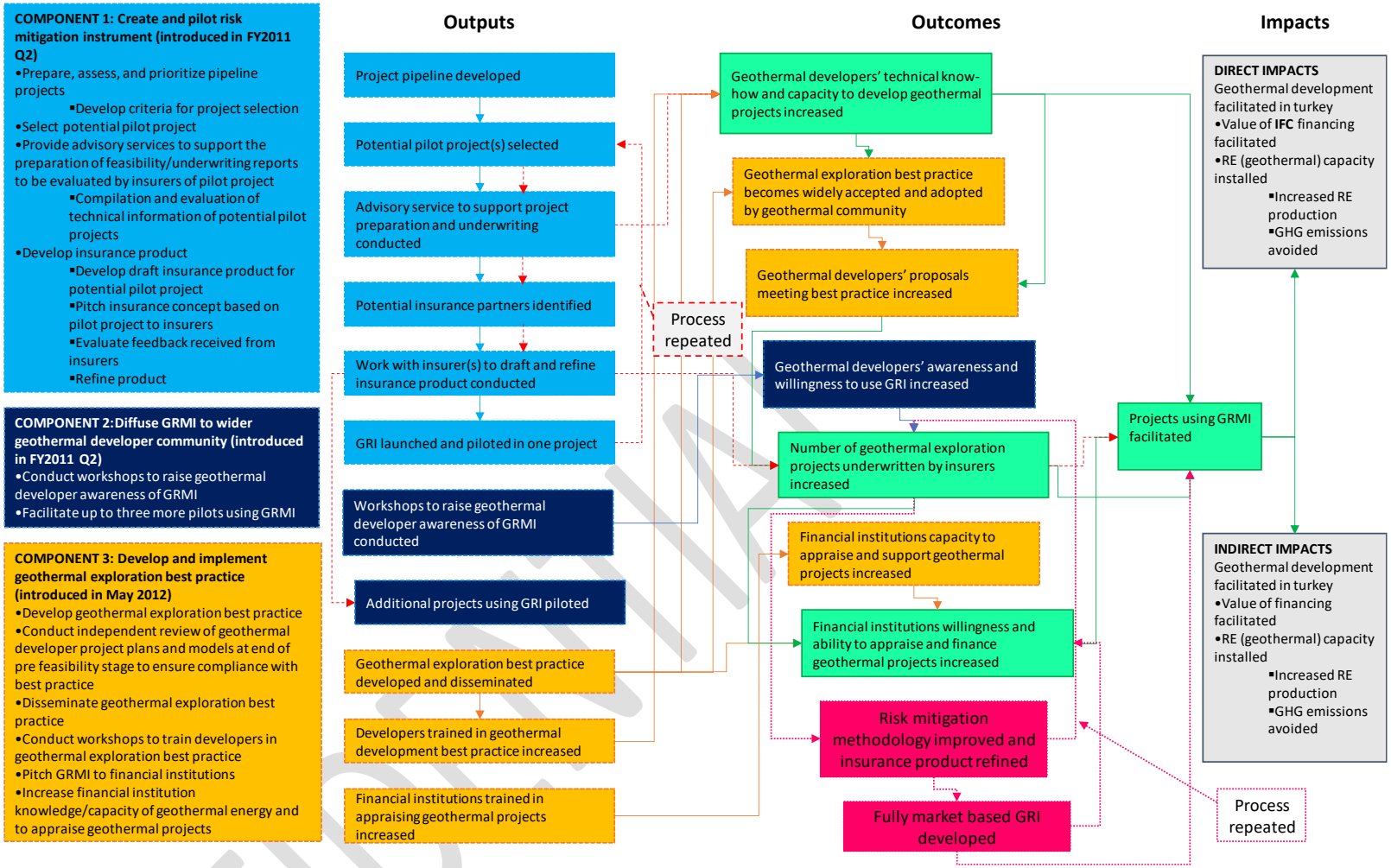
In 2012, IFC conducted an internal re-evaluation of the Project. At this stage, it was determined that IFC could not co-insure a project because it did not have an insurance license. IFC would instead buy down the premium of the GRI from an insurer. It was also decided that the Project's scope would be broadened to provide capacity building efforts at the sector-level. A third component was therefore added, to develop best practice for geothermal exploration was developed (orange boxes). The component involved developing the second edition of best practice principles and standards geothermal exploration and disseminating those best practices to the sector stakeholders through workshops.[4] The expected outcomes of the activities were to encourage the adoption of best practices by developers, thereby increasing the quality of proposed geothermal projects that could qualify for GRI.

It is our understanding that IFC's work to create, pilot, and diffuse a GRI product was intended to directly facilitate potential IFC investments (direct impacts), and also have a "demonstration effect", as potential investors and insurers see that "first movers" in the sector are willing to purchase and insure the exploration phase of geothermal developments, and so are more likely to use the risk mitigation insurance product for their projects (indirect impact).

Some of the outcomes and impacts shown in Figure 3.2 are slightly offset from one another to show that, between the results that IFC typically categorizes as "outcomes" and "impacts", there are lines of causation. For example, a fully market-based insurance product would not exist before the GRI is refined, improved and tested on many geothermal projects.

[4] A first edition of the best practices guide was developed by IFC and GeothermEx in 2010/2011 (reported in PSR FY2011 Q4).

Figure 3.2: IFC's Logic of Intervention for the Geofund Turkey Project



Note: The green boxes indicate outcomes and impacts that can result of various activities (multiple pathways).

3.2 Reorienting the Analytical Approach of the Project's Theory of Change

As described in section 2, the Project's strategic approach changed between 2008 and 2012. As a result, its components (Figure 3.2), which stabilized in 2012, reflect phasing and shifts in the overall strategy but obscure distinct interventions taken to address barriers to geothermal development in Turkey. After discussions with IFC, it was decided that it would be clearer and more useful to develop and analyze the project's theory of change by stakeholder group rather than by component. Table 3.1 shows the Project's expected results by stakeholder group. In section 4, we use this approach to answer the evaluation questions.

Table 3.1: Project's Expected Results by Stakeholder Group

Stakeholder	Outputs	Immediate outcome	Intermediate outcome	Impacts
Developers	**Firm-level:** ▪ Project pipeline developed ▪ Potential project sponsors (pilot projects) selected ▪ Advisory services to support project preparation and underwriting conducted ▪ Up to four projects using GRI piloted **Sector-level:** ▪ Workshops to raise geothermal developer awareness of GRI conducted ▪ Exploration best practice standards and principles developed ▪ Geothermal developers trained in exploration best practice	▪ Technical know-how and capacity to develop geothermal projects increased ▪ Geothermal exploration best practice becomes widely accepted and adopted ▪ Project proposals meeting best practice increased ▪ Awareness and willingness to use GRI increased	Geothermal development projects using GRI facilitated	**Direct impacts:** Geothermal development facilitated in Turkey ▪ Value of **IFC** financing facilitated ▪ RE (geothermal) capacity installed – Increased RE production – Greenhouse gas (GHG) emissions avoided **Indirect impacts:** Geothermal development facilitated in Turkey ▪ Value of financing facilitated ▪ RE (geothermal) capacity installed – Increased RE production – GHG emissions avoided
Insurers	▪ Potential insurance partners identified ▪ Work with insurer(s) to draft and refine insurance product conducted ▪ Insurance product launched ▪ Insurance product offered to potential pilot projects	▪ Number of geothermal exploration projects underwritten increased ▪ Risk mitigation methodology improved and GRI refined ▪ Fully market-based GRI developed		
Financial institutions	▪ Financial institutions trained in appraising geothermal projects (firm-level) **Sector-level:** ▪ Workshops to raise financial institutions' awareness of GRI conducted ▪ Trainings/workshops to raise financial institutions' knowledge on financing early stage geothermal development conducted	▪ Capacity to appraise and support geothermal projects increased (firm-level) ▪ Willingness and ability of financial institutions to appraise and finance geothermal projects increased (sector-level)		

4 Geofund Turkey Project Evaluation by OECD/DAC Criteria

Section 4 evaluates the Geofund Turkey Project against OECD/DAC criteria. The questions included in our Terms of Reference (ToR) are used to frame the narrative. We have, in some cases moved questions (or parts of questions) to better correspond with the DAC criteria.

4.1 Relevance: Moderately Satisfactory

The Project's design was well aligned with IFC and World Bank's high-level strategic commitments to climate change, but more tenuously aligned with the World Bank's country partnership strategies in 2007 (the year of the Project start) and 2016 (the year of the Project end). The Project's interventions were relevant to removing the key barriers preventing scale up of geothermal power projects in Turkey, and largely successful at securing client buy-in and contributions. IFC also made efforts to adjust the Project design to make it more relevant to market needs, by introducing the geothermal exploration best practices component in 2012.

The sequencing of project activities, in the original project design, detracted somewhat from the project's relevance because it failed to include early outreach to banks who might finance geothermal projects. Attempts to engage financial institutions were largely undertaken late in the Project in 2014, after IFC had identified three potential pilot projects, developed a draft insurance policy, and found a reinsurance provider that was willing to offer the product.

4.1.1 To what extent were the design and implementation of the Project relevant to and aligned with the priorities, policies/strategies of IFC and the World Bank in Turkey?

The Project's design and activities were well aligned with the high-level policies and strategies of the World Bank Group and the GEF-3 operational Program Six, but less closely aligned to the World Bank's country partnership strategies.

Alignment with IFC and World Bank Group organizational level strategies

The Project was well aligned with IFC's and the World Bank's high-level strategic commitments. The Project's focus on geothermal energy development is in line with IFC's Climate Change Strategy (2008), which includes mobilizing donor financing to commercialize innovative, clean energy investments. The Project also contributes to the World Bank's Renewable Energy and Energy Efficiency Action Plan (2004) target, which sets a 20 percent annual increase in RE and EE commitments from 2005 to 2009.

Alignment with GEF operational program

The Project was also well aligned with GEF-3 operational Program Six, which focuses on promoting the adoption of RE by removing barriers and reducing implementation costs. The Geofund Turkey Project targeted several interrelated barriers to geothermal development. By developing and piloting GRI, the Project aimed to remove financing and market barriers to geothermal energy. Because GRI targeted the riskiest stage of geothermal development, it could increase the likelihood that a developer secures financing for the exploration phase of a project. The Project design

was also modified over time to make it more relevant. The Project had a capacity building component to provide advisory services to project developers since its inception. In 2012, the capacity building component was expanded to include sector-level activities: developing best practice standards and principles for geothermal exploration, compiling a global database on well success rates, and conducting workshops to disseminate the materials. The capacity building was aimed at increasing the likelihood that a project qualified for insurance or financing. The database on well success rates was aimed specifically at informing the risk pricing models used by insurers to calculate a premium for a project.

Alignment with World bank country partnership strategies

The Project was loosely aligned with the World Bank's Country Partnership Strategy from 2004 to 2006. During the 2004-2006 period, the World Bank planned to support private sector involvement in RE power generation as part of fostering an "attractive business climate and knowledge". The Geofund Turkey Project aimed to support the deployment of geothermal heat and power generation through investments and the removal of market barriers and knowledge barriers.

The Project was more directly aligned with the World Bank's Country Partnership Strategy (CPS) for 2008 to 2011. During the 2008 to 2011 period, the World Bank developed its CPS around Turkey's Ninth Development Plan and planned to support the Turkish government in improving the country's competitiveness and employment opportunities. As part of this area of focus, the World Bank planned to support projects that improved the security, reliability, and efficiency of Turkey's energy supply by emphasizing RE development. The Geofund Turkey Project follows that line of reasoning as it focuses on facilitating geothermal development.

The World Bank's CPS for 2012 to 2015 similarly emphasized an improved supply of reliable and efficient energy along with an increase in the use of RE and climate actions (as a part of Strategic Objective 3: deepened sustainable development). The Geofund Turkey Project is likewise aligned with this strategy in its facilitation of geothermal development.

Appendix Table D.1in Appendix D shows statements in IFC, World Bank, and GEF Strategies that support the Project's relevance.

4.1.2 To what extent were the interventions undertaken under the Project relevant to the country's context (at the time of the evaluation and at the time the Project was being developed)?

The Project was relevant to the context in Turkey at the time it was designed and is relevant at the time of this evaluation. The Project's planned and actual interventions were in line with the Turkish Government's policy objectives for the energy sector and the market context, and were relevant to addressing barriers to capacity, access to finance, and technology in geothermal development.

Relevance of Project objectives to GoT priorities and the market context in 2007

The Project's objectives in 2007—to promote geothermal development through the removal of barriers—were well aligned with the Turkish Government's targets in its 9th Development Plan (2007-2013). The 9th Development Plan aimed to develop, by 2013, 565MW$_e$ of geothermal electricity generational capacity, 1,350MW$_{th}$ for

residential district heating, 680MW$_{th}$ for greenhouse heating, and 560MW$_{th}$ for balneological facilities. In 2007, there were 30MW of installed geothermal power capacity, only 3 percent of the total available economic potential (1000MW).[5] Table 4.1 shows the barriers to geothermal development that the Project planned to address.

Table 4.1: Comparison of Barriers to Geothermal Development in Turkey and the Geofund's Planned Interventions

Barrier	Planned interventions
Limited access to financing	▪ Train financial institutions in appraising geothermal projects (firm-level) ▪ Conduct workshops to raise financial institutions awareness/knowledge on early stage financing for geothermal development, including GRI ▪ Demonstrate the effectiveness of GRI as suitable instrument to de-risk geothermal resource development and facilitate funds raising
Low quality of project proposals and technical capacity of project developers	▪ Provide advisory services to support project preparation (review project plans and models; collate and present data to financial institutions) ▪ Train and increase awareness of project developers on geothermal exploration best practice standards and principles
High exploration risks in geothermal development	▪ Develop and pilot GRI ▪ Compile a global geothermal well database ▪ Prepare a report on factors contributing to drilling success

The Project's interventions were also relevant and timely given the electricity market conditions in Turkey in 2007. When the Project was developed, electricity demand in Turkey was growing rapidly, at about seven percent per year, outpacing investments in generation. Investments in baseload generation were needed to avoid energy supply shortages that were expected to emerge by 2008 or 2009. At the same time, substantial institutional, legal, and regulatory reforms were taking place as the energy sector was unbundled and liberalized. The GoT passed the RE Law in 2005, which established a price floor of USD 55/MWh for power purchases from RE projects. In 2007, the Law on Geothermal Sources and Mineral Waters was passed, facilitating the concession of potential geothermal sites to the private sector, and establishing procedures which would allow developers to explore and develop new sites. Given the GoT's commitments to geothermal, the improvements to the regulatory environment for RE, and the dearth of geothermal plants in 2007, the Project design was clearly relevant.

[5] ESMAP, "Turkey's Energy Transition: Milestones and Challenges". 2015.

Relevance of Project interventions to the current country context (2017)

The Project's objective to promote sustainable energy resource use and limit climate change impacts in Turkey—through the removal of geothermal development barriers—continues to be relevant and in line with the GoT's energy policy. Turkey is highly dependent on imported fossil fuels. This dependence has an impact on Turkey's energy security, and on its current account balance, which can affect the value of its currency and it ability to meet public debt obligations. Recognizing this dependence, the Government in its National Climate Change Action Plan (2011-2023) plans to increase the utilization of RE in electricity generation. In its Strategic Plan (2015-2019) and National RE Action Plan (2015) Government plans to increase RE to 30 percent of electricity generation, geothermal electricity generation capacity to 1000MW; and to build two regional heating systems based on geothermal energy by 2023.

The continued relevance of the Project design is supported by the fact that European Bank for Reconstruction and Development (EBRD) and the World Bank have recently initiated projects that address the same key barriers to geothermal development in Turkey. Table 4.2 compares the planned interventions of the EBRD Early Stage Geothermal Support Framework (PLUTO) initiative and the World Bank's Turkey Geothermal Development Project.

Table 4.2: Comparison of Barriers to Geothermal Development and Interventions of the Geofund and Comparable Programs

Barrier	Planned interventions	EBRD PLUTO Initiative	World Bank (WB) Turkey geothermal development project
Limited access to financing	▪ Train financial institutions in appraising geothermal projects (firm-level) ▪ Conduct workshops to raise financial institutions awareness/knowledge on early stage financing for geothermal development, including GRI ▪ Demonstrate the effectiveness of GRI as suitable instrument to de-risk geothermal resource development and	▪ Provide direct financing to large projects ▪ Offer syndicated loans and co-financing	▪ Set up a resource development loan facility to finance resource and plant development stages ▪ Provide training and support to TKB to manage the risk sharing mechanism (evaluation of applications, negotiating contracts, monitoring drilling progress, verifying drilling and well testing results)

	facilitate funds raising		▪ Provide training to TKB and TSKB to
Low quality of project proposals and technical capacity of project developers	▪ Provide advisory services to support project preparation (review project plans and models; collate and present data to financial institutions) ▪ Train and increase awareness of project developers on geothermal exploration best practice standards and principles	Provide advisory services to support project development and environmental assessments	
High exploration risks to geothermal development	Develop and pilot GRI	Provide concessional finance from the Climate Technology Funds to support early stage geothermal development	Establish a risk sharing mechanism for resource validation

4.1.3 To what extent did the Project respond adequately to changes in the macroeconomic and market context that occurred over the course of its implementation?

The macroeconomic environment in Turkey was stable and conducive to the Project's objectives throughout the implementation period, except in 2015 and early 2016, because of spillover effects from geopolitical instability in the region and two general elections, one in June and November 2015 (the first election resulted in a hung parliament).

Changes in the macroeconomic context

There were few changes in the macroeconomic context to which IFC had to respond. The Turkish economy bounced back quickly from the global economic crisis of 2009, registering negative growth in only one year. In 2010, the Turkish economy grew by about 8 percent, and has been able to maintain positive, albeit declining growth since. There was only one instance in which IFC recorded disturbance in the macroeconomic context. IFC recorded in PSR 17_Q2 that political uncertainty prior to the general elections in November 2015 slowed down local banks' decision-making on whether to

provide financing to Eyre's project, using the GRI as collateral. After the elections, negotiations continued, but Eyre was unable to secure financing by the time the Project ended in February 2016.

Factors besides political uncertainly could have impacted Eyre's ability to secure financing using GRI. IFC has noted in the PCR that because developers were not able to convince financial institutions to accept GRI as collateral, it should have sought banks' buy-in earlier in the Project. We assess IFC's internal thinking that banks should have been involved from the project's inception in greater detail in section 5.1.2.

Changes in the market context

Turkey made dramatic institutional and legal reforms in the power sector during the years of the Project. By early 2009, a wholesale electricity market had been established and retail tariffs had been brought to cost-recovery levels. By 2013, all regional distribution companies had been privatized. Important laws and regulations supporting RE development were also put in place during this period. Including priority dispatch for RE technologies (2010), technology specific feed-in tariffs and local production premiums (2010), a RE price support pool (2010), and the removal of licensing requirements for small generators under 1MW (2013).

IFC recognized that, despite these improvements, substantial barriers to geothermal remained. IFC realized that there was, in particular, a knowledge and capacity gap among developers, as well as differing expectations between developers and investors on how project proposals were prepared and the information included. IFC responded by expanding the scope of the exploration best practices report initially prepared in 2010. IFC also developed a global database on geothermal well productivity and a report which analyzes the factors affecting well productivity. Such a database was potentially useful for project developers but also in actuarial analysis for potential insurers of brownfield projects.

4.1.4 To what extent was the Project's design appropriate to meet its objectives and expected results in terms of the selection and sequencing of activities/components?[6]

The selection of activities, as planned, was largely appropriate to meet the Project's objectives, but the sequencing of activities could have been improved.

Selection of Project activities

The Project's activities were largely appropriate to meet its objectives. IFC's combination of firm- and sector-level interventions were well designed to address information, capacity, and exploration risk barriers that impede geothermal development in Turkey. The planned activities included:

- Providing advisory services at the firm-level to developers to ensure project proposals met exploration best practice, and developing and raising

[6] This question has been unbundled from the original question: "To what extent was the Project's design appropriate to meeting its objectives and expected results in terms of i) the selection and sequencing of activities/components, ii) funding, iii) time frame, and iv) human resources?". The other components of the question are addressed in section 4.3.2, under efficiency.

awareness of geothermal exploration best practice standards and principles at the sector-level;

- Working with insurers to develop and launch a GRI product;
- Training financial institutions to appraise geothermal projects and understand early stage financing for geothermal projects; and
- Developing a well productivity database to support actuarial analysis and contribute to increased understanding in the geothermal community of the factors impacting drilling success.

Sequencing of Project activities

The sequencing of Project activities could have been better planned. The original Project design did not foresee engagement with financial institutions until 2012, plans which largely did not come to fruition because banks were not willing to pay for IFC's advisory services and workshops on financing early stage geothermal development. More importantly, the market assessment conducted in 2008—which could have guided the Project's subsequent interventions—did not sufficiently identify gaps in the investment climate for geothermal exploration. The market assessment acknowledged access to finance as a bottleneck to geothermal development but did not recommend any measures to address it, or to test the hypothesis that GRI would be a sufficient and acceptable de-risking mechanism. The assessment simply suggested that GRI could contribute to reducing the financing barrier. A second market mapping exercise conducted in 2010 included interviews with local banks to assess their interest in financing geothermal projects. From the interviews, local banks expressed that they were most concerned about sponsor and resource risk, and would be interested in financing arrangements, including GRI that could help increase their willingness to invest in geothermal projects. However, the market mapping exercise did not identify further steps in involve financial institutions and did not result in IFC engagement at the time. IFC noted in the PCR that if financial institutions had been engaged at an earlier stage, it is conceivable that the GRI developed would enable developer to secure financing for early stage geothermal development (ultimately the missing key to piloting the Eyre-Munich RE pilot project). We feel that it is difficult to predict how the Project's design or outcomes could have changed if IFC had engaged financial institutions sooner, but because financing was identified as a key barrier to early stage geothermal development, financial institutions should have been thoroughly consulted from the Project's inception.

4.1.5 Have potential synergies between Geofund Turkey and other related E&RE projects both in the country of implementation and in the Europe and Central Asia (ECA) region, whether ongoing or completed, been optimized?

Synergies between Geofund Turkey and other E&RE projects were identified but not optimized. At the Project's inception, the Project team intended to coordinate closely with the World Bank's Turkey RE Project, which aimed to support private sector investments in power generation from renewable sources. To prevent overlap and maximize the uptake of geothermal in Turkey, IFC (in its 2008 approval plan) said it might focus more on multi-purpose or direct use (heating) geothermal projects, and work with private sector sponsors. However, interviews revealed that IFC ended up focusing largely on developing geothermal power generation projects. This is, in part

because the legal and regulatory framework in the power sector was more conducive to private sector participation, unlike district heating, which is municipality owned and operated, and end-user tariffs are below cost recovery levels. Early in the project (2009), IFC/IBRD received a project proposal from Izmir municipality to drill additional reinjection wells to support the expansion of the district heating network. However, the project was not taken up by IFC because it requested for a contingent grant; IFC wanted to focus on projects that were interested in GRI.

Interviews with other donor partners indicated that there were also potential synergies between Geofund Turkey and recent donor projects such as EBRD's PLUTO initiative and the World Bank's Geothermal Development Program, but misalignment of the Projects' respective timelines meant that attempts at collaboration were unsuccessful. According to the PSRs, and an interview with a development partner, IFC staff tried to jointly develop a workshop for financial institutions with EBRD and the World Bank, but were unsuccessful because the Geofund Turkey Project was nearing its end, while EBRD and the World Bank's projects were only in the preparation phase.

4.2 Effectiveness: Moderately Unsatisfactory

The Project delivered roughly two-thirds of its planned outputs, and managed to achieve some of its planned outcomes:

- It delivered all its planned sector-level outputs and most of the firm-level outputs, except the piloting of geothermal projects using GRI
- It achieved two of its six outcome targets.
  - The outcome indicators for component 1 were intended to record whether an insurance product was launched, and the number of pilot projects using GRI that were facilitated. IFC achieved one of two outcomes under component 1 because an insurance product was launched in 2015, but not piloted.
  - The outcome indicator for component 2 was intended to record the number of projects indirectly facilitated by IFC using the GRI that was developed. No outcome achievements were recorded for component 2, which is contingent upon one project piloting GRI.
  - The outcome indicators for component 3 were intended to record whether geothermal best practices were developed and implemented, and the number of due diligence reports accepted by IFC clients. IFC recorded another outcome achievement under component 3 because the exploration best practices guide was developed and disseminated, and technical due diligence reports for Hateks, Kayi, Transmark and Zorlu projects were accepted by the clients.

The Project achieved the most results in its work targeting geothermal developers and insurers, and fewer results in its work targeting financial institutions. Whereas the Project did not achieve its intended outcomes under component 2 (piloting a project using GRI), IFC's experience informed newer donor projects in Turkey—such as EBRD's PLUTO initiative and WB's Geothermal Development Program—in their thinking about

alternative financing arrangements to support the geothermal sector in Turkey. Because no outcomes were achieved under component 2, impacts were also not realized for the Project.

4.2.1 What were the expected outputs of Geofund Turkey? To what extent were these delivered with satisfactory quality?

The Project met 10 of its 16 output targets (62.5 percent); meeting or surpassing all of its target outputs under component 1, one of its five target outputs under component 2, and six out of its eight target outputs under component 3. Table 4.3 summarizes the Project's output indicators, targets, and results. A complete list and description of the Project's outputs are summarized in Appendix D.

Table 4.3: Summary of Overall Project Output Targets by Component

Outputs

Component	Indicator	Target	Result	Achievement
Create and pilot risk mitigation instrument (Component 1)	Number of reports (assessments, surveys, manuals, Phase I/strategic option reports) completed	4*	6	150%
	Number of entities receiving advisory services	6*	8	133%
	Number new financial products designed	1	1	100%
Diffuse GRMI to wider geothermal developer community (Component 2)	Number of participants in workshops, training events, seminars, conferences, etc.	190*	180	95%
	Number of workshops, training events, seminars, conferences, etc.	3*	2	67%
	Number of participants providing feedback on satisfaction	50*	18	36%
	Number of participants reporting satisfied or very satisfied with workshops, training, seminars, conferences, etc.	28*	15	54%
	Number of entities receiving advisory services	8	12	150%
Develop and implement geothermal exploration best practice (Component 3)	Number of reports (assessments, surveys, manuals, Phase I/strategic option reports) completed	6	7	117%
	Number of entities receiving advisory services	8	50	625%
	Number of entities receiving in-depth advisory services	7	5	71%

Number of workshops, training events, seminars, conferences, etc.	5	3	60%
Number of participants in workshops, training events, seminars, conferences, etc.	60	112	187%
Number of participants providing feedback on satisfaction	32	55	172%
Number of participants reporting satisfied or very satisfied with workshops, training, seminars, conferences, etc.	21	50	238%
Number of procedures/firm-level policies/practices/standards recommended for improvement or elimination	1	1	100%

Note: *Target revised from original value

As described in section 3.2, it was agreed with IFC that it would be more useful to use an adapted theory of change for the Project because the original theory of change obscures distinct interventions taken by IFC to address barriers to geothermal development in Turkey. Table 4.4 shows the Project's planned outputs organized by stakeholder group. We use this organization to evaluate the Project's output achievements

Table 4.4: Planned Outputs of the Project by Stakeholder Group

Stakeholder	Outputs
Developers	**Firm-level:** ▪ Project pipeline developed ▪ Potential project sponsors (pilot projects) selected ▪ Advisory services to support project preparation and underwriting conducted ▪ Up to four projects using GRI piloted **Sector-level:** ▪ Workshops to raise geothermal developer awareness of GRI conducted ▪ Exploration best practice standards and principles developed ▪ Geothermal developers trained in exploration best practice
Insurers	▪ Potential insurance partners identified ▪ Work with insurer(s) to draft and refine insurance product conducted ▪ Insurance product launched ▪ Insurance product offered to potential pilot projects
Financial institutions	▪ Financial institutions trained in appraising geothermal projects (firm-level) **Sector-level:** ▪ Workshops to raise financial institutions' awareness of GRI conducted ▪ Trainings/workshops to raise financial institutions' knowledge on financing early stage geothermal development conducted

Assessment of outputs relevant to developers

IFC delivered all its planned sector-level outputs and most of the firm-level outputs, except the piloting of geothermal projects using GRI. Our evaluation of the Project's output results targeted at developers by planned output are summarized in Table 4.5 (firm-level work) and Table 4.6 (sector-level work). Box 4.1 provides a detailed summary of the feedback received from some of the key outputs targeted at developers.

Table 4.5: Output Results from Activities Targeted at Project Developers (Firm-Level)

Planed output	Results	Our assessment
Project pipeline developed	▪ In 2009, a market assessment was conducted to evaluate the project pipeline developed by IBRD. Projects were found to have been completed, abandoned, or based on incorrect assumptions. ▪ In 2009, IFC issued a Request for Proposal (RFP) for companies to participate in the Geofund Project and received seven proposals, of which four were selected as potential pilot projects ▪ In 2010, IFC hired SAM GmbH to conduct a market study on Turkey geothermal sector. The brief identified potential developers, challenges and opportunities in the sector, and overview of local banks' experience in the RE space. ▪ In 2011, IFC issued a Request for Expressions of Interest (REOI) for companies to participate in the Geofund Project on a rolling basis	**Delivered and to moderately satisfactory level of quality** IFC took efforts to ensure a project pipeline was available for the duration of the Project including conducting two market assessment/mapping activities and initiating two RFP processes. The quality of the first market assessment was deemed inadequate so IFC hired another external consultant in 2010 to conduct a follow on market mapping exercise. The first market assessment also reassessed an initial pipeline of projects that IBRD developed. The projects were found to be unsuitable and IFC quickly initiated an RFP for project sponsors. To ensure that the pipeline did not dry up, IFC initiated a rolling Expression of Interest (EOI) process to identify additional potential project sponsors in 2011. IFC also used feedback forms at its workshops to identify developers that might be interested in the Project (sector-level work).
Potential project sponsors (pilot projects) selected	▪ IFC hired external consultants in 2010 to evaluate project proposals from the 2009 RFP process ▪ Four potential pilot projects were selected from the 2009 RFP process ▪ Additional projects from the developers Transmark, Kayi, and Eyre were identified from 2011 onwards	**Delivered and to satisfactory level of quality** IFC systematically identified potential project sponsors from the project pipeline. It then developed and initiated discussions with developers to pitch the insurance product and advisory services so as to secure mandate letters.
Advisory services to support project preparation and underwriting conducted	▪ IFC prepared "developer reports" for Eyre and Derin Jeotermal ▪ IFC conducted due diligence for Zorlu, Kayi, Hateks, Transmark, and Eyre projects ▪ IFC supported in underwriting insurance term sheets for Zorlu, Hateks, and Eyre projects	**Delivered and to a moderately satisfactory level of quality** When IFC received project proposals from potential developers it worked to obtain signed mandate letters so that AS could be provided. First, IFC conducted integrity due diligence to ensure there were no potential political conflicts of interest that could rise from working with the developer. If the developer passed the integrity due diligence, IFC would ask GeothermEx to conduct a technical due diligence of the project to

		assess it quality for GRI. We were only able to interview two developers for the evaluation, both of whom expressed that they were greatly satisfied with IFC's work quality. We note that developers interviewed during the Project's Mid-term Review (MTR) were dissatisfied with IFC's work quality. The developers interviewed as part of the MTR felt that IFC's approach was "slow and bureaucratic", and there was a sense of disappointment that even in 2013, no insurance product had been launched.
Up to four projects using GRI piloted	No projects using GRI were piloted	**Unsatisfactory** IFC was able to facilitate a deal between an insurer and developer in 2015 but the developer was still unable to obtain financing for the project by the Project's close.

Table 4.6: Output Results from Activities Targeted at Project Developers (Sector-Level)

Planed output	Results	Our assessment
Workshops to raise geothermal developer awareness of GRI conducted	IFC conducted informational workshops in 2009 and 2011 to inform developers (and more widely the geothermal community) about geothermal risks, evaluating drilling success and the benefits of GRI.	**Delivered and to a level of satisfactory quality** ▪ No feedback was sought in the 2009 workshop/conference, but the number of participants (150) was recorded in the project results framework. ▪ Participant feedback from the 2011 workshop revealed that most participants were satisfied or very satisfied with the sessions. In addition, 53 percent of the participants indicated that they would like IFC to follow up with them (see Box 4.1)
Exploration best practice standards and principles developed	▪ IFC developed two editions of a guide to best practices in geothermal exploration. ▪ A workshop was conducted in 2013 to launch the best practices guide	**Delivered and to a level of satisfactory quality** ▪ IFC prepared the 1st edition of the exploration best practices, to guide project evaluation and developers. When it became evident that there was a substantial divide between what investors and developers expected in a project proposal, IFC repurposed the guide to capture international practice in geothermal exploration and set up common ground for the methods of analysis and presentation of project proposals. The guide was peer reviewed and received endorsements from several national geothermal associations (see Box 4.1) ▪ IFC then conducted a workshop to launch the guide. The workshop had 70 participants representing various stakeholders, of which 30 provided feedback.

		86 percent of the feedback survey respondents were satisfied or very satisfied with the event.
Geothermal developers trained in exploration best practice	A two-day workshop and field trip was conducted in 2013 on various geothermal exploration techniques.	**Delivered and to a level of satisfactory quality** The workshop sessions lasted two days covering a wide variety of exploration techniques. There were 31 participants in the workshop, of which 24 provided feedback. 23 out of the 24 participants that provided feedback gave the workshop a rating between 3 to 4 (4 being the highest rating).

Box 4.1: Summary of Feedback IFC Received for Outputs Targeted at Developers

2011 Geothermal Workshop

The geothermal workshop covered topics on geothermal risk, evaluating success of geothermal drilling, and the requirements and benefits of IFC's insurance product. There were 30 workshop participants, representing stakeholders in Turkey's geothermal sector including developers, banks, and potential investors. Most participants were satisfied or very satisfied with the workshop sessions. The key learnings from the workshop participants included an increased understanding of IFC's proposed insurance scheme, drilling success rates and data, and IFC funding conditions for geothermal projects. In addition, 53 percent (16 out of 20 survey respondents) of workshop participants indicated that they would welcome IFC follow up on potential business development opportunities.

2013 Best Practices Launch Workshop

The Best Practice Launch presented an overview of geothermal best practices and application, explained best practice methodology for conducting geology, geochemistry, and geophysics research and conceptual modeling, and introduced financers and investors to geothermal projects to provide an insight into geothermal specific risk, assist in identifying high quality projects, and how finance may be structured to mitigate project risks. There were more than 70 event participants representing various stakeholders in Turkey's geothermal sector including developers, contractors, financial institutions, and insurance companies. Of the 30 participants that provided feedback, most were satisfied with the launch event. The key learnings from the workshop participants included an increased understanding of project financing, geothermal markets, exploration, drilling, and international sector views.

2013 Developer Workshop

The developer workshop lasted two days. Day one sessions covered topics on geological plays, characteristics of geothermal reservoirs in Turkey, Borehole geomechanics and well design, and drilling technologies. Day two sessions covered topics on seismic methods, resistivity surveying and electromagnetic methods, water-rock interaction, alteration minerals and mineral geothermometry, and isotope and gas geochemistry of geothermal solutions. There were 31 participants on day one, participants on day two, and 12 field trip participants, representing developers, service providers, investors, and academia. Twenty-four participants who provided feedback were satisfied or very satisfied with the workshop sessions but want more discussion on topics such as the various effects of temperature on drilling equipment and mud composition and information on how geological characteristics should inform exploration strategy.

Exploration Best Practice Guide

The Geothermal Best Practice Guide shares information on geothermal play types, the process of geothermal development, data collection and exploration methods, strategies for exploration of different plays, and an example table of contents in a model pre-feasibility study. According to the PCR, the guide received more than ten endorsements from local and international geothermal associations, technical consultancies, and key industry players. The characteristics that they endorsed included the familiar writing style and relevance of the skills discussed for both the present and the future. The Guide also provides assistance to address early-stage risks while maintaining project quality and cost effectiveness, as well as tools and techniques to define a resource. In our review of correspondences with endorsers, one indicated they were willing to support further revisions of the document to cover all geological settings and environments.

Assessment of outputs achieved relevant to insurers

The Project delivered on most of its planned outputs targeted at insurers. The Project's output results aimed at insurers are summarized in Table 4.7.

Table 4.7: Output Results from Activities Targeted at Insurers (Firm-Level)

Planed output	Results	Our assessment
Potential insurance partners identified	IFC first developed a draft term sheet, which it used to reach out to 13 reinsurers. Three expressed initial interest in the project.	**Delivered and to a satisfactory level of quality** IFC made good efforts to bring insurers onboard to the project. We feel that IFC's approach to first develop a draft term sheet and pitch it to insurers increased the attractiveness and credibility of such an innovative product. When insurers expressed disinterest IFC made sure to follow-up to understand their hesitation. When insurers did not respond to their initial pitch, IFC followed up.
Work with insurer(s) to draft and refine insurance product conducted	IFC worked closely with two insurers to refine an insurance policy for potential pilot projects.	**Delivered and to a satisfactory level of quality** IFC's work with the first insurer included workshop sessions and a site visit to the project sponsor's project site in Kosedere, as well as work to refine an insurance product for the Hateks project. The developer found the workshop to be very "productive and useful". IFC's work with the second insurer included pitching three potential projects, and working with the insurer to refine a term sheet for the qualifying project.
Insurance product launched	IFC launched the insurance product in 2015.	**Delivered and to a satisfactory level of quality** IFC was able to bring one insurer into Turkey that was willing to offer GRI to developers. The deal between Munich RE and Eyre can be firmly attributed to IFC's efforts. Munich RE in written feedback has said that IFC's presence and support for GRI was a key determinant for Munich RE to target the Turkish geothermal sector.
Insurance product offered to potential pilot projects	IFC was not able to pilot the insurance product by the project's closing date.	**Unsatisfactory** IFC was able to facilitate a deal between Munich RE and Eyre but could not pilot the project before the Geofund Project's closing date because the developer was unable to secure financing.

Assessment of outputs achieved relevant to financial institutions

No project outputs were achieved, as planned activities for financial institutions did not end up being conducted. IFC held several discussions with financial institutions in 2013 to pitch its advisory services to the Project and the IFC Financial Markets team had informed financial institutions about the Geofund Turkey project. Despite expressing initial interest, when IFC sent out invitations to participate in workshop on financing geothermal investments, only one bank was willing to pay the fee to participate.

4.2.2 What were the intended outcomes of Geofund Turkey? To what extent have intended outcomes been achieved?

The Project achieved two of its six outcome targets. The outcome indicators for component 1 were intended to record whether an insurance product was launched, and the number of pilot projects using GRI that were facilitated. The outcome indicator for component 2 was intended to record the number of projects indirectly facilitated by IFC using the GRI that was developed. The outcome indicators for component 3 were intended to record whether the exploration best practices were developed and implemented and the number of due diligence reports accepted by IFC clients. IFC achieved one of two outcomes under component 1 because an insurance product was launched in 2015, but not piloted. IFC recorded another outcome achievement under component 3 because the exploration best practices guide was developed and disseminated, and technical due diligence reports for Hateks, Kayi, Transmark and Zorlu projects were accepted by the clients. No outcome achievements were recorded for component 2, which is contingent upon one project piloting GRI. Table 4.8 shows the Project's outcome indicators, targets, and results.

Table 4.8: Outcome Indicators, Targets, and Expected Results by December 2015

Outcomes (Expected achievement by 12/31/2015)

Component	Indicator	Target	Result	Achievement
Create and pilot risk mitigation instrument (component 1)	Number of entities that implemented recommended changes	4*	0	0%
	Number new financial products launched	1	1	100%
Diffuse GRMI to wider geothermal developer community (component 2)	Number of entities that implemented recommended changes	5	0	0%
Develop and implement geothermal exploration best practice (component 3)	Number of entities that implemented recommended changes	4	0	0%
	Number of recommended procedures/policies/practices/standards that were improved/eliminated	1	1	100%
	Number of reports accepted by client	5	4	80%

Note: *Target revised from original value

As described in section 3.2 and 4.2.1, it was agreed with IFC that it would be more useful to use an adapted theory of change for the Project, organized by stakeholder group to evaluate the Project's achievements. This is because the original theory of change obscures distinct interventions taken by IFC to address barriers to geothermal development in Turkey. Table 4.9 summarizes the intended immediate and

intermediate outcomes of the Geofund Turkey Project by stakeholder group, using the adapted theory of change.

Table 4.9: Immediate and Intermediate Outcomes of the Project by Stakeholder Group

Stakeholder	Immediate outcome	Intermediate outcome
Developers	▪ Technical know-how and capacity to develop geothermal projects increased ▪ Geothermal exploration best practice becomes widely accepted and adopted ▪ Project proposals meeting best practice increased ▪ Awareness and willingness to use GRI increased	Geothermal development projects using GRI facilitated
Insurers	▪ Number of geothermal exploration projects underwritten increased ▪ Risk mitigation methodology improved and GRI refined ▪ Fully market-based GRI developed	
Financial institutions	▪ Capacity to appraise and support geothermal projects increased (firm-level) ▪ Willingness and ability of financial institutions to appraise and finance geothermal projects increased (sector-level)	

Assessment of immediate outcomes relevant to developers

The outcome relevant to developers was to increase technical know-how and project preparation quality. Some of the outcome targets relevant to this work stream were achieved. IFC conducted technical due diligence on eight projects, for five clients, to ensure their project proposals met best practices and were in a format that was acceptable to insurers. Four reports were accepted by the clients, 80 percent of IFC's target of five (outcome indicator under component 3). There is also evidence that the best practices developed by IFC in cooperation with IGA Services was widely accepted. The second edition of the geothermal exploration best practice report developed by IFC was endorsed by several geothermal industry associations from various countries, academia, developers and technical consultancies. The endorsers agreed that the guide would be beneficial to the global geothermal community and indicated their approval of the vocabulary, description of the key phases in geothermal development, and explanation of data collection and exploration methods used in the report. Comments from the geothermal associations of Turkey, El Salvador and Mexico praised the guide saying:

> *"This valuable work of IGA will serve to a common agreement in exploration of geothermal energy as a RE resource, [which is] very important for today and for the future." – Geothermal Association of Turkey*

> *"This is done in a very good manner, including the main tools and key parts of geothermal exploration. In this sense the report will be of great help to the global geothermal community." – El Salvador Geothermal Association*

"[We] believes it provides a useful sequence of the steps to be followed in geothermal exploration for a successful development of geothermal resources. Thus, we think this guide will help to start geothermal projects for power generation as well as for direct uses. We would also support further improvements and reviews of the document to cover all geological settings and environments." – Geothermal Association of Mexico

There is some evidence to suggest that awareness and willingness to use GRI among geothermal developer also increased because of the Project. To raise awareness of the GRI product, IFC conducted four workshops introducing the Project and the GRI product to mitigate exploration risk. The willingness of developers to use GRI is evidenced by the number of proposals IFC received to participate the Geofund Project and signed mandate letters for AS services to conduct project due diligence and pitch qualifying project proposals to an insurer.

Assessment of immediate outcomes relevant to insurers

The outcome target relevant to insurers was to increase the number of projects using GRI and work towards developing a fully market based insurance product. Immediate outcomes targeted at insurers were largely not achieved because the GRI product was not piloted in any geothermal development projects in Turkey. Nevertheless, Munich RE prepared a draft GRI policy underwriting Eyre's Simav East Project, a necessary first step towards piloting the product. Because there was no successful pilot using GRI, subsequent outcomes such as improvements and refinement of the risk mitigation methodology and a fully marked based GRI product were also not achieved.

Assessment of immediate outcomes relevant to financial institutions

Immediate outcomes targeted at financial institutions were not achieved because Project activities (apart from pitches made to financial institutions) in this area were not conducted. There were also no specific outcome indicators in the Project's results framework that apply to this work stream. The Project activities to train financial institutions in appraising geothermal projects and conduct workshops on financing early stage geothermal development were only conceived in 2012, as part of the newly added best practices component. According to the FY2014 Q2 PSR, financial institutions (seven banks and two leasing companies) expressed interest in participating in a workshop on financing for geothermal projects and future transaction advisory for plant development. However, there was no effective demand for a workshop because only one bank was willing to pay the fees to attend such an event. In response, IFC reached out to Energy Sector Management Assistance Program (ESMAP), EBRD, and the World Bank teams that were preparing geothermal sector projects (EBRD PLUTO Initiative and World Bank Geothermal Development Project) to jointly develop and host a workshop. Because of delays, the workshop was not conducted before the Project's close.

Assessment of intermediate outcomes

The intermediate outcome was not achieved because a pilot project using GRI was not implemented by the Project's close.

4.2.3 What unintended outcomes (positive and negative) have occurred?

Interviews with stakeholders revealed that there were some unintended positive and negative outcomes from the Project.

On the use of insurance to mitigate early stage geothermal development risks

The Project intended to showcase an innovative use of commercial insurance to mitigate resource risk, one of the key barriers to geothermal development. The Project did not achieve its intended outcome, but the failure to pilot a project using GRI and the IFC approach (buying down the insurance premium) helped newer donor projects in Turkey such as EBRD's PLUTO initiative and WB's Geothermal Development Program develop alternative financing arrangements to support the geothermal sector in Turkey. The two programs are described briefly in Box 4.2.

Box 4.2: Development Partner Projects Following the Geofund Turkey Project

EBRD PLUTO Initiative: Early Stage Private Sector Geothermal Development Framework for Turkey

The objective of EBRD'PLUTO initiative is to scale up geothermal production by supporting private sector developers during early stage geothermal development and subsequent production drilling and plant construction phases through a combination of TA, policy dialogue, and financing. EBRD is partnering with the Clean Technology Funds (CTF) to provide contingent grants and seed capital of up to 5 EUR million (sponsor must provide 50 percent of equity required for the exploratory drilling) for geothermal exploration drilling. If the drilling is successful, the grant is converted to a concessional loan and the project proceeds to the production and reinjection drilling phase. At the plant construction stage, the private sector injects additional equity into the project and the soft loan is refinanced to a commercial loan. If drilling at the exploration stage is unsuccessful and the company decides to abandon the project, the CTF guarantee is exercised. If drilling is unsuccessful at the production drilling stage, the sponsor has ten years (three-year grace period) to pay back the concessional loan.

EBRD's policy dialogue activities for the project include regulatory support for social and environmental assessment and sustainable reservoir use. The bank is also working with the World Bank to identify options for injecting or finding productive uses for non-condensable gas from geothermal resource extraction. EBRD is also conducting an options study to inform government on potential RE incentives for geothermal once the current Feed-in Tariff (FiT) expire in 2023. At the firm-level, EBRD is providing technical assistance to ensure that projects meet industry best practices.

World Bank Geothermal Development Program

The objective of the World Bank Program is to scale up private sector investment in geothermal energy by de-risking geothermal exploration and increasing access to long-term financing for the development of geothermal resources. The project will establish a risk sharing mechanism for resource validation that offers a contingent grant of up to 40 to 60 percent (region specific) in case of unsuccessful exploratory drilling for up to 5 wells. If drilling is successful, the risk mitigation facility collects a 10 percent success fee (based on the total planned expenditure of drilling operations), to ensure the replenishment of the fund. The success fee will be 25 percent for the fourth and fifth exploration wells, if applicable. The project will also establish a loan facility for resource development to provide long-term financing from the resource development to plant construction phases of a project. The loan facility will offer loans at market rates but have a longer maturity period. In addition to financing instruments, the project will also provide technical assistance to two financial institutions, which are the acting financial intermediaries for the project. The World Bank will provide capacity building to staff at the banks to manage the risk sharing mechanism. Specifically, the training will cover the evaluation of project applications, contract negotiation, and monitoring and verifying results from exploratory drilling and well testing.

On the knowledge materials IFC developed

The Exploration Best Practices report developed by IFC and IGA was converted into a textbook and published by IGA.

Data from the global well database has been used to inform studies such as the Bloomberg white paper "A global fund to de-risk exploration drilling: possibility or pipe dream?".

4.2.4 Are the achieved outcomes of the Project commensurate with the Project's objectives?

The outcomes achieved by the Project are not commensurate with the Project's objectives. The Project set itself a high bar to facilitate geothermal development in Turkey though the removal of key barriers including: limited access to financing, high exploration risk in early stage geothermal development, and low quality project proposals and technical capacity of project developers. As described in section 4.2.2, the Project achieved its outcome objectives to some extent, by directly increasing four geothermal developers':

- Technical knowledge and capacity to develop geothermal projects, through firm-level advisory services supporting project preparation and developing and disseminating best practices in geothermal development.
- Awareness and willingness to use GRI through individual outreach and workshops.

However, the Project did little to address the barrier of access to finance, and was largely unsuccessful in facilitating widespread adoption of private sector insurance as a solution to high exploration risk in early stage geothermal development. Nevertheless, the Project's interventions arguably resulted in positive outcomes that contributed to barrier removal to geothermal development at a global level. As described in sections 4.2.2 and 4.2.3, the usefulness of exploration best practices and analysis of factors contributing to drilling success has been widely acknowledged.

4.2.5 To what extent has the Project fostered client buy-in and contributions?

The Project successfully fostered client buy-in and to a lesser extent, client contributions. The Project team made substantial efforts to foster buy-in from developers, insurers, and financial institutions but only managed to work closely with five project developers and two insurers over its lifetime.

Client buy-in

The Project approached 31 geothermal developers, more than 70 percent of the major geothermal developers with licenses in Turkey. Developers were approached through two RFPs to solicit potential pilot projects/sponsors, workshops, and follow-up meetings to develop a pipeline of potential projects. IFC had signed mandates with five developers--Zorlu, Hateks, Transmark Turkey, Eyre, and Derin Jeotermal—to support them in improving their project proposals and in conducting due diligence (integrity, technical, and financial). The objective of the work was to increase the likelihood of each project's acceptance by an insurer; once a project proposal was prepared and if it met due diligence criteria, IFC pitched the project directly to insurers.

IFC pitched a draft term sheet to 13 global insurers in 2010, based on a draft policy developed for the Zorlu Kilidere Project. Most of the insurers were hesitant about the product because they felt that exploration risk was uninsurable, Turkey's market potential was too small, and the data required for risk assessment insufficient. Only one insurer, SCOR (with no prior experience in geothermal energy) was interested in further engaging with IFC. In 2012, SCOR ultimately withdrew, but IFC engaged another reinsurer, Munich RE, a firm with prior experience offering geothermal

exploration risk insurance in Europe. IFC's work to obtain buy-in from SCOR and Munich RE is described below:

- **Work with SCOR.** From 2010 to 2012, IFC worked closely with SCOR to refine and finalize a draft term sheet (originally developed for the Zorlu Kilidere project), and provided training on the technical aspects of geothermal development and risks involved. IFC intended to pitch one project from a company called Hateks, which wanted to drill eight to ten production and injection wells for a 15MW_e geothermal power plant in Kosedere. However, technical due diligence concluded that the information on the feasibility of the Hateks project was not sufficient to qualify it for GRI. Before IFC could identify and pitch another qualifying project, SCOR withdrew. SCOR's reasoning was that the risks inherent to geothermal exploration in greenfield projects represented uninsurable risk, because the data from surface studies was insufficient to determine the productivity of the field and therefore could not be assessed or priced. SCOR's view was therefore that the risk should be borne by equity investors, and was inappropriate for an insurance product.
- **Work with Munich RE.** IFC first approached Munich RE in 2010, but reinsurer declined cooperation on the Project. In 2012, it renewed its interest in the Project. IFC pitched three projects (two projects from a company called Transmark, and one from Eyre) to Munich RE. Transmark wanted to drill two exploration wells for two 10MW_e projects, one in Gulpinar and one in Kestanbol. Eyre wanted to drill five production wells for a 38MW_e geothermal power plant. Munich RE selected Eyre's Simav East project to insure but declined to insure Transmark's projects because they were too small in value, with too few wells. IFC was able to facilitate a deal between Eyre and Munich RE, but Eyre was ultimately unable to obtain financing, despite having the GRI from Munich RE.

Client contributions

According to the PCR, the Project received USD 38,591 in fees for advisory services, 36% percent of the secured advisory and success fees expected from developers and insurers over its lifetime (2007 to 2016). No fees or contributions were secured for financial institutions despite the interest expressed in IFC workshops on financing and appraising geothermal projects.

4.2.6 To what extent does the Project effectively generate, manage, apply and share knowledge and learning?

The Project effectively generated, managed, applied, and shared knowledge and learning to a substantial extent. IFC made the knowledge products generated by the project (such as the global database on well productivity, drilling success report, and exploration best practices guide) available publicly, and made efforts to disseminate them among the global geothermal community. The subheadings below describe how IFC shared its knowledge and learnings from the Project.

Global report and database on well productivity

IFC's global report on well productivity is available on the IFC, World Bank, and ESMAP websites. When it was published, the report was promoted by several leading online RE publications such as RE World and ThinkGeoEnergy. The report has also been cited in at least six geothermal academic papers on Google Scholar alone and on various white papers published by think tanks and non-governmental associations. The database was used to inform a Bloomberg white paper, which assesses the possibility of establishing a global risk mitigation fund for geothermal exploration.

Exploration best practices guide

IFC's exploration best practices guide is available on IFC, World Bank, IGA and UN Climate Technology Center and Network websites. As described in section 4.2.2, the guide was endorsed by various stakeholders in the geothermal community for its ability to establish common ground on the phases, methods, and tools for conducting geothermal exploration, as well as the presentation of a pre-feasibility report.

IFC brand

IFC's Tom Harding-Newman contributed to the 2012 ESMAP geothermal handbook "Planning and Financing Power Generation", which is one of three featured publications of the ESMAP Global Geothermal Development Plan. In interviews, IFC staff also mentioned that they were invited to various geothermal conferences to speak about the Geofund Project. Over the course of the Project, IFC staff estimated that they attended and presented at one to two conferences each year (2012-2015).

4.2.7 Differentiating between Project components, where has Geofund Turkey achieved significant traction/results, and where not?

The Project achieved the most results in its work targeting geothermal developers and insurers, and fewer results in its work targeting financial institutions.

The Project achieved the most success in its work with insurers. Despite substantial challenges and delays, IFC was eventually able to spark private sector insurer interest in Turkey by developing a pipeline of projects, conducting due diligence on potential pilots, and working with insurers to develop GRI for the Turkish market. In 2015, IFC facilitated a deal between Munich RE and Eyre. However, Eyre was not able to secure financing for geothermal exploration by using the insurance, limiting the Project's success. Nevertheless, IFC's report and global database on drilling success, both of which were the first of its kind appears to have contributed to increased understanding of factors that affect drilling success. Munich RE has said that the "database of 2600 geothermal wells globally developed by IFC [] have been of great value to us". The data can inform actuarial analysis as well as other risk assessments conducted by financiers or developers of geothermal projects.

The Project achieved a substantial amount of traction in its work with project developers at the firm-level. IFC's advisory services assessed the quality of project developer's project proposals to help them qualify for GRI at the firm-level. Each project proposal was submitted to GeothermEx and evaluated against 11 resource and non-resource related criteria. If a project proposal met the minimum score required to be recommended for GRI, IFC would, with the project developer's approval, pitch the project to an insurer.

IFC's knowledge products targeting geothermal developers also appear to have increased the knowledge base of the geothermal community. As described in section 4.2.2, the exploration best practices report developed by IFC was widely accepted by different stakeholders in the global geothermal community and incorporated into a textbook being developed by IGA and course material.

The Project achieved the least traction in its interventions targeting financial institutions. As described in 4.2.2, the Project developed a strategy for engaging financial institutions in 2012, only two years before the Project's planned completion date. IFC planned to provide capacity building to financial institutions (FIs) to increase their knowledge of geothermal energy and ability to appraise geothermal projects through conferences and workshops. Expected results were not achieved because: (i) there was no effective demand for IFC's AS despite initial interest, (ii) among the few financial institutions that attended the best practices launch conference, most thought the material on financing was insufficient. Each instance is described below:

1. In March 2013, three financial institutions attended the Best Practices Launch Workshop. In Workshop feedback, two of the three financial institutions said that they would have liked more information about the financial risks and financing of geothermal projects.
2. In 2014, IFC's financial Markets and Project team developed a pitch to provide AS to local banks. IFC met with seven banks and two leasing companies and offered to conduct a workshop on geothermal financing and eventually transaction support. IFC reported that the banks expressed interest, but when a firmer proposal for a workshop was presented, only one bank was willing to pay to attend. IFC then tried to partner with EBRD and the World Bank to deliver a workshop to FIs, but ultimately a workshop never materialized before Project closing.

4.2.8 To what extent was the Project able to facilitate the development of the market?

The objective of the Project was to facilitate market transformation in Turkey through the development of a market based GRI instrument. The Project was not able to facilitate the development of a GRI market in Turkey because the instrument was never piloted.

The evaluation team asked Munich RE whether their experiences in Turkey informed the exploration risk insurance product that they currently offer in Latin America and Eastern Africa as part of their work with other development partners. Munich RE stated that it was its work in Germany, the Netherlands, Kenya, and Denmark in the early 2000s (low enthalpy regions, with high drilling costs, and smaller number of production and injection wells per project) that informed the structure of the product they now currently offer, not its work with IFC in Turkey.

Nevertheless, according to written feedback from Munich RE:

> *"IFC's presence in the market and support for the development of geothermal exploration risk insurance [,which included pipeline development and pre-screening of projects, support in structuring the GRI, and developing exploration best practices and a global geothermal well database] were a key*

determinant for Munich RE to target Turkey's geothermal sector and adapt our insurance product to the local market."

In short, a market for GRI did not fully materialize, but IFC's work helped the private sector bring its product to a new market.

4.3 Efficiency: Moderately Unsatisfactory

The TA budget allocated to the Project was appropriate to meet its objectives, primarily because we do not feel that additional TA would have substantially improved the Project's effectiveness in achieving outcomes or impacts. The Project used the full TA budget and contingency funds to provide advisory services to insurers and developers, and for developing the best practices component (added after GEF approval).

We felt that the Project's design was not appropriate to meeting its objectives in terms of project planning (timeframe) and human resources. The Project set aggressive deadlines for Project results that were probably unrealistic and the Project's staffing was likely not appropriate given the Project's highly technical and specialized goal of developing GRI.

We were not able to assess the adequacy of the budget set aside for concessional financing because no pilot projects were realized. The evaluation team did not evaluate the cost effectiveness of the Project because there were no comparable initiatives ongoing when the Project was being implemented.

4.3.1 To what extent has the Project been cost-effective in achieving results, relative to comparable initiatives of GEF, IFC and/or other stakeholders in the sector? Considering the costs and results, to what extent has Geofund Turkey provided value-for-money?

There were no comparable initiatives that could be compared to the Project. We identified a list of potential comparable initiatives to the Project including the following donor programs:

- Kreditanstalt für Wiederaufbau (KfW) Geothermal Risk Mitigation Facility in Eastern Africa (multi-country: grants program),
- EBRD/CTF PLUTO Initiative: Early Stage Geothermal Support Framework for Turkey,
- IDB Geothermal and Risk Transfer Program (MEX), and
- Geothermal Development Facility for Latin America and the Caribbean (LAC)

However, because the KfW program provides purely grant support for early stage geothermal financing and the other programs just started they are not comparable to IFC's project. In addition, the evaluation team reached out to IFC's Efstratios (Stratos) Tavoulareas who is a Principal Energy Advisor in the Energy and Energy Efficiency Advisory Services department. Stratos confirmed that to the best of his knowledge, no comparable programs exist during the time of the Project's implementation.

The Project ultimately did not offer value-for-money because, despite a generally appropriate budget, it achieved only 1/3 of its output targets and 2/3 of its outcome targets.

4.3.2 To what extent was the Project's design appropriate to meet its objectives and expected results in terms of funding, iii) time frame, and iv) human resources? To what extent have resources been well used in achieving outputs and outcomes?

In the subsections below, we assess if the project's planned budget, timeline, and human resources were appropriate to meet its objectives and expected results.

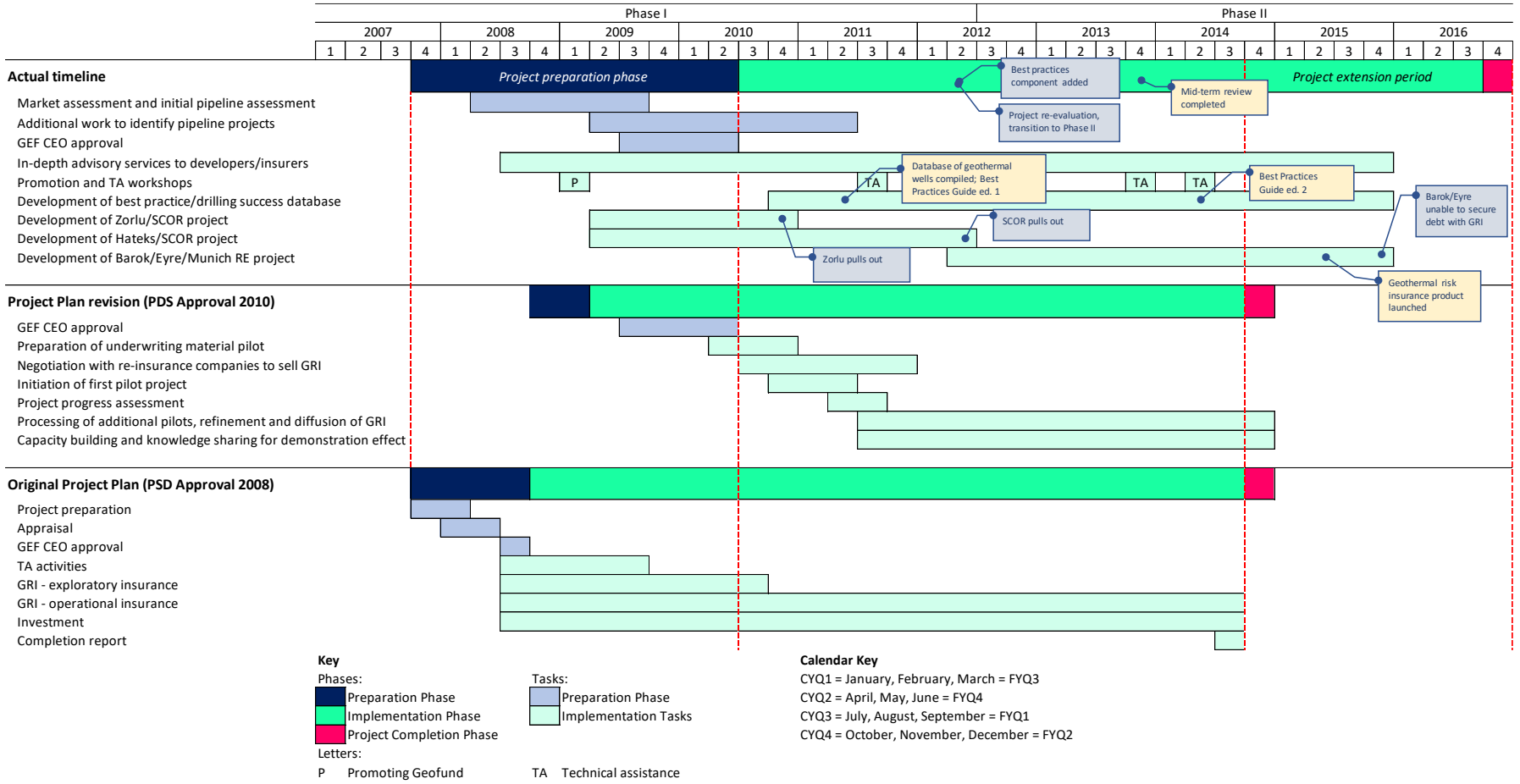
Funding

The Project requested and received an allocation of USD 1.7 million to carry out the technical assistance component, USD 8 million to provide concessional finance to pilot projects, and USD 300 thousand in contingency funds (applicable to the TA or concessional financing component) from the GEF. The funds allocated for concessional financing was not used because a project was not piloted. The Project used the full technical assistance budget and contingency funds to provide advisory services to insurers and developers, and for developing the best practices component (added after GEF approval), beyond the scope of the original budget. Therefore, we feel that the TA budget was appropriate to meet the Project's objectives. Because none of the concessional financing was used, we cannot assess the appropriateness of the budget dedicated to financing pilot projects.

Time frame

Figure 4.1 shows the timing of the activities planned under the Project as compared to the timing of actual activities, and key milestones.

Figure 4.1: Planned Versus Actual Project Plan and Key Milestones



Source: Actual timeline based on Consultant's understanding of PSRs. Planned timelines from Project Approval reports.

The original Project Plan proposed in 2008 set aggressive deadlines for Project results to be realized that were probably unrealistic. The Project initially estimated that geothermal exploration insurance could be developed in two years and IFC investments facilitated shortly thereafter. In reality, there were substantial delays during the Project Preparation phase. It was only in May 2010, two and a half years after the Project started, that GEF CEO endorsement was obtained, which allowed for the disbursement of grant funds and beginning of Project implementation (more than double the expected time). The Project launched the insurance product only one year before Project close.

In our view, the Project's timeframe was too short for the direct impacts to be realized (from 2008 to December 31, 2016). It is widely accepted that geothermal plant development take approximately six to eight years from resource exploration to completion of plant construction. The Geofund Program planned for sub-projects to last up to eight years (the Geofund Turkey project being one of those sub-projects). Additional time would therefore have been required to develop a robust pipeline of projects in Turkey, an insurance product, and buy-in from financiers.

Human resources

The Project's staffing was likely not appropriate given the Project's objective. The PSRs recorded four transaction leader/project leaders from 2008 to 2010. The Project's staffing stabilized in late in 2010, but expertise in insurance and technical aspects of geothermal development appears to have been outsourced to external consultants and obtained in an ad-hoc manner from other IFC departments. From August 2010 to February 2016, the day-to-day operations of the Project were managed by an Energy Specialist, with the transaction leader and Energy Specialist maintaining communications on almost a daily basis on the Projects operations. Appendix E summarizes the key project team members and external consultants involved in the Project.

Given the highly specialized and novel nature of the Geofund Turkey Project—a project requiring knowledge of the technical and commercial realities of geothermal power generation, insurance products, and Turkish market conditions—it may have been helpful to have a dedicated team of individuals with expertise in each of these areas, instead of loose cooperation between IFC departments.

The Project's focus on developing GRI and conducting technical due diligence for project developers required staff with expert knowledge in the technical and financing aspects of geothermal development, and a deep understanding of the insurance industry. Project staff learned quickly and drew on external consultants and other IFC units (insurance, financial markets, access to finance) for support, but commented that it would probably have been beneficial for the Project to have an expert on insurance and geothermal development that could dedicate about 40 to 50 percent of their time solely to Geofund Turkey.

4.3.3 To what extent were resources allocated appropriately and efficiently across the three Project components and activities under each component?

We feel that the Project's budget was probably allocated appropriately across the Project components since IFC mostly achieved the planned outputs under the technical assistance component (component 1 as proposed in the GEF approval

document), which includes the work in under component 1 (create and pilot a risk mitigation instrument) and 2 (diffuse GRMI to wider geothermal developer community) in the most up to date results framework. Project staff interviewed felt that the team spent the right amount of resources engaging stakeholders (developers, insurers, and financial institutions). A Project Staff member said, given the "chance orientated" nature of the Project, where project results were dependent on the securing a deal between an insurer and developer. Project staff also felt that the Project's resources were maximized because IFC identified additional areas of value addition during an internal re-evaluation in 2012 when the exploration best practices component was added. We agree with this takeaway.

We cannot assess the efficiency of resources allocated towards concessional financing (geological risk mitigation or component 2 as proposed in the GEF approval document) since none of the budget for concessional financing was used because no projects were piloted.

4.3.4 Have links with E&RE global resources been leveraged?

Links with E&RE global resources seem to have been leveraged. The Team involved several IFC other E&RE staff who provided operational oversight and technical expertise on an as-needed basis.

4.3.5 What could have been done to improve efficiency?

The Project's efficiency could have been improved by increasing staff strength to meet the high-level of effort required to develop and pilot the insurance product. IFC needed to secure buy-in and provide advisory services to financial institutions, insurers and geothermal developers, but was only able to dedicate a substantial amount of time to the latter two groups. Involvement from IFC's insurance and financial markets team were largely limited to introductions and providing ad-hoc advice to key Project staff. It is not certain whether deeper involvement from various IFC departments such as investments and financial markets could have been possible because IFC institutional rules do not allow staff overtly influence investment decisions. For example, the financial markets team was involved mostly in introducing the Geofund Project to financial institutions but any other work would be managed by Project staff.

In retrospect, IFC staff also said that hiring an insurance expert to support developing insurance and negotiating with insurers could have increased Project efficiency, given the niche nature of the insurance product. This in turn would have freed up time for other staff to work identify more potential projects, and secure buy-in from financial institutions.

4.4 Work Quality and Design and Implementation of M&E: Satisfactory

The Project's operational risks were mostly properly assessed, identified, and managed. We also feel that IFC involved and communicated well with donors and other stakeholders, with some minor exceptions such as its coordination with IBRD early in the project, and limited interactions with government and financial institutions.

The Project's M&E plan, at the point of GEF CEO endorsement, (2010) was practical and sufficient. IFC provided a clear and substantiated rationale for GEF involvement and funding. In our opinion, the Project's M&E plan was well managed, despite changes to the Project strategy, which also resulted in changes to the Project's logframes and results framework. The results measurement framework was updated biannually, despite substantial changes over time such as indicators being replaced or reshuffled to match changes to the Project's components. We only highlight a few very small inconsistencies in the results framework in the subsections below.

4.4.1 To what extent have the operational risks been well managed?

The operational risks of the Project were mostly well managed.

We reviewed the PSRs to understand whether risks and mitigation measures were properly assessed, identified, and followed at the beginning and over the course of the Project. PSRs earlier than FY2011 Q2 did not have likelihood and impact ratings for risks, or mitigation measures (they were available only from 2010 Q2 onwards), and are therefore assessed based on actions taken by IFC to overcome them.

An assessment of the key risks and mitigating actions taken or identified before FY2011 Q2 are summarized in Table 4.10.

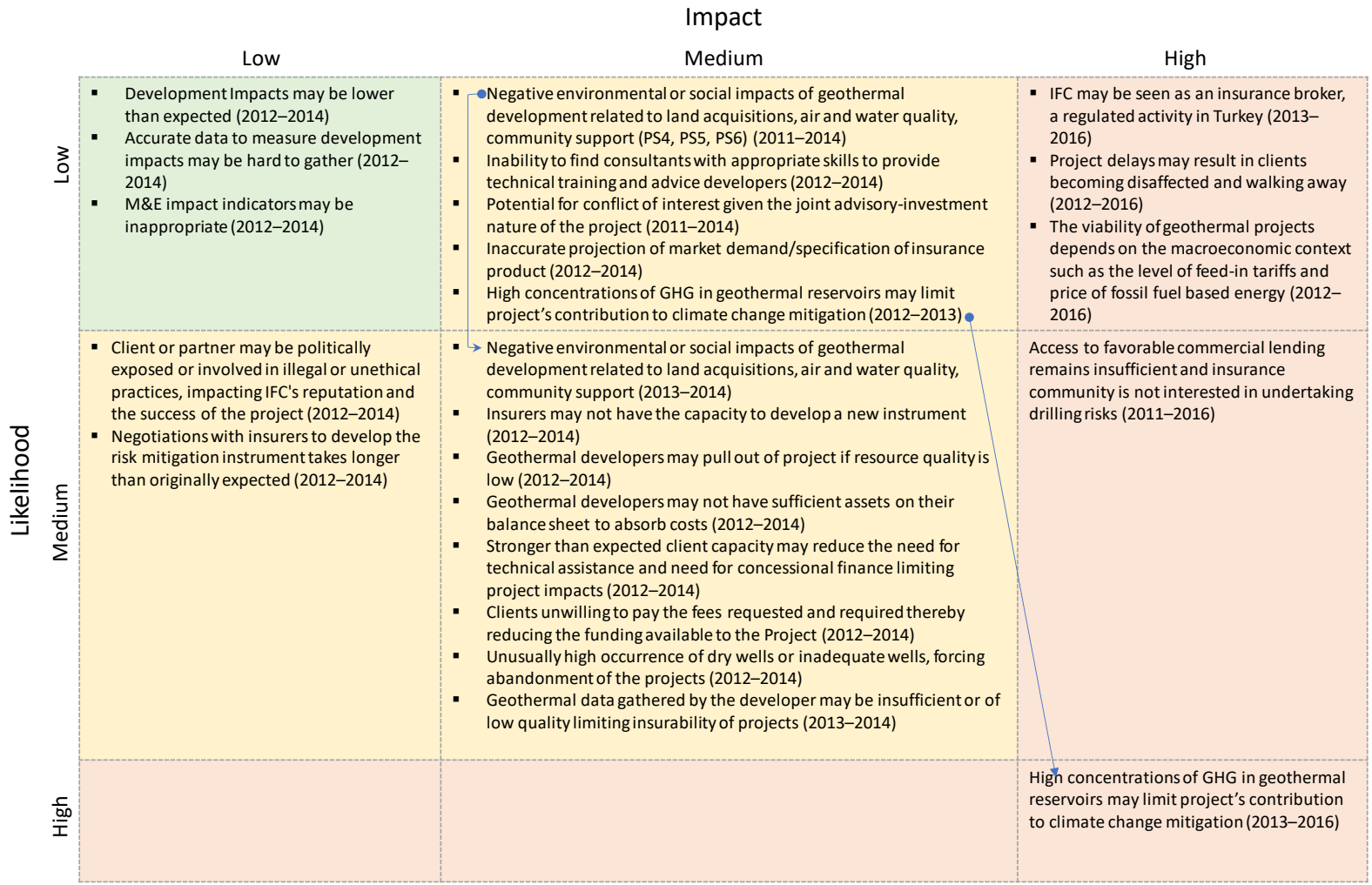
Table 4.10: Assessment of Key Risks Identified before FY2011 Q2

Risk	Mitigating action taken/measure identified	Our assessment
Uncertainty surrounding sufficient funding for the Project and IFC/IBRD coordination since the IBRD leader was retiring from the World Bank and GEF was undergoing operational changes (FY 2009 Q4)	IFC revised the implementation schedule and conducted negotiations with IBRD to determine an initial budget for the Project	IFC's approach was appropriate given the unpredictability of the situation.
Risks that the initial project pipeline developed by IBRD would not have projects that were suitable for the Project; (FY 2008 Q4)	IFC initiated an RFP process to identify additional potential sub-projects	IFC's approach was appropriate and showed pragmatism.
Insufficient data to inform actuarial analysis resulting in high premiums and unwillingness of commercial reinsurers to participate in the Project (FY 2009 Q2)	▪ IFC said it would try to assess geological risks in as much detail as possible. ▪ IFC planned to pay down the insurance premium or offer a contingent grant similar to the Geofund Project in Hungary	IFC identified a key parameter that would affect insurance premiums. Since the Project was in its early days, we feel that IFC's approach to offer direct financing was appropriate.

Credit and environmental risks of potential pilot projects. (FY 2010 Q4)	IFC reviewed detailed environmental assessments from prospective project sponsors and conducted site visits and diligence on each company	IFC's approach was appropriate.

Figure 1.1 summarizes the Project risks, and changes in risk ratings from FY 2011 Q4 onward. Arrows in the figure show changes to impact and or likelihood ratings of risks identified by the Project.

Figure 4.1: Summary of Project Risks by Impact and Likelihood Ratings



An assessment of the key risks and mitigating actions taken identified prior to FY2011 Q2 are summarized in Table 4.11.

Table 4.11: Assessment of Key Risks Identified After FY2011 Q2

Dates	Risk	Mitigation measure	Our evaluation
2011-2016	Access to favorable commercial lending remains insufficient and insurance community is not interested in undertaking drilling risks (Rating: H; Likelihood: M)	Promotion of projects with local lenders through appropriate technical assistance activities. If necessary, demonstration of the viability of such risk mitigation instrument by engaging in the initial projects through Geofund guarantees only, and without the engagement of an insurance company.	IFC assumed the worst-case scenario and planned to guarantee or finance a pilot project if both insurers and financial institutions were not interested in the Project. Our understanding from interviews with Project Staff is that after the World Bank's experience in Hungary, IFC did not plan to provide contingent grants for early stage geothermal development. The mitigation measure should have been updated, since ultimately a key reason for the failure to pilot GRI was because Eyre was unable to secure commercial financing.
2012-2014	Negotiations with insurers to develop risk mitigation instrument takes longer than originally expected; first pilot may happen only 3-4 years after project with impacts at 5 years (Rating L; Likelihood: M)	IFC will keep GEF updated on the Project's progress.	We feel that the risk rating was inappropriate and the mitigation measure too limited. Delays in developing an insurance product resulted in missed opportunities in the Zorlu project. Looking over the Project's correspondences it seems that there was a mismatch between insurers' and developers' timetables. Transmark, who was interested in obtaining GRI wanted to commit to additional wells so as to secure a policy from Munich RE, but the insurer was busy with another Project and could not respond in time for their spud date.
2013-2014	Geothermal data gathered by the developer may be insufficient or of low quality limiting the insurability of	TA assistance will be necessary to improve the gathering of quality data.	The risk rating was appropriate but the mitigating measures identified were insufficient. Recognizing the possibility that data insufficiency could affect insurers' appetite to offer a GRI, IFC could have explored other means to increase the

	projects (Rating: M; Likelihood: M)		insurability of a project through different approaches to structuring the insurance product or developing alternative financing mechanisms. The PCR also acknowledges that the Project should have been designed to give the team flexibility to address barriers to early stage geothermal development (section 5.1.4)
2012-2016	High concentrations of GHG in geothermal reservoirs may limit project's contribution to climate change mitigation (Rating: H; Likelihood: H)	IFC will require geothermal developers to include plans for dealing with Non-condensable gas (NCG) in project proposal IFC will assign an E&S specialist to the team to advice on mitigating E&S risks	The risk rating for the project was appropriate and mitigation measures sufficient. Since the overarching goal of the project was to increase sustainable energy use in Turkey, it was important the IFC require projects to include plans for dealing with NCG. Additional studies on NCG abatement would have been more appropriate at the feasibility and resource development stages.

4.4.2 How well did Geofund Turkey communicate and involve with donors and other stakeholders?

IFC's team appear to have involved and communicated well with donors and other stakeholders, with some minor exceptions such as its coordination with IBRD early in the project, and limited interactions with government and financial institutions.

IFC's communication and involvement of donors in the Project

IFC's communication and involvement of other donors in the Project was largely appropriate. The Project was initially developed as a joint IFC/IBRD project, but project activities were conducted separately. According to IFC staff, communication and involvement of IBRD in the Project was limited to occasional updates of Project activities. During the Project, the Project team was asked to share and present its experiences on the Geofund program with other donors such as ESMAP, CTF, EBRD, and IBRD. The project team presented at several international conferences, and contributed to ESMAP's financing geothermal power sector investments publication. In 2014, the team also shared its Project experience with EBRD and WB to inform their current geothermal programs in Turkey and tried to develop a joint workshop on geothermal financing for financial institutions.

IFC's communication and involvement of other stakeholders in the Project

The following bullets summarize our assessment of IFC's communication with other stakeholders:

- **Developers.** IFC involved 31 developers through the four workshops it conducted, and by inviting them to participate in the Project though two RFP processes and direct contacts. When potential pilot projects were identified, IFC worked with developers to vet and improve their project proposals to qualify for GRI and pitched them to insurers. Section 4.2.5, which assesses the extent to which IFC fostered client buy-in and contributions provides a more detailed description of the work that IFC did.
- **Insurers.** In 2010, IFC reached out to 13 of the leading reinsurers, through its Insurance Services Group, to pitch a draft insurance policy that was developed. Of the 13 reinsurers that were contacted, 2 responded with initial interest. IFC sent follow up emails to reinsurers who did not respond or who took longer than expected to respond. When reinsurers declined, IFC took the opportunity to inquire about their reasons. Over the course of the Project, IFC worked closely with two insurers to refine and tailor the GRI to specific projects it was pitching for GRI.
- **Financial institutions.** IFC involved financial institutions in the project through the best practices workshop in 2013 (almost six years after the Project's inception), where seven entities attended. IFC also initiated contact with financial institutions, through its Financial Markets team, which informed its contacts in the Turkish banking sector of the Geofund Project.

- **Government.** To our knowledge, IFC did not involve or communicate with many government agencies during Project implementation. The General Directorate of Mineral Research & Exploration (MTA) is a government agency that conducts scientific and technological research on mineral exploration and geology. The only record of communication with the MTA that we found was from a Back-to-office (BTO) report in April 2008.[7] During the meeting, IFC learned from MTA that they were planning to tender concessions for seven wells that have been proven to be suitable for power production.
- **Industry associations.** IFC worked closely with the IGA to prepare the second edition of the exploration best practices guide, which was also reviewed and endorsed by several national geothermal associations.

We feel that IFC sufficiently communicated with and involved most stakeholders in the Project. The exceptions were financial institutions and relevant government entities. Financial institutions were only engaged six years after the Project's inception, just two years before its original end date. One IFC staff member who was interviewed said that, in retrospect, IFC could have sought more government involvement to facilitate sharing of data on geothermal fields. We agree with this viewpoint that the availability of data is crucial to estimating the risk and premium on an insurance policy.

4.4.3 To what extent was a sound M&E plan to monitor progress and track results towards achieving objectives designed and implemented, and adequately budgeted for?

IFC's overall approach to conducting M&E was appropriate and well implemented despite changes to the Project's overall approach in 2012 (just two years before the planned Project completion date).

M&E design

The Project's M&E plan at the point of GEF CEO endorsement (2010) was practical and sufficient. Annex F in the GEF approval request described IFC's incremental reasoning for GEF involvement and request for funding (USD 10 million) by articulating key barriers to geothermal development in Turkey, including baseline data on installed geothermal capacity in Turkey in 2010, and estimating the expected direct impacts that would be realized through the project (piloting four geothermal projects using GRI). The four projects in IFC's assessment included were potential projects, which it had identified through the RFP process initiated in 2009. The estimated direct impacts and key performance indicators for the Project from these four projects were:

- Four projects using GRI piloted,
- Demonstration of GRI to government and private insurance providers interested in offering commercial GRI,
- GHG emissions reductions of 18.4 million tons over a 20 year investment life time, and

[7]

- Increased installed geothermal capacity of 73MW_{el} and 117$MW_{th.}$

The Project's proposed logframe identified sources of data collection to record Project impacts, namely reports from developers that piloted projects using GRI. The Project's request for GEF CEO approval also described how it planned to monitor and evaluate the Project's progress. The Project planned to:

- Capture short-term operational results semiannually though the PSRs
- Collect data on market characteristics from project sponsors and official sources as part of financing facility monitoring, and
- Hire consultants to conduct an independent mid-term and terminal evaluation of the Project. (specific management in next question)

M&E implementation

IFC's implementation of the proposed M&E plan in the GEF approval document was moderately satisfactory. As described in section 2, the Project's strategy evolved substantially over the time. This also resulted in changes to the Project's logframes and results framework, which only stabilized in 2012. Nevertheless, IFC continued to track the Project's operational results and hired external consultants to conduct independent evaluations of the Program. However, we noticed that the key performance indicators proposed to GEF were not the same as the ones included in IFC's results framework. For these reasons, we feel that IFC's implementation of its M&E plan was well implemented.

M&E budget

The M&E budget appears to have been adequate. According to the Project's request for GEF CEO approval, the M&E budget was estimated at USD 150,000, of which USD 85,000 was for external consultants, USD 15,000 for travel, and USD 50,000 for data collection over the course of the Project. All of what was planned appears to have been achieved: The Project's results were consistently reported biannually, the internal budget from 2010 accounts for M&E costs in the staff cost line item, mid-term and terminal evaluations were conducted, and there are no records of budgetary problems relating to M&E.

4.4.4 To what extent was the Project's results measurement system appropriate and well managed? Were quantitative and qualitative data available for the indicators defined in the results framework? Were selected indicators adequate?

The Project's results measurement system appropriate for measuring the Project's results and well managed despite considerable changes to the project's strategy and result framework up till 2012. The original project strategy was mirrored after the Geofund umbrella program offered three components: technical assistance (component 1), direct financing (component 2), and GRI (component 3). In the GEF CEO approval document (May 2010), the project's M&E framework was structured around two components: Technical assistance (component 1) and Geological risk mitigation (component 2), which combined the direct financing and GRI windows. By 2011 Q2, the project's components had been updated to reflect an internal management decision to break up the project's activities into two phases: Create

GRMI with one pilot (component 1/phase 1) and refine GRI with three more pilots and take GRI to market to leverage broader impact (component 2/phase 2). In 2012, the Project underwent an internal IFC review (to approval for phase 2) and a third component: Develop and implement geothermal best practice was included. Each iteration of changes to the Project's strategy was accompanied by changes to the result framework.

Availability of quantitative and qualitative data for indicators

The results framework was updated biannually in the PSRs. Over time, project indicators were replaced or reshuffled to match the changes to the project's components and new additions were made. The data of quantitative and qualitative data for indicators were well tracked but because of the changes, some of the project' achievements were re-recorded, well past the original time of implementation. For example, the output indicator "number of entities receiving advisory services" under component 1.

Since no projects were piloted, IFC did not collect data from project sponsors to record any impact results.

Adequacy of indicators

The selection of indicators was adequate, with the exception of one, which may be redundant. Because the Project's strategy evolved over time, the Project's indicators only stabilized after 2012. As described in the subsection above, Project indicators were replaced or reshuffled and some new additions were made up till 2012/2013. The indicators became more general over time, reflecting changes to IFC's M&E guidelines and new indicators were added to better capture the project's activities to develop an insurance product. In 2011 Q2, an output indicator was added to the project's component 1: Number of new financial products designed. In 2013 Q2, an additional outcome indicator was added to the project's component 1: Number of new financial products launched. We feel that the indicators under the best practices component (3) were adequate. We only noticed one instance where an indicator under component 2 "Number of workshops, training events, seminars, conferences, etc." was added (2010 Q2) after a workshop had already conducted. The indicator did not replace another. In the previous recording period (2009 Q4), the Project had already recorded the number of participants that attended a conference session where IFC pitch the Geofund.

4.5 Impact: Unsatisfactory

The Project did not achieve any of the direct or indirect impacts planned because GRI was not piloted. Nonetheless, IFC's experiences informed IBRD and EBRD's current programs in Turkey that also deal with risk mitigation for early stage geothermal development. Having examined the Project documents and talked to stakeholders, we feel that the Project's inability to achieve impacts can be attributed to several reasons: 1.) demand for GRI was fundamentally limited, 2.) it was difficult for IFC to align multiple external stakeholder decisions and timetables, 3.) an increasingly favorable legal and regulatory environment for geothermal generation reduced the scope for GRI, and 4.) the long project cycle of geothermal projects relative to the Project's time frame limited its odds of success.

4.5.1 What long-term changes, direct and indirect, positive and negative, intended and unintended, are likely to result from the Project?

Because the Project did not succeed in piloting the GRI instrument and no impacts were recorded, there are no intended, direct, or indirect long-term changes that can attributed to the project.

Nevertheless, as described in section 4.2.3, the lessons of IFC's experiences informed IBRD's and EBRD's approaches to risk mitigation for early stage geothermal developments.

4.5.2 To what extent has Geofund Turkey achieved its intended impacts by completion as set in its objectives?

Because a project using GRI was not piloted, no direct or indirect impacts were achieved.

The Project set out to achieve the following impacts:

- USD 420 million of direct investment and USD 600 million of indirect investment facilitated in geothermal energy;
- 451.08 thousand tons per year of greenhouse gas production avoided by directly from IFC facilitated projects, and by 644.4 thousand tons per year from projects that were indirectly facilitated through the Project; and
- An increase of 840 thousand MWh per year of energy produced from RE by from IFC facilitated projects, and by 1.2 million MWh per year from projects that were indirectly facilitated through the Project.

Direct impacts would have been recorded if an IFC investment had been facilitated from a pilot project using GRI. Indirect impacts would have been recorded if private sector investment and development of geothermal projects using GRI were facilitated as a result of "first movers" in the sector who are willing to purchase and insure the exploration phase of geothermal developments.

4.5.3 What were the major factors influencing the achievement/non-achievement of results to date, and likely to influence post-completion results?

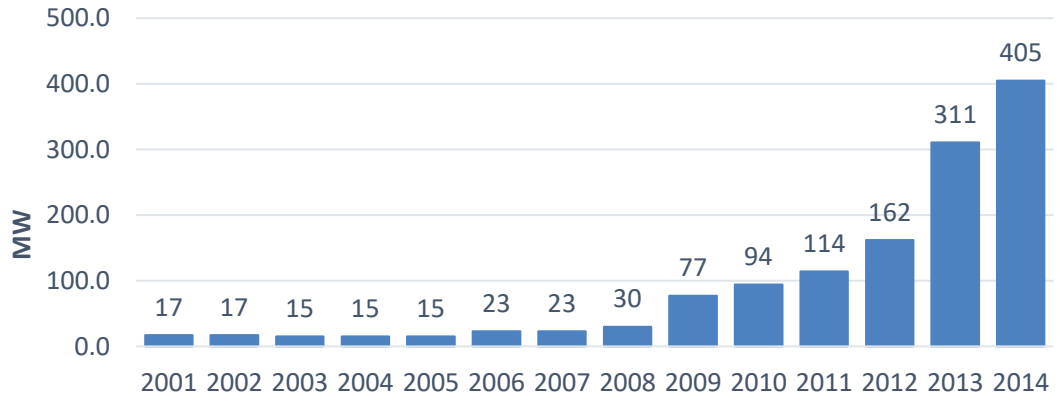
There were several factors that limited the Project's achievement of results:

- **Difficulty aligning multiple external stakeholder decisions and timetables.** There were several missed opportunities for the Project. In one instance, IFC found a suitable project, but no insurance partner had yet been found. When an insurer was found, it took six months to obtain a signed Project Services Agreement (PSA). During that time, the developer proceeded with drilling without an insurance policy despite a draft term sheet having been drawn up. IFC then provided training to the same insurance company and worked closely with them to develop a product for second potential project, but the insurer eventually walked away. In a second instance, a different insurer was ready to insure a project, but the developer proceeded to conduct additional due diligence on its own and was eventually unable to secure financing for the project before the Geofund's project closing date. In short, IFC did what it could to facilitate an agreement between insurers and developers by providing training for an insurance company, working

closely with them to develop a product, and pre-evaluating and pitching projects, but on the first occasion the insurer (SCOR) walked away and on the second, the developer (Eyre) was unable to secure financing. As a result, a project using GRI was not piloted.

- **Increasingly favorable legal and regulatory environment for geothermal power generation reduced the scope for GRI.** The theoretical technical potential of geothermal power generation in Turkey is 4500MW, of which 1000MW is considered economically viable. At the project's inception in 2007, installed geothermal power generation capacity was 23MW, retail electricity tariffs were below cost, and there were no specific RE technology FiTs. By 2010, retail electricity tariffs were cost-reflective and a geothermal FiT had been put in place. Private sector investment in geothermal power generation grew rapidly, increasing from 94MWe in 2010 to 405MWe in 2015, even in fields that were not explored by the MTA. As of August 2017, installed geothermal power capacity was about 1000MW. It is therefore questionable whether there was sufficient market potential for GRI, given the activity of private developers moving ahead without GRI. Figure 4.2 shows amount of installed geothermal power generation capacity in Turkey from 2001 to 2014. Table 4.12 shows geothermal development projects in Turkey by installed capacity and indicates whether exploratory drilling has been conducted by government.

Figure 4.2: Geothermal Power Generation Capacity in Turkey (2001 to 2014)



Source: ESMAP, "Turkey's Energy Transition: Milestones and Challenges". 2015.

Table 4.12: Geothermal Development Projects in Turkey by Installed Capacity and Indication of whether Exploratory Drilling has been Conducted by Government

Project Name	Province - Location	Installed Capacity (MW)	Start-up Year	Initial Drilling by MTA
Kizildere 1	Denizli-Saraykoy	15.00	1984	Y
Dora-1	Andin-Salavatli	7.50	2006	Y
Bereket	Denizli-Saraykoy	6.50	2007	Y

Germencik 1	Aydin-Germencik	47.50	2010	Y
Tuzla	Canakkale-Tuzia	7.50	2009	Y
Dora-2	Aydin-Salavath	12.00	2010	N*
Kizildere 2	Denizli-Saraykoy	60.00 20.00	2014 2014	Y Y
Irem	Aydin-Germencik	20.00	2014	Y
Pamukoren 1+2	Aydin-Pamokoren	44.00	2013	Y
Gumuskoy 1	Aydin-Germencik	6.60	2013	N
Gumuskoy 2	Aydin-Germencik	6.60	2014	N
Sinem	Aydin-Germencik	22.50	2012	Y
Deniz	Aydin-Germencik	22.50	2012	N*
Dora 3U1	Aydin-Salavath	21.00	2013	N*
TR1	Manisa-Alasehir	24.00	2014	N
Dora 3U2	Aydin-Salavath	20.00	2014	N*
Germencik 3	Aydin-Germencik	25.00	2014	N*
Kerem	Aydin-Germencik	22.50	2014	N*

Note: * indicates that an MTA exploration well is close by but not within the Project area

Source: ESMAP. "Comparative Analysis of Approaches to Geothermal Resource Risk Mitigation." 2012.

- **Long project cycle of geothermal projects**. Geothermal projects take about 9 to 13 years (about 6 years in Turkey) to develop from surface studies to plant commissioning.[8] The exploration phase itself can take up to five years. The Project was originally planned for eight years. Given the typical time required for geothermal projects to be developed relative to the Project's duration, it would have been difficult for IFC to achieve facilitate a geothermal investment (one of the impacts foreseen by the Project design) once the time required to conduct a market assessment and develop a project pipeline and insurance product was included.
- **Lack of market appetite.** Interviews and information from the project documents suggest that there was a lack of market appetite for an

[8] NRDC. "Geothermal Energy: Unleashing the Earth's Power to Fuel Chile's Future". 2013.

insurance product in Turkey. The sub-bullets below discuss the viewpoints of the three key stakeholders in the project (developers, insurers, and financial institutions):

- **Financial institutions.** The project approval plan in 2008, the market assessment conducted in 2009, and the 2010 market mapping exercise stated that the Turkish banking sector had experience providing debt financing for power plant construction, but not for geothermal exploration. According to the mid-term review and PSRs, some Turkish banks expressed interest in learning more about geothermal project risks and GRI. One bank also suggested that they would be interested in financing the second phase of exploration drilling (after initial wells are proven to be successful). However, there is some anecdotal evidence to suggest that financial institutions were unwilling to provide financing using GRI as collateral. When IFC staff offered workshops to financial institutions, only one bank was willing to pay to participate, and the one developer who tried to seek project finance using IFC's GRI product was unsuccessful.
- **Developers.** There was certainly interest in the Project, as evidenced by the project proposals IFC received from developers and by the willingness of one reinsurance broker to participate. However, there is some evidence to suggest that market appetite for an GRI was limited to smaller developers who were unable to borrow on a balance sheet basis. Zorlu Group, one of the biggest geothermal developers in Turkey (the most experienced developer that IFC engaged), submitted two project proposals, but eventually went ahead with drilling because there was not yet an insurance counterpart participating in the Project. The two projects that came closest to being insured were from small developers with no experience in the Turkish geothermal market. It is also possible that the favorable legal and regulatory environment for geothermal limited developers' interest. As described above, there was a surge in geothermal development in Turkey, especially after technology specific FiTs and local production premiums were introduced in 2010. Coupled with low drilling costs and a high-risk appetite among geothermal developers, there was less interest in the product, or as one interviewee described it, "complicated financing" from IFC.
- **Insurers.** There was limited interest from the insurance market when IFC pitched a draft term sheet to 13 of the leading insurers and reinsurers. Only three reinsurers expressed initial interest and ultimately only Munich RE was willing to offer the product to developers. According to Project documents and the MTR, reinsurers did not want to cover exploration drilling risk because they felt that the risk was related to a fundamental lack of understanding of a preexisting condition. Data from surface studies was insufficient to determine the productivity of the field, publicly available databases of geothermal monitoring well productivity were not available, and even if they were, resource availability is so site specific insurers felt that the resource risk could not

be assessed or priced. They also believed that the product could increase the incidence of moral hazard.

Munich RE, the only reinsurer willing to offer the product was attracted to Turkey for two reasons: 1.) low drilling costs and 2.) IFC's involvement in conducting due diligence for each project proposal, which lowered their risk exposure. Munich RE has said that it now prefers to offer exploration risk insurance to projects with at least six to eight wells (portfolio approach), and use a phased approach which has several step-out options to limit their risk exposure. Because the risk is the highest in first well, Munich RE also prefers that equity be used to fund at least the first well.

In short, given the favorable legal and regulatory environment for geothermal power development, the unique characteristics of the Turkish private sector (competitive drilling services market and high-risk appetite), and unconventional nature of the product being offered (even to most market players), the market for exploration risk insurance was fundamentally limited.

4.5.4 To what extent was the Project able to demonstrate catalytic or replication effect?

The Project was not able to demonstrate replication effect in its work with insurers and financial institutions because a project using GRI was never piloted.

4.6 Sustainability: Unlikely

The Project only managed to achieve planned outcomes in its work aimed at developers. No impacts were recorded for the Project, and it is unlikely that any will be realized even after the Project's completion. Nevertheless, there may be prospects for the replication and scaling up of a project similar to Geofund Turkey. The Project was the first to attempt to use commercial insurance to facilitate geothermal exploration in an emerging market. Since then, other development partners have developed programs to mitigate exploration risk but few have structured them solely around commercial insurance. These new programs combine finance instruments (contingent grants, concessional loans, and commercial insurance) to mitigate geothermal exploration risk. They are discussed in the section 4.6.5 of the report.

4.6.1 What is the likelihood of sustainability of outcomes and impacts? To what extent has the Project established/enhanced capacity, processes and systems that are likely to be sustained?

As described in 4.2.2, the Project achieved outcomes related to its work with developers (increasing their technical know-how and capacity to develop projects and project proposals that met best practice and awareness/willingness to use GRI), but did not achieve outcomes related to its work with financial developers (increasing their capacity to appraise geothermal projects). The outcomes are limited to IFC's direct work with four developers.

The outcomes achieved included increasing developers' technical know-how and capacity to develop geothermal projects (firm-level), raising their awareness and willingness to use GRI (firm-level), and promoting exploration best practices to ensure

they are widely accepted and adopted (sector-level). We were not able to find evidence of any indirect impact on other developers in the market.

Project outputs targeted at financial institutions (trainings and advisory services to increase knowledge of early stage geothermal finance and project appraisal) were not delivered, and therefore no outcomes were achieved. GRI was never piloted, is not currently being offered in Turkey, and does not appear to be the basis for exploration risk insurance offered in other countries. Because GRI was never piloted, there are also no impacts to be sustained.

Assessment of firm-level outcomes

The sustainability of the firm-level outcomes is likely. According to the PCR, IFC identified areas for improvement on Hateks' project proposal that the developer acted on. We also feel that the uniform criteria applied in the due diligence process would have signaled to developers the standards expected by insurers and investors of the information and presentation of survey study results. We have anecdotal evidence that the sustainability of know-how gained from IFC's exploration best practices guide at the firm-level is likely. One of the developers interviewed said that the material has been "a useful guideline in geothermal project development". The sustainability of developers' willingness to use GRI (limited to those with whom IFC worked) is unlikely because it did not help address their ability to access finance. In the view of one developer interviewed, insurance is not needed in the Turkish market, what is needed is financing. Another developer said:

> *"Unfortunately, the way banks see it in Turkey, geothermal risk insurance does not have an effect on the bankability of the project. The banks and investors think it's 'nice' that we have gone through the process and managed to get an insurance policy but there is no real, tangible, positive effect."*

Assessment of sector-level outcomes

The sustainability of the sector-level outcomes is also likely. The guide is available publicly on the World Bank website and has already been adapted into a textbook that is being offered by IGA. According to a geothermal expert who was involved in putting together the exploration guide, advancements in geothermal exploration technology typically happen every five years and take about ten years to become used widely. As a result, the best practices guide is likely to be useful in the medium term. Nevertheless, the longer-term sustainability of the benefits it offers will ultimately be determined by how widely it is disseminated and used by the geothermal community and whether it maintains its relevance through periodic updates. To the best of our understanding, there is currently no system in place to record and incorporate feedback for future updates.

4.6.2 What are the main internal and external risks and factors (financial, socio-political, institutional framework and governance, environmental etc.) that are likely to affect the persistence of Project outcomes and impacts after the Project's completion? To what extent are the Project results/benefits likely to be resilient to these risks?

As described in section 4.6.1, there is only one outcome—knowledge in the geothermal exploration best practice guide—that can be reasonably assessed and

sustained. Only technological risks are likely to affect the relevance and usefulness of the guide. We assess this risk to be low because according to a geothermal expert that was involved in preparing the best practices guide, advancements in geothermal exploration technology typically happen every five years and take about ten years to become used widely. Therefore, the report can reasonably be updated (every five years) to reflect technological changes to ensure that it meets industry best practice in exploration. To ensure the guide is updated with the most relevant and useful material, IFC or IGA would have to reach out to its users to identify areas for improvement.

4.6.3 What is the likelihood of the implementation of geothermal projects in Turkey in the long run? What incentives are needed to facilitate this process?

The likelihood of implementation of geothermal projects in Turkey in the long run will largely depend on surveys and test drilling to ascertain the geothermal resource potential in Central and Eastern Anatolia and changes in the regulatory and macroeconomic environment.

Turkey has experienced a lot of growth in the sector in the last few years, installed geothermal power generation capacity has increased by more than 4 times from 94MW to 405MW between 2010 and 2015. These investments have largely been driven by a stable political environment up till the end of 2015, a favorable RE FiT regime, low drilling costs, and private sector entrepreneurial spirit. However, the growth in capacity is largely confined to the Western part of the country where the resources have largely been exploited and are even at risk of over exploitation.

Future developments in the market will be contingent on more up to date data on resource availability in the eastern and central parts of the country, the cost of finance, government's signal on the future of FiTs, the cost of competing technologies, and developing a supportive regulatory framework for the regulation of the sector more generally, and other types of geothermal development applications such as heating.

EBRD is currently spearheading efforts to prove and develop new geothermal resources in Eastern and Central Anatolia. If successful, the likelihood that geothermal projects are implemented will be high, given the private sector's willingness to invest in geothermal development. On the other hand, from the developers' perspective, there are several barriers that may temper geothermal investment in the short to medium-term. Currently, the cost of financing for plant construction is high because of the geopolitical instability in the region and because RE FiTs are set to expire by October 2020. According to Turkish developers interviewed, it is unclear whether there will be incentives for RE once the current regime expires, and there are even rumors circulating that the FiTs may change before the 2020 deadline. Unless the GoT extends the validity of FiTs or introduces new incentives for RE, investors might be unwilling to invest in geothermal energy in the medium-term. Another factor, which is closely related to RE incentives is the long-term trend of prices for alternative technologies to RE such as solar, wind, and hydro, as well as conventional fossil fuels. If the cost of these technologies decreases relative to geothermal, investors are less likely to pursue geothermal developments. As described in section 4.5.3, geothermal projects face substantial challenges in obtaining financing because of long project cycle and resource risks in the resource exploration and development phases. Most

geothermal projects will come up against financing constraints unless the project developer has a substantial balance sheet, which it can use to secure loans. There is substantial geothermal potential – 31,500 MW_{th} – for thermal applications but no incentives for geothermal heating and other applications or a supportive institutional and legal framework for private sector participation in the subsector. District heating is under the jurisdiction of municipalities and there is no licensing regime for heat generation. The GoT will need to update legislation to signal to investors and developers the type of return they can expect on their investments. EBRD has commissioned a study to help government identify the appropriate mechanism and price level for future power sector RE incentives.

In the longer-term, IFC staff, development partners, and developers have said that clearer regulations on geothermal resource management and permitting need to be established to ensure that resources are not overexploited, to reduce potential commercial conflicts between neighboring wells, and ensure that proposed plant capacity will not put a strain on the resource and can be operated sustainably for the plants lifetime.

4.6.4 To what extent did the Project undertake actions and succeed to establish a long-term monitoring system?

The Project's M&E data was tracked on IFC's iDESK and ASOP biannually and summarized in Project PSRs.

A post-implementation monitoring plan is not in place and was not recommended in the Project PCR. Given the narrow definition of direct and indirect impacts for the Project, we agree with the PCR's assessment that a post-implementation monitoring system is not required.

4.6.5 What are the prospects for replication and scaling up?

There may be possibilities for the replication and scaling up of a project similar to Geofund Turkey. The Project was the first to attempt to use commercial insurance to facilitate geothermal exploration in an emerging market. Since then, other development partners have developed programs to mitigate exploration risk but few have structured them solely around commercial insurance. The EBRD and WB projects that began implementation in 2016 in Turkey do not use commercial insurance (see Box 4.3 for a description of these programs). The exceptions are IDB's Geothermal Financing and Risk Transfer Program in Mexico and the multi-donor Geothermal Development Facility (GDF) in Latin America, which are combining insurance and finance instruments (contingent grants, concessional loans, and commercial insurance) to mitigate geothermal exploration risk. The IDB Mexico Program and GDF is described briefly in Box 4.3 below:

Box 4.3: Recent Donor Programs that use Commercial Insurance for Early Stage Geothermal Development

IDB's Geothermal Financing and Risk Transfer Program (Mexico). The Program offers loans convertible to grants for exploratory drilling and insured loans for production/capacity drilling through on-lent funds from the CTF and IDB to the State bank Nacional Financiera S.N.C (NAFIN). The convertible loans will cover up to 70 percent of the cost of exploratory drilling for the first two wells (Munich RE is willing to insure exploratory drilling if the premium is more than 30 percent of the insured amount). If the project is successful, the project sponsor pays back 80 percent of the grant to the Loss Reserve Fund. Loans (up to 70 percent of drilling costs) for production/capacity drilling are then offered to the sponsor by NAFIN. This phase of the project is also covered by exploration risk insurance (offered by Munich RE), which will be paid out to NAFIN if minimum outputs are not met.

The GDF in LAC. The Program offers grants that cover up to 40 percent of total costs (up to 6 EUR million) for surface studies through a Risk Mitigation Fund (revolving fund). Contingent grants of up to 40 percent of total costs (up to 6 EUR million) for exploratory drilling of the first three wells are also offered. If exploratory drilling is successful, the project sponsor pays back 80 percent of the grant to the Risk Mitigation Fund (RMF). Loans for production/capacity drilling are then offered to the sponsor through "capacity drilling and investment financing lines" funded by the Central American Bank for Economic Integration(BCIE) or the Development Bank of Latin America (CAF). The loans offered by BCIE or CAF for capacity drilling (wells #4 up to #8) will cover up to 70 percent of a project's drilling cost. Wells #4 to #8 are also covered by exploration risk insurance (offered by Munich RE), which will be paid out to BCIE or CAF if minimum outputs (in MW) are not met.

The premiums and pay outs for each policy under both programs are determined on a case-by-case basis and influenced by the quality of data, geological characteristics, coverage required by the project sponsor, assessed risk, and whether or not the project is brownfield or greenfield.

In short, newer programs offer concessional loans, convertible grants and contingent grants to "insure" the first two to three exploration wells, while commercial exploration risk insurance purchased by the developer indemnifies the loan portion of the total investment in case the subsequent wells to not yield the expected output. Development partners leading these programs on-lend to a state-owned bank (back stopped by sovereign guarantees) to finance 60 to 70 percent of the exploration drilling and only involve commercial insurers once the first 2 or 3 wells are successful. This means that the loans are ultimately contingent liabilities on governments' balance sheets. Depending on a country's macro-economic situation, alternative risk mitigation instruments may be more appropriate. We assess the approaches for mitigating early stage geothermal exploration risk, paying specific attention to financing sources, products, and arrangements section 5.2.

5 Lessons and Recommendations

Section 5 provides lessons and recommendations derived from the evaluation of the Geofund Turkey Project. Some lessons had already been identified in the Project's PCR. Section 5.1 contains our external assessment of these lessons, and section 5.2 provides an assessment of framework conditions that determine financing source and arrangement for geological risk mitigation.

5.1 External Assessment of Lessons Identified in the PCR

We were asked to conduct an external assessment of the lessons identified by IFC in the PCR. Subsections 5.1.1 to 5.1.6 include our assessment of each lesson identified in the PCR.

5.1.1 "Early efforts should include an assessment of market dynamics, demand for the product, and pipeline quality"

IFC expected that companies involved in geothermal exploration would be experienced and in a strong financial position (because of the large investments needed for geothermal exploration). However, some of these companies proved to be inexperienced and financially weak, with an interest in the development of only small resources. The big players in the geothermal sector had no use for the insurance product, as they preferred to self-insure or use their corporate balance sheets as collateral for debt finance.

The PCR concluded that early efforts should have been taken to assess the market dynamics, demand for the product being offered, and quality of any future pipeline.

Evaluator's assessment

We largely agree with the Project team's assessment. An in-depth assessment of the demand for the insurance product would probably have allowed IFC to better structure the insurance component of the Project and realize the need to dedicate more resources to securing buy-in from financiers for such a product. At the same time, IFC appears not to have fully taken onboard the findings of the preliminary market assessment and pipeline identification and screening exercise that was conducted in 2008, and the second market mapping conducted in 2010. The 2008 assessment provided an overview of the Turkish geothermal sector, commercial potential for geothermal development, gaps in the investment climate, and identified and evaluated a list of potential pilots for the Project. The assessment identified key barriers to geothermal development related to the capacity and work quality of geothermal developers. However, it was only after 2012 that IFC incorporated sector-level interventions in the form of developing and disseminating exploration best practices and standards. Before 2012, advisory services were provided at the firm-level only, to projects that were potential candidates for the insurance product, resulting in a self-selection of higher quality project proposals.

The preliminary market assessment also identified the lack of experience of the Turkish banking sector in financing geothermal investments. However, the assessment was limited in that it did not elaborate on banks' hesitation to enter the market or gauge the level of interest for insurance or direct financing and simply concluded that an insurance product would be able to address the financing and

capacity barriers to development. The assessment in 2010 however, included interviews with local banks to assess their interest in financing geothermal projects. The report concluded that banks were most concerned about the credibility and equity available to a project sponsor (sponsor risk) and resource risk. The banks expressed interest in learning about evaluating geothermal projects and openness to financing arrangements that could help increase their willingness to invest. As described in Section2, IFC only started to engage banks in 2013-2014 as part of its best practices component (TA).

IFC also conducted a project identification and screening exercise (in 2008) to reassess IBRD's project pipeline, but found the projects to be unsuitable, completed, or abandoned. IFC then initiated an RFP process in 2009 to establish a new project pipeline and external consultants were hired to evaluate the proposals. The 2010 assessment identified companies that were planning to undertake exploration drilling within the next few months. In this regard, we feel that IFC did the necessary preparatory work, but other factors may have contributed to the characteristics of the companies submitting proposals. In section 5.2 we discuss the conditions that are likely to determine if GRI is the appropriate method for geological risk mitigation.

5.1.2 "IFC should have collaborated with banks from the Project's inception"

IFC expected financial institutions to offer debt financing for the de-risked drilling phase. However, financial institutions were not convinced of the collateral value of the insurance. In 2015, even after Munich RE agreed to insure Eyre's project, Eyre was unable to secure financing.

The PCR concluded that IFC should have collaborated with banks from the Project's inception and involved these banks in structuring the insurance product.

Evaluator's assessment

We agree with IFC's assessment that collaborating with banks from the Project's inception could have increased the likelihood that a project using GRI was piloted, or could have saved resources if it was determined that a GRI product was not a good fit for the Turkish market. Existing programs that incorporate commercial insurance as part of their resource risk mitigation strategy (such as IDB's Geothermal Financing and Risk Transfer Program in Mexico and the multi-donor Geothermal Development Facility in LAC, described in Box 4.3) have secured the buy-in of state-owned banks that offer loans to qualified geothermal projects that use GRI. In the case of an unsuccessful well, the insurance payout is made to the bank (beneficiary). This arrangement increases the bankability of the exploration phase of a project by reducing equity requirements and reducing potential financial losses.

5.1.3 "A sequential project structure, with a knowledge management project followed by a pilot project, is more appropriate for product development"

IFC expected the insurance product to be designed quickly, and for piloting to begin immediately. However, the product design was delayed because of the novelty of it,

unfamiliarity of insurers with the geothermal market, and the challenge of quantifying risks.

The PCR concluded that a sequential project structure would have been more appropriate, beginning with a knowledge management project (to test the hypothesis and gauge market demand) then a client facing pilot project. This structure applies to any project where new products are being developed and/or tested, particularly if there are known high risks at the project onset.

Evaluator's assessment

We agree with IFC's assessment that a more clearly staged approach and a detailed needs assessment could have improved or brought up alternative products to insurance that IFC could offer to geothermal developers. When we asked IFC staff why the project decided to focus on insurance they cited the conceptual advantages of improved risk allocation to mitigate resource risk and accelerate geothermal development in Turkey. Experience from the Project and interviews with two developers revealed that the value of GRI is probably limited in the Turkish context. In section 5.2, we evaluate the framework conditions that are likely to make GRI an attractive product to developers.

5.1.4 "Project teams should be given flexibility to determine the best method for solving an identified problem"

IFC expected that the development of the product would be expedited because of the project's narrow focus on insurance. However, since only one insurer was willing to take on the risk, the Project had to work within the restrictions of that insurer's timeline, priorities, and pricing.

The PCR concluded that the Project team should be allowed flexibility in the method of addressing the identified problem.

Evaluator's assessment

We agree with the PCR's assessment and characterization of this lesson. IFC had underestimated the time it would take to develop an insurance product and find an insurer to offer it. A draft term sheet was drawn up in 2010, but it was only in 2015 that an insurance product was finally launched, after the Project's original deadline. We learned from interviews that because the project was GEF-funded and a decision was made early on to develop an insurance project, changes to the Project's scope would have required substantial efforts requiring different levels of approval. Recognizing this, the Project team decided to push on but put in place a phased approach to the project (at the request of regional management) to ensure the project was reevaluated in 2012. In 2012, the project identified other ways to increase IFC's value addition to Turkey's geothermal sector and introduced sector-level interventions with the best practice component.

5.1.5 "An assessment should be done early on to identify skills needed to complete a project and staff to fill each skill"

IFC expected that the Project could be effectively managed utilizing the combined skills of IFC (in RE and insurance), and consultants (to provide technical input). However, a dedicated expert may have been more effective in addressing geothermal specific problems and risks.

The PCR concluded that pre-implementation should involve an assessment of skills needed to successfully complete the Project and the necessary staff to fill those skills should be involved as early as possible and when attempting to design new financial products, the relevant industry experts should be involved in pre-implementation, to set the scope and limitations of the new design.

Evaluator's assessment

We agree with IFC's assessment that the Project's staffing requirements should have been determined before implementation. Given the niche nature of the Project's interventions, it is also possible that IFC was unable to determine with specificity the types of expertise required to develop an insurance product. Thus, we suggest that staffing is highlighted as an operational risk in PSRs and subject to regular monitoring and assessment. In retrospect, IFC staff indicated that it would have been useful to have insurance and geothermal experts assigned to the project who could dedicate about 40 to 50 percent of their time to the assignment. Sections 4.3.2 and 4.3.5 describe our evaluation of the efficiency and effectiveness of the Project's staffing.

5.1.6 Projects involving the development of financial tools may need a regional/global focus to ensure an adequate pipeline of clients

IFC expected that there would be sufficient interest in piloting the insurance product, because of the good geothermal potential and vibrant private sector in Turkey. However, the Project had difficulty finding interested companies that had a strong track record in building and operating geothermal energy projects.

The PCR concluded that a regional or global focus is more appropriate for projects involving the development of innovative financial tools, particularly when there is a limited project pipeline due to long lead times.

Evaluator's assessment

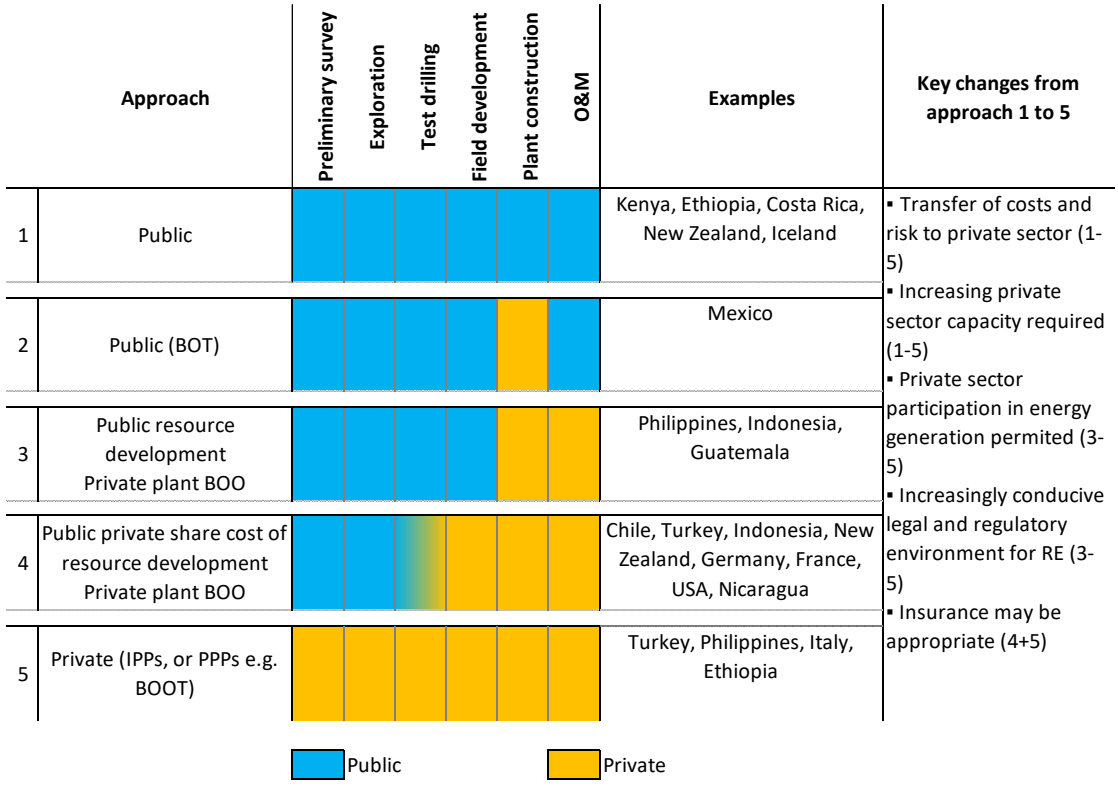
Conceptually, we agree with IFC that a regional or global approach that gave the team flexibility to develop a suite of financial tools tailored to individual projects or countries could have increased IFC's chances of success. A regional or global approach would enable IFC to direct its resources to projects with the greatest readiness, especially in a sector with long project lead times and limited insurance providers. However, a regional or global approach would probably also require a relatively larger administrative budget compared to a programmatic approach, in order to be efficient and effective. It should be noted the Project was initially part of a larger regional Geofund umbrella Program, that was cancelled because of administrative cost overruns. According to the implementation and results report of the Geofund Program, the administration budget was depleted just three years after

the project started because the Project team had to "identify, market, solicit, prepare, and review proposals for all possible Geofund subprojects." The cost of M&E is also likely to be higher especially the recording of indirect impacts from a project, where market level data must be collected regardless of the size of an intervention.

5.2 Assessment of Framework Conditions that Determine Financing Source and Arrangement for Geological Risk Mitigation

IFC has asked us to assess the conditions under which it is most appropriate to cover drilling risk from public sources, request full coverage from private investors, or develop an insurance product. As shown in Figure 5.1, many approaches, with varying degrees of private sector involvement, have been used to develop geothermal resources. Countries such as Ethiopia, New Zealand, and Turkey have used multiple approaches to develop geothermal power plants, suggesting that more than one approach can be used within a country's context.

Figure 5.1: Approaches for Developing Geothermal Power Plants (Private v. Public)



Source: Adapted from ESMAP. "Geothermal Handbook: Planning and Financing Power Generation". 2012.

General framework conditions necessary for private sector entry into RE markets

There are a widely-agreed set of framework conditions that are important for the scaling up of RE technologies in general. The single best set of intermediate indicators we know of are the Readiness for Investment in Sustainable Energy (RISE) indicators, included in Appendix H. These RISE indicators, in our view, provide good guidance on

determining the characteristics of the legal and regulatory environment to facilitate private sector investment in RE. Turkey scores 71 out of 100 on the RE RISE indicators, well above the average score of 58 for the Europe and Central Asia region. Among these indicators, Turkey received a perfect score on legal framework for RE, and network connection and pricing. Turkey also scores high on incentives and regulatory support for RE and attributes of financial and regulatory incentives.

Framework conditions necessary for private sector entry into geothermal markets

There are also conditions—specific to geothermal investment—that are important in attracting private sector interest. Important conditions include:

- **The existence of an experienced and capable geothermal/oil and gas services sector.** The sector can be private or public sector led (when private sector capacity is relatively limited). Experience and technical know-how are important to ensure that surface studies, drilling programs, and geothermal systems are designed well and cost effectively.
- **Availability of data on resource potential and geological conditions.** The availability of resource/geological maps and information on resource potential and productivity of potential fields contribute to increasing private sector interest in early stage geothermal development. However, the availability of field level data may have limited impact on increasing private sector interest because geothermal resources are extremely volatile and on-site surveys and exploration must be conducted to confirm resource availability – a process that can be up to 30 percent of the total investment required for geothermal development.
- **A relatively low cost of exploration.** In the same vein, if the costs of exploration are low, private sector will be more willing to undertake early stage geothermal developments in greenfield areas.

Attractiveness of financing/risk mitigation products to types of market players

Because resource confirmation requires substantial investment, access to finance is key to stimulating private sector interest in early stage geothermal development. A market player's access to finance is determined by its financial position, which in turn determines which types of financing/risk mitigation products would be attractive to it.

Table 5.1 compares approaches to financing for early stage geothermal development to types of geothermal developers. For simplicity, we define large developers as firms that can finance geothermal development on their balance sheet and small/medium firms as those that have to raise external equity.

Table 5.1: Approaches and Financing Source for Early Stage Geothermal Development

Approach	Financing source	Small/Medium developers	Large developers
Capital subsidy/cost sharing	Private equity firms/funds (project finance)	Interested but unlikely to be able to secure. Private Equity (PE) typically seeks returns of above 20% and is unlikely to be interested in	Has sufficient equity to self-finance or seek cheaper alternative options

		utility sector returns (about 12% in the United States, may be lower in other countries)	
	Donors/development partners (grants, concessional loans, guarantees, equity)	Very interested in concessional financing from donors because the alternative is costly private equity and banks are not structured to offer project finance for early stage geothermal development	May perceive processes to qualify for donor funds as bureaucratic and slow and less interested than small/medium developers
	Banks (corporate finance)	Banks are not familiar or comfortable in providing financing for what they perceive as business risk	Can obtain loans on the basis of the performance of other business lines
Fiscal incentives	Government (tax incentives)	Reduces the overall cost of investment for all developers but may not be sufficient (depends on cost of capital of any given project)	
Insurance	Commercial insurance (exploration risk insurance)	May be interested when resource risk is perceived to be very high, exploration costs are high (very deep wells in low enthalpy regions such as Europe), but are unlikely to be able to afford the premium under those circumstances	Can lower risk factor and boost net present value of future revenues to increase bankability of project or be used to obtain a bridge loan. More likely to be interested when resource risk is perceived to be very high, exploration costs are high (very deep wells in low enthalpy regions such as Europe)
	Donors (co-underwriter in partnership with insurer, subsidy for insurance premium)	May be interested when resource risk is perceived to be very high, exploration costs are high (very deep wells in low enthalpy regions such as Europe). Subsidy helps make premium more affordable	May perceive processes to qualify for donor funds as bureaucratic and slow and less interested than small/medium developers

Source: Adapted from ESMAP. "Comparative Analysis of Approaches to Geothermal Resource Risk Mitigation." 2012.

Evaluators assessment

In short, even if the enabling conditions are conducive (supportive legal and regulatory environment, availability of supporting infrastructure, availability of technical capacity to carry out geothermal development) for private sector *entry* into the geothermal market, a developer will only invest if the return on risk-adjusted net present value of future revenues is higher than the cost of capital required – owing to the long lead time and resource risk inherent in early stage geothermal development. Resource risk can be mitigated through government-funded exploration (approaches 3 and 4 in Figure 5.1), but when government does not have the capacity and funds to conduct early stages of geothermal development, several financing options remain (Table 5.1). As shown in Table 5.1, Government can offer fiscal incentives to reduce the cost of investment (no direct fiscal outlays) or donors can offer concessional financing to reduce the cost of capital or equity requirements of a project. Companies with healthy balance sheets will more likely prefer to rely on commercial financing or use their own equity to finance a project. Commercial insurance can, in theory, reduce equity requirements if a developer can use it to secure a bridge loan or boost the bankability of a project because of risk transfer to the insurance provider. However, as the Project's experience has shown, banks are not keen to offer financing on the basis of GRI and large companies have been willing to go ahead with drilling without the insurance product. Private equity, which typically seeks high returns, is also unlikely to be interested in projects that as one interviewee characterized "require oil and gas investments with utility returns". In short, commercial insurance is likely to only be demanded by small to medium developers that have limited equity and cannot raise commercial financing.

Appendix A: Required Project Identification and Financial Data for Submission to GEF

Project and Terminal Evaluation Data

GEF Project ID	4224
IA Project ID	557205
Project name	Turkey Geofund
Country	Turkey
Implementing agency / agencies	World Bank (IFC)
Executing agency / agencies	N/A
Focal area	Climate Change
GEF strategy / operational program	OP#6 – RE use and energy conservation
Date of work program approval	March 2010
Date of CEO endorsement	May 2010
Date of project start / effectiveness	May 1, 2007
Date of project completion (completion of project activities; indicate expected or actual)	June 30, 2016
Name of evaluators	Denzel Hankinson, DHInfrastructure; Deborah Ong, DHInfrastructure; Nicole Rosenthal, DHInfrastructure
Date of terminal evaluation completion	

Financial data

Project Preparation through PDF/PPG grants (in US $)

Particulars	At approval	At PDF/PPG completion
GEF PDF/PPG grants for project		
Co-financing for project preparation	191,524	191,524

GEF's Project Funding

Particulars	At CEO endorsement	At project completion
GEF project grant	10,000,000	1,766,364

Co-financing[9]	10,650,000	662,347
Total	20,650,000	2,428,711

Project Co-financing Break up

Name of the Co-financer	**Co-financer type[16]**	**Type of co-financing[17]**	**Co-financing at project start**			**Actual Co-financing at project end**		
			In-kind	**Cash**	**Total**	**In-kind**	**Cash**	**Total**
IFC	Exec. agency	In-kind	1,150,000		1,150,000			-
Global Environmental	Reimbursable accounts				-			170,884
IFC SBI-Child/sustainable energy	Donors/ MNTAAS pooled							14,265
CA fees from clients	AS client fees							5,652
SEGEF Geofund Turkey	Donors							300,000
IFC FMTAAS for GEF portfolio administration-climate change	FMTAAS							171,546
Grand Total								662,347

[16] Examples of categories include: local, provincial or national government; semi-government autonomous institutions; educational and research institutions; private sector; multilateral or bilateral organizations; Non-profit organizations; and, others.

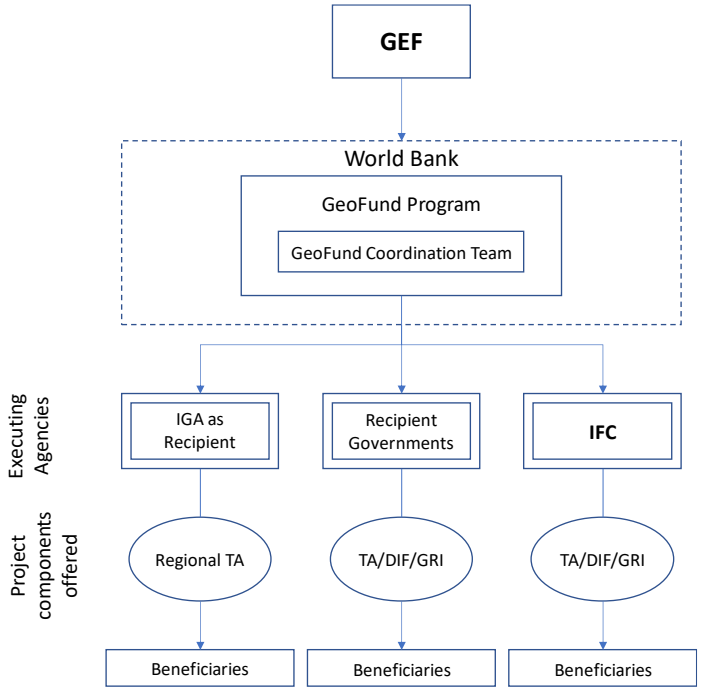
[17] Grant; loan; or equity participation by beneficiaries (individuals) in form of cash, in-kind or material contributions.

[9] Includes levered co-financing

Appendix B: Rationale and Scope of the Umbrella Geofund Program

Geothermal Energy Development Program or the "Geofund" Program, is a regional facility that was developed by the World Bank (World Bank) and funded by the GEF to promote the use of geothermal energy in Eastern ECA by systematically removing common barriers to RE development and specific barriers to geothermal resource development. The Program was implemented on a project-by-project basis in various countries, each lasting up to eight years. The Geofund Program funded projects in Armenia, Hungary, and regionally though the International Geothermal Association. Projects were executed by government line ministries/World Bank, International Geothermal Association (IGA)/World Bank, or IFC/World Bank. The institutional arrangement and instruments/components offered through Geofund is shown in Appendix Figure B.1 below.

Appendix Figure B.1: Institutional Arrangement and Instruments Offered by Geofund



Note: TA refers to Technical assistance; DIF refers to Direct investment window; GRMI refers to GRI window

Source: World Bank, "Project Appraisal Document for the Geofund Program", 2006.

At the Program's inception, the World Bank identified several barriers to RE and geothermal development that were similar across the ECA region including:

- **Institutional, legal, and regulatory barriers.** The institutional, legal, and regulatory environment in many ECA countries is not conducive for RE development. Barriers include market distorting energy policies such as subsidies for fossil fuels or below cost heat and electricity tariffs, and incomplete or unclear regulatory frameworks for RE. Moreover, in the ECA region it is common for the heat or electricity off-taker (often a

state-owned, vertically-integrated utility or transmission company) to be financially weak and uncreditworthy.

- **Knowledge and capacity barriers.** Substantial knowledge and capacity gaps often exist in the public and private sectors at the decision-making, investment, and end-user levels. Such gaps limit the ability of governments and the private sector to coordinate and implement RE projects. Many countries in the region also lack inadequate baseline data on RE resources that would allow help developers and policymakers to identify potential investments.
- **Barriers in accessing finance.**[10] Access to commercial finance in the region—especially to project finance—is limited. Many financial institutions will lend only on a balance sheet basis, which limits the ability of smaller developers (without collateral) to acquire the financing required for infrastructure investments such as RE projects. Moreover, lenders often do not understand or know-how to appraise loans for RE projects.
- **RE technology barriers.** These barriers include the relative high upfront costs and non-dispatchable nature of some RE power and heat generation technologies compared to fossil fuel based generation, the exception being technologies such as geothermal generation. While the cost of some RE technologies such as solar have declined because of technological advancements, until energy storage solutions become economical, it will be difficult for RE to displace fossil fuel based generation on a large scale.
- **Specific barriers for geothermal.** There are specific barriers which limit geothermal resource development. Unlike other RE technologies, there are high upfront costs and risks associated with identifying a suitable site, and accurately assessing the resource potential for geothermal heat or electricity generation. There is a substantial risk that a chosen site might not have any resource, or that the resource temperature will be inadequate for production of electricity or heat. Geothermal exploration and test drilling can take up to four years. Even if sufficient resources are found at the testing stage, the life and productivity of geothermal wells is unpredictable, and premature depletion of the resource is common. Moreover, geothermal development poses unique environmental risks such increased seismic activity, water contamination, and CO_2 emissions from electricity generation.

The Program aimed to systematically remove these barriers through three components:

- **Component 1: Technical assistance.** This component included studies to identify and prioritize measures to improve the enabling environment for RE development; improving resource databases; providing training to

[10] Access to finance is not limited to RE development. Access to finance is an economy wide barrier to non-public investments in infrastructure.

sector stakeholders to increase capacity and knowledge to develop geothermal projects; conducting pre-feasibility, feasibility, due diligence; and preparing business plans for potential projects.

- **Component 2: Direct investment.** The Program had a direct investment funding window, to provide concessional loans, grants, and contingent grants to buy down the capital costs for geothermal drilling, reinjection wells, and post-drilling project implementation. Projects and countries with limited resources to develop their geothermal sectors – out of date or poor resource data, limited availability of commercial financing, limited capacity of project sponsors – were priority candidates for grant or concessional financing.
- **Component 3: GRI (compensation scheme).** The Program proposed a GRI window to mitigate geothermal exploration risks (low resource yield at test site) and operations risk (early resource depletion). Projects participating in the facility would be appraised to determine key indicators of exploration/operation success such as well head temperature and flow rate. The parameters would be used to determine the extent of success/failure of the project and associated value of compensation (up to 85 percent of allowed testing, drilling, exploration, and operations costs). Project sponsors would pay a premium for the insurance product and the payout would be contingent on the occurrence of a risk event (failure to meet defined and agreed parameters from the project appraisal stage).

Appendix C: Statements from IFC, World Bank, and GEF Strategies Relevant to the Geofund Turkey Project

Appendix Table C.1 below shows statements from statements from IFC, World Bank, and GEF Strategies that support the Project's relevance.

Appendix Table C.1: Statements from IFC, World Bank, and GEF Strategies That Show the Project's Relevance

Policy/strategy document	Priority/strategy/policy statement
IFC FY08 Investment Strategy	As the private sector member of the World Bank Group, IFC is helping private companies identify business risks associated with climate change as well as business opportunities. IFC provides its client companies with expert advice on reducing, managing, and mitigating the impacts of climate change on their businesses and on investing in sustainable energy and carbon finance. By leveraging its investments and partnerships, IFC is playing a key role in helping the private sector address climate change. In response to the need for concessional resources to remove barriers and lower costs to climate friendly investments, IFC utilizes GEF and other donor funding for private sector projects that help transform markets. These projects are done in partnership with the private sector and highlight the potential for innovative and catalytic approaches.
World Bank RE and EE Action Plan (2004)	"With the aim of ensuring an institutional focus on the transition toward cleaner energy sources, the World Bank Group commits with the concurrence of its Board of Directors to a target of at least 20 percent average growth annually – in both our energy efficiency commitments and our RE commitments – over the next five years (FY05 – FY09)."
World Bank CPS 2004-2006	"The objective of this CAS is to help Turkey continue to implement fundamental reforms to reduce economic vulnerability and achieve high and stable growth, and continue the process of addressing long neglected social and environmental problems. … "The planned assistance program for FY04-06 is structured around four development themes in line with the Government's priorities: ▪ Sound macroeconomics and governance ▪ Equitable human and social development ▪ Attractive business climate and knowledge ▪ Strong environmental management and disaster prevention" IFC will rely on its established multi-prong strategy focusing on projects with tangible benefits of growth and reform and on demonstration projects that could be replicated elsewhere.

World Bank CPS 2008 - 2011	"The goal of the new Bank Group CPS for FY08-11 is for the Bank Group to be a partner with Turkey in realizing her development vision-to achieve fast and sustained growth with equity-through full integration into the Government's formulated development strategy. Accordingly, the CPS is shaped directly by Turkey's Ninth Development Plan and by the Government's Program and aims at contributing to three main development pillars: (i) improved competitiveness and employment, (ii) equitable human and social development, and (iii) efficient provision of high-quality public services."
World Bank CPS 2012-2015	"This CPS aims to contribute to Turkey's goal of fast, sustainable and inclusive growth that respects the environment. Its design reflects priorities established in Turkey's own development frameworks, notably the Ninth Development Plan 2007- 20131 and the 2012-2014 Medium Term Program, and is intended to be flexible to adapt to changes. The main criterion for World Bank Group (WBG) support in Turkey is its 'strategic value-added', through a combination of financing, analysis and advice, implementation support to help address development challenges, and the sharing of global experience to provide benchmarks and help inform the development and implementation of policies and programs. The CPS has three main strategic objectives and pillars: enhanced competitiveness and employment; improved equity and public services; and, deepened sustainable development."
GEF-3 Strategic Program on RE Use: Operational Program 6: Promoting the Adoption of RE by Removing barriers and Reducing Implementation Costs	"GEF activities in this Operational Program will remove identified barriers to and reduce implementation costs of RE technologies in a specific market."

Appendix D: Summary of Project Outputs

The Project's outputs from the Preparation Phase is summarized in Appendix Table D.1. Appendix Table D.2 summarizes outputs from the Implementation Phase.

Appendix Table D.1: Outputs from the Project Preparation Phase

Type of output	Description	Stakeholders targeted
Part A: Turkey's Geothermal Market Potential (2008)	Describes preliminary market assessment of geothermal projects, identifies priority projects and their constraints, and identifies key players in geothermal	IFC/IBRD
Part B: Assessment and feasibility study on Potential Projects (2008)	Identifies potential pipeline projects and initial assessments with respect to geological resource availability, technical capacity, operational capacity, project economics, financial analysis, and regulatory issues	IFC/IBRD
Geofund Turkey Project Promotional Workshop (2009)	IFC pitched the Geofund Project to the geothermal community in Turkey	Developers, financial institutions, insurers
Evaluation of Geothermal Well Productivity Risk for New Wells at the Kizildere Geothermal Project (2010)	Technical report for a pilot applicant evaluates resource risk and focuses specifically on Productivity Risk Insurance (PRI)	Developers, Insurers
Market Mapping of Geothermal Energy in Turkey (2010)	Memo report on potential investors that are operating or planning to enter in the geothermal market in Turkey with an investment of at least 10 MWel capacity, and current trends, opportunities and major challenges that are common in the market	IFC
Development of a Geothermal Well Productivity Risk Insurance Program Kizildere (2010)	Information package discusses the geothermal market, key variables to consider and define, draft term sheet, and next steps	Developers, Insurers

Appendix Table D.2: Outputs from the Project Implementation Phase

Output category	Type of output	Description	Stakeholders targeted
Workshop	TA Workshop at Turkish International RE Congress (2011)	Sessions on geothermal risk, evaluating drilling success, and the requirements and benefits of the insurance product	Developers

	Best Practice Launch Workshop (2013)	The sessions covered the following topics: geothermal exploration best practice, phases of geothermal projects, key financial risks of geothermal, managing project risks, structuring finance for geothermal projects	Developers, financial institutions
	Developer Workshop (2013)	There were four workshops on: seismic methods, resistivity surveying and electromagnetic methods, water-rock interaction, alteration minerals and mineral geothermometry, isotope and gas geochemistry of geothermal systems	Service Providers, Developers, and Academia
	Planned: Geothermal Financing Workshop (2014)	Workshop on project finance for geothermal development to increase financial institutions' capacity to appraise geothermal projects	Financial Institutions
Knowledge product	Market Mapping Geothermal Energy (2010)	Study focuses on potential investors operating or planning to enter geothermal market and current trends, opportunities, and challenges	Developers, financial Institutions
	A Guidebook for Geothermal Investment in Turkey (2010)	Presents general and country-specific information to help lay the foundation for private investment in geothermal power projects	Developers, financial Institutions, and Policy Makers
	Database of Geothermal Wells (2011)	Global database with information on 2,527 wells and drilling success	Developers
	Best Practices Guide ed. 1 (2011)	Describes process of geothermal development, financing mechanisms, and guidelines for data presentation	Developers
	Drilling Success Report (2013)	Analyzes overall success rate of wells and the factors that affect success	Developers and financial Institutions
	Best Practices Guide ed. 2 (2014)	Provides information on tools and techniques for identifying and defining a geothermal resource to minimize geothermal exploration risk	Developers, Contractors, and financial Institutions
	CO_2 Emissions Report (2014)	Analyzes the natural occurrence of gases in geothermal fields and methods for maintenance and monitoring	Developers, Other IFIs
AS report	TA Report on Hateks Salihli License (2010)	An environmental report describes geological and geophysical surveys, hydrothermal activities in the region, and provides a geothermal resource assessment	Developers

Inspection and Evaluation of Hateks Project Site (2011)	Describes the activities and observations made during a visit to the project site, an evaluation, and recommendations	Developers, Insurers
Kayen Energy Project Memo (2011)	Memo describes financial details, geographic area, technical summary, a plan, schedule, and budget for the project, and a geological map	Developers, Insurers
Geothermal Risk Insurance Evaluation Hateks (2013)	Assesses the viability of the geothermal resource and ranks the resource in terms of geothermal features, geological, geochemical, and geophysical data, temperature data, and well drilling, logging, and testing	Developers, Insurers
Review of Exploration Data and Well Sites Selected by Hateks (2013)	Technical brief evaluating project suitability for GWPI in terms of the current state of the project, level of understanding of the resource, and the choice of drill sites	Developers, Insurers
Geothermal Risk Insurance Evaluation Transmark Turkey – Gulpinar (2014)	Details technical and financial information, plans and procedures, and evaluation and scoring of the project	Developers, Insurers
Geothermal Risk Insurance Evaluation Transmark Turkey – Kestanbol (2014)	Details technical and financial information, plans and procedures, and evaluation and scoring of the project	Developers, Insurers
Transmark Renewables Assessment (2014)	Report outlines the company's history and structure, history in geothermal power, team, business plan, and financial strength	Insurer (Munich RE)
Exploration Risk Insurance Term Sheet (2014)	Details exploration risk insurance conditions, measures, reimbursements, premiums, deductibles, etc. for geothermal development in Turkey	Developers

Appendix E: Key Project Team Members and External Consultants Involved in the Project

Appendix Table E.1: Key Project Team Members and External Consultants Involved in the Project

Name	Role/Scope of work	Dates of involvement
Alexios Pantelias	Business Line Specialist / Global Product Specialist/Transaction Leader (February 2009 – July 2010)	February 2009 – February 2014
Patrick Avato	Transaction Leader	July 2010 to project completion
Tom Harding-Newman	Transaction Leader (Proxy/Energy Specialist)	January 2011 to project completion
Shinya Nishimura	Transaction Leader	August 2008 – February 2009
Sandeep Kohli	Transaction Leader	August 2007 –August 2008
Jan Mumenthaler	Industry specialist/Head Insurance Services Group	Augusts 2011 – March 2015
Patrick Luternauer	Regional Business Line Manager	July 2012 – March 2015
Martin Dersk	Financial Markets	2012
Efstratios Tavoulareas	Senior Energy Advisor (International)	July 2013 – August 2015
Helmut Schreiber	Program Manager (World Bank)	April 2008 – July 2009
Fjarhitun Consulting Engineers	▪ Overview sector/regulatory framework ▪ Resource mapping ▪ Identify gaps in investment climate ▪ Identify the potential pipeline of projects that may be supported under the Geofund projects ▪ Provide initial assessments of pipeline projects on geological resource availability, technical and operational capacity, project economics, financial analysis, and regulatory issues	January 2008 – December 2009
Verkis Consulting Engineers	▪ Compile comments and conclusions resulting from the technical assistance activities for assessment of project candidates to support from Geofund in Turkey	May 2009 – July 2009

	▪ Assess applications to identify priority projects to be supported under the Geofund program	
IGA Service GmbH	▪ Peer review and update the best practices guide ▪ Secure endorsements of the Guide by financial institutions and key stakeholders ▪ Launch Event	January 2013 – December 2013
GeothermEx	▪ Evaluate feedback from Insurers from Kizildere GWPI concept ▪ Prepare a "Good Practice Guide" for Geofund GWPI applicants currently in the exploration (pre-drilling) phase ▪ Specify required elements for Geofund applications and criteria for project selection by IFC ▪ Evaluate up to 10 proposals for additional Geofund support ▪ Prepare technical and underwriting reports for up to 3 additional projects ▪ Monitor Geofund-supported projects	November 2010 – July 2014
SAM GmbH	▪ Develop a mapping of approximately 10 geothermal licenses/projects in Turkey ▪ Submit a final briefing memo and result presentation summarizing the conducted work with a database of projects and the current trends, opportunities, and challenges common to the surveyed license holders/developers and banks	November 2008 – January 2011
GreenMax Capital Advisors	Conduct a Mid-Term Review of the GEF supported SEGEF Geofund Turkey project	November 2012 – April 2013

Appendix F: Sources of Evidence

F.1 Project Documents

Appendix Table F.1 below describes the types of documents that the Project has shared with us.

Appendix Table F.1: Description of Shared Documents

Type of Document	Description
Internal IFC documents (Operations)	▪ Email correspondences ▪ Back to the Office Reports (BTORs) ▪ Office Memorandums ▪ PSRs (1 to 17) ▪ AS Approval Reports (January 2008, October 2010) ▪ PCR ▪ Integrity due diligence of developers for potential IFC engagement
Internal IFC documents (Legal)	▪ Memorandums of Understanding ▪ Mandate/engagement letters (Derin Jeotermal, Eyre Enerji, Transmark) ▪ Cooperation agreements (Hateks Energy) ▪ Grant Agreements (IGA Services) ▪ Project services agreements (Munich RE, SCOR SE) ▪ Training services agreement (TSKB) ▪ Trust fund agreement (Iceland) ▪ External consultant contracts ▪ GEF focal point endorsement letter ▪ GEF CEO approval
Project outputs (Project preparation)	▪ Market Assessment report (Fjarhitun Consulting) ▪ Identification and assessment of potential pipeline projects report (Fjarhitun Consulting) ▪ Appraisal of GRI and TA proposals (Verkis)
Project outputs (Component 1 and 2)	▪ REOI and Request for Proposals for potential sponsor projects ▪ Technical due diligence and underwriting reports ▪ Annual client feedback survey results (2012-2015) ▪ Exploration Risk Insurance Policy Term sheet
Project outputs (Component 3)	▪ Workshops/Conferences – 2009 IGA International Geothermal Workshop ➢ Participants list – 2011 RE Conference (Greenpower) ➢ Presentations on drilling data, good practice for the collection, interpretation and presentation of geothermal resource data, GWPI update, risk and management in geothermal development, drilling success rates analysis, IFC's financing in RE in ECA ➢ Sponsorship ToR

	➢ Contract with Greenpower ➢ Contract modification for an additional closed-door workshop – 2013 IGA Developers workshop ➢ Developer workshop feedback (2013) ➢ IGA workshop participant list ➢ IGA academy seminar programs – 2014 geothermal financing workshop ➢ Invitation ▪ Best practices – Best practices publication (1st and 2nd edition) ▪ Drilling success database ▪ Global report on drilling success (IFC/GeothermEx) ▪ Report on GHG emissions of geothermal power plants in Turkey (GeothermEx)
Miscellaneous reports	▪ Geofund aims and plans PowerPoint

Note: Component 1 refers to Diffuse GRMI to wider geothermal developer community; Component 2 refers to Geothermal exploration best practice; Component 3 refers to Create and pilot a geological risk mitigation instrument

F.2 Interviews

Appendix Table F.2 shows our interview log.

Appendix Table F.2 Interview Log

Interviewee	Meeting time (EST)
Tom Harding Energy Specialist running the project	10-Aug-17 10AM
Patrick Luternauer Global relationship lead (acting head of regional advisory services)	15-Aug-17 9:30AM
Matthias Tonnis Underwriter Munich RE	16-Aug-17 9AM
Sandeep Kohli Transaction leader early stage	21-Aug-17 10AM
Erdin Cetin Zorlu	24-Aug-17 9AM
Dr. Adona Hererra-Martinez PLUTO Initiative	24-Aug-17 9AM
Colin Harvey IGA engineer that wrote best practices	24-Aug-17 5PM
Jan Mumenthaler Principle insurance officer	29-Aug-17 9PM
Martin Dasek Climate Finance Specialist	31-Aug-17 9PM

Alexios Pantelias Transaction leader before Patrick	11-Sep-17 11AM
Kerim Ertan Eyre	5-Sep-17 9AM

Below we list the potential Interviewees who we have reached out to but have either not heard back from or with whom we have not yet scheduled interviews:

- Marit Brommer/Alex Ritcher, New IGA executive director replacing Ms. Sander
- Ali Hocaoglu, Hateks
- Rogier Pieterse (Ralph van Hof), Transmark
- Bertand Le gall, SCOR
- Shinya Mishimura, Transaction leader early stage
- Fuphan Chou, IFC investments
- Shinji Yamamoto, Head of IFC investments in geothermal energy globally

Appendix G: Evaluation Questions and Evaluation Approach by DAC Criteria

Appendix Table G..G.1 to Appendix Table G..G.6 describe our evaluation approach to answering each of the evaluation questions listed in the ToR. We have recategorized some of the evaluation questions and indicate in the tables how they were categorized under a different DAC criterion.

Appendix Table G..G.1: Evaluation Questions by Approach: Relevance

Evaluation question	Information required	Information source	Data analysis method[11]
To what extent were the design and implementation of the Project relevant to and aligned with the priorities, policies/strategies of IFC and the World Bank in Turkey?	▪ Statements of Project, IFC, and World Bank strategic priorities in Turkey	▪ Project documents, particularly PSRs, donor reports, original AS plan, and work plans and strategies ▪ Other relevant IFI documents, particularly World Bank country partnerships strategies for Turkey and IFC sector strategies ▪ Project staff and (as appropriate) other development institutions/partners	▪ Review Project documents ▪ Review IFI documents ▪ Interview Project staff and review Project documents to understand expected outputs, outcomes, and impacts of Project ▪ Assessment (by evaluation team) of appropriateness of the Project's strategy of intervention, given our understanding of IFC and World Bank strategies/development objectives in Turkey

[11] Where interviews with Project staff and clients, or other donors are mentioned, please refer to **Error! Reference source not found.** for suggested interviewees. We will further develop and finalize these lists when discussing the Inception Report with IFC. We have developed a draft list of questions to be asked of Project staff, clients and donor partners in **Error! Reference source not found.**.

Evaluation question	Information required	Information source	Data analysis method[11]
To what extent were the interventions undertaken under the Project relevant to the country's context (at the time of the evaluation and at the time the Project was being developed)? To what extent has the Project fostered client buy-in and contributions?	▪ Understanding of operational environment (i.e. political, macroeconomic, access to finance, and legislative conditions at Project inception and presently) ▪ Understanding of barriers to geothermal development when the project was being developed and presently (at the time of the evaluation) ▪ Understanding of market demand for GRMI when the project was being developed and presently ▪ Understanding of client commitment to Project activities ▪ Understanding of how and whether needs have changed ▪ Other experts' views of market demand for GRMI	▪ Clients and (as appropriate) prospective clients (developers, insurers, and financial institutions) ▪ Project staff (as appropriate) other development institutions/partners ▪ Target countries' national plans and strategies for energy and RE ▪ Project documents, particularly: client and workshop feedback forms; market studies; IFC/client pitches and agreements; and PSRs ▪ Third-party reports and data related to market barriers to geothermal development and demand for GRMI in Turkey ▪ Third-party reports and data on operational environment in Turkey, including media reports, reports commissioned by IFIs, and the World Bank development indicators database	▪ Interview Project staff and clients (and prospective clients) ▪ Review Project documents relating to client needs and commitment ▪ Review Project documents describing Project objectives, rationale, and statement of market failure ▪ Review country sector strategies to understand national priorities ▪ Review third-party documents to understand and document country and sector context ▪ Assessment (by evaluation team) of Project's responsiveness to market needs (ability to address market/technology specific barriers)

Evaluation question	Information required	Information source	Data analysis method[11]
To what extent did the Project respond adequately to changes in the macroeconomic and market context that occurred over the course of its implementation?	▪ Understanding of key changes in market context (access to finance, legislation etc.) and macroeconomic changes over the course of Project implementation ▪ Understanding of Project staff response (if any) to market context and macroeconomic changes over the course of Project implementation	▪ Project staff ▪ Clients ▪ Project documents, particularly meeting notes, PSRs and ASOP data on risks and intervening factors ▪ Third-party reports and data on macroeconomic, market context, and other intervening factors, including World Bank Governance Indicators, media reports, and other IFI reports	▪ Interview Project staff and clients to better understand Project risks and macroeconomic and market context changes and their responses to them ▪ Review Project documents to understand risks and macroeconomic and market context changes ▪ Desk research to understand intervening factors and compare with Project documentation ▪ Assessment (by evaluation team) of changes to Project priorities or focus areas in response to market context or macroeconomic changes and the extent to which they were adequate
Have potential synergies between Geofund Turkey and other related E&RE projects both in the country of implementation and in the ECA region, whether ongoing or completed, been optimized?	▪ Understanding of E&RE projects that were ongoing or completed in Turkey and ECA during Project implementation ▪ Understanding of specific projects with which the Project coordinated ▪ Understanding of how the Project attempted to make use of possible synergies	▪ Project staff ▪ Project documents describing complementarities with other projects, particularly PSRs, work plans and strategies, and meeting notes ▪ World Bank, GEF, and other IFI project databases	▪ Interview Project staff to understand which E&RE projects the team coordinated and the extent to which synergies with them were optimized ▪ Desk research to identify projects with potential synergies with Geofund Turkey during the Project's implementation ▪ Review project documents to understand identified complementarities with other projects ▪ Assessment (by evaluation team) of the extent to which potential synergies between Geofund Turkey and other projects were optimized

Appendix Table G..G.2: Evaluation Questions by Approach: Effectiveness

Evaluation question	Information required	Information source	Data analysis method
What were the expected outputs of Geofund Turkey? To what extent were these delivered, in a timely manner and with satisfactory quality?	▪ Information on the expected outputs of the Project ▪ Information on the extent to which targets for the Project's outputs were delivered	▪ Project documents relating to expected versus actual results, particularly PSRs, donor reports and ASOP data ▪ Project deliverables (e.g., workshop and conference materials, technical due diligences etc.) ▪ Project staff and clients	▪ Review Project documents/deliverables to assess the differences between the expected and actual outputs produced during the Project's implementation ▪ Interview Project staff and clients to assess the timeliness and quality of the Project's outputs
What were the intended outcomes of Geofund Turkey? To what extent have intended outcomes been achieved?	▪ Information on the expected outcomes of the Project (targets and whether they were met)	▪ Project documents relating to expected versus actual results, particularly PSRs, donor reports and ASOP data ▪ Project staff and clients	▪ Review Project documents to assess differences between expected and actual results ▪ Interview Project staff and clients to assess the differences between expected and actual results
What unintended outcomes (positive and negative) have occurred?	▪ Information on any unintended outcomes	▪ Project documents relating to expected versus actual results, particularly PSRs, donor reports and ASOP data ▪ Project staff and clients	▪ Review Project documents to understand any identified unintended outcomes of the Project ▪ Interview Project staff and clients to understand any of unintended consequences of Project activities

Evaluation question	Information required	Information source	Data analysis method
Are the achieved outcomes of the Project commensurate with the Project's objectives?	▪ Information on the expected outcomes of the Project (targets and whether they were met)	▪ Project documents relating to expected versus actual results, particularly PSRs, donor reports and ASOP data ▪ Project staff and clients	▪ Review Project documents to assess the extent to which achievements contributed to the removal of market barriers to geothermal development in Turkey ▪ Interview Project staff and clients to the understand their perspectives on the extent to which achievements contributed to the removal of market barriers to geothermal development in Turkey ▪ Assessment (by evaluation team) of the extent to which the achieved outcomes of the Project are commensurate with the Project's objectives
To what extent does the Project effectively generate, manage, apply and share knowledge and learning? *This question was moved from the list of questions under the sustainability criteria	▪ Understanding of knowledge sharing practices and effectiveness	▪ Clients ▪ Project staff ▪ Project documents related to knowledge sharing, particularly PSRs, client and workshop feedback forms, original AS plan, work plans and strategies, and meeting notes	▪ Interviews with Project clients or representatives on the extent of knowledge sharing and learning ▪ Identification, in Project documents or through interviews of steps specifically taken to promote knowledge sharing and learning ▪ Assessment (by evaluation team) of effectiveness of knowledge sharing practices
Differentiating between Project components, where has Geofund Turkey achieved significant traction/results, and where not?	▪ Understanding of Project activities by component ▪ Understanding of successes and challenges by component	▪ Project staff ▪ Project documents, particularly PSRs, donor reports, ASOP data, client agreements, work plans, and meeting notes	▪ Review Project documents to assess Project activities by component ▪ Interview Project staff to understand successes and challenges by component and

Evaluation question	Information required	Information source	Data analysis method
To what extent was the Project able to facilitate the development of the market?	▪ Understanding of the factors contributing to the development of the geothermal sector in Turkey since the Project's inception to the present ▪ Understanding the extent to which developments of the market can be directly attributed to Project activities	▪ Project staff ▪ Clients ▪ Industry stakeholders ▪ Local geothermal sector experts ▪ Project documents, particularly PSRs, Project PCR, and donor reports ▪ Third-party reports on the geothermal market developments in Turkey	▪ Review Project documents to understand the factors contributing to the development of the geothermal sector in Turkey since the Project's inception ▪ Conduct desk study of secondary reports/data to understand the factors contributing to the development of the geothermal sector in Turkey since the Project's inception ▪ Interview Project staff, clients, industry stakeholders, and geothermal sector experts to obtain their perspectives on the extent to which the Project helped facilitate geothermal sector development ▪ Assessment (by evaluation team) on the extent to which the Project helped facilitate geothermal sector development

Evaluation question	Information required	Information source	Data analysis method
What were the major factors influencing the achievement/non-achievement of results?	▪ Understanding of intervening factors (expected and unexpected) led to or did not lead to the achievement of Project outputs and outcomes	▪ Project staff ▪ Clients ▪ Project documents relating to intervening factors, particularly PSRs, ASOP data, work plans, and meeting notes ▪ Third-party reports and data on intervening factors (expected and unexpected) in the Project's logframe, including media reports, other IFI reports, World Bank development indicators database, and World Bank Governance Indicators	▪ Interview Project staff and clients, and review Project documents to understand effect of intervening factors on operations ▪ Third-party research to understand intervening factors ▪ Assessment (by evaluation team) on the major factors that influenced the achievement/non-achievement of Project results

Appendix Table G..G.3: Evaluation Questions by Approach: Efficiency

Evaluation question	Information required	Information source	Data analysis method
To what extent has the Project been cost-effective in achieving results, relative to comparable initiatives of GEF, IFC and/or other stakeholders in the sector? Considering the costs and results, to what extent has Geofund Turkey provided value-for-money?	▪ Budget and human resource expenditure by Project component and activity ▪ Planned and actual delivery dates for outputs ▪ Budgets for comparable donor programs (e.g., other Geofund sub-projects)	▪ Project documents relating to budget and output delivery date information, particularly PSRs and ASOP data ▪ Terminal evaluations of other Geofund sub-projects ▪ Third-party reports on other donor activities and levels of resources used ▪ Project staff views on IFI programs worthy of comparison	▪ Review Project documents to assess budget utilization ▪ Review Project documents to understand cost-effectiveness of output delivery and potential economic benefits derived from the Project ▪ Interview Project staff to get views on use of resources and potential economic benefits derived from the Project ▪ Desk research to understand level of resources used by other projects/programs or institutions to produce similar outputs (to try to establish parameters of comparison)
To what extent was the Project's design appropriate to meet its objectives and expected results in terms of i) the selection and sequencing of activities/components, ii) funding, iii) time frame, and iv) human resources? *This question was originally categorized under the Relevance criteria	▪ Understanding of selection and sequencing of Project activities ▪ Understanding of Project and activity budgets, schedules, and staffing	▪ Project staff ▪ Clients ▪ Project documents relating to planned versus actual activities, particularly the original AS plan, work plans and strategies, meeting notes, and PSRs	▪ Interview Project staff ▪ Interview Clients ▪ Review Project documents to assess differences between planned activities for a given period and activities actually implemented in that period ▪ Assessment (by evaluation team) of appropriateness of project plan compared with expected results
To what extent were resources allocated appropriately and efficiently across the three Project	▪ Understanding of Project's allocation of resources among components	▪ Project staff ▪ Clients	▪ Review Project budget to understand the allocation of resources among Project components

Evaluation question	Information required	Information source	Data analysis method
components and activities under each component?[12] *This question was originally categorized under the Relevance criteria	▪ Understanding of the relevance of Project interventions (analysis from question above)	▪ Project documents describing budget and resource allocation, particularly PSRs, work plans and strategies, and meeting notes ▪ Third-party reports and data on market barriers to geothermal development in Turkey	▪ Interview Project staff, clients and where appropriate other IFC/World Bank department staff involved in the project (market finance and access to finance teams) to understand needs and satisfaction with resource allocation ▪ Assessment (by evaluation team) of appropriateness of resource allocation
To what extent is the Project appropriately staffed, and can it field the right expertise?	▪ Understanding of staffing levels and expertise	▪ Project staff ▪ Clients ▪ Project documents related to staffing levels, particularly PSRs, work plans and strategies, and meeting notes	▪ Interview Project staff, clients and other donors to collect views on staffing levels and expertise ▪ Review Project documents to understand Project staffing levels
Have links with E&RE global resources been leveraged?	▪ Understanding of IFC's E&RE Group work ▪ Understanding of which resources IFC used and why	▪ Project staff ▪ Staff from IFC departments that were and/or could have been involved in the Project	▪ Interview Project staff and representatives from other parts of IFC and World Bank group

[12] This question was initially under the criteria of relevance. We feel that the question relates more to efficiency (of implementation) than project design.

Evaluation question	Information required	Information source	Data analysis method
What could have been done to improve efficiency?	▪ Budget and human resource expenditure by Project component and activity ▪ Planned and actual delivery dates for outputs	▪ Project documents relating to budget and output delivery date information, particularly PSRs and ASOP data ▪ Terminal evaluations of other Geofund sub-projects ▪ Third-party reports on other donor activities and levels of resources used ▪ Project staff views on IFI programs worthy of comparison	▪ Review Project documents to assess budget utilization ▪ Review Project documents to understand cost-effectiveness of output delivery and potential economic benefits derived from the Project ▪ Interview Project staff to get views on use of resources and potential economic benefits derived from the Project ▪ Desk research to understand level of resources used by other projects/programs or institutions to produce similar outputs (to try to establish parameters of comparison) ▪ Assessment (by evaluation team) of possible actions/measures that could have been conducted to improve the efficiency of the Project
To what extent have resources been well used in achieving outputs and outcomes? *This question was moved from the Work Quality criterion	▪ Budget and human resource expenditure by Project component and activity ▪ Budget and human resource expenditure used by comparable donor initiatives	▪ Project staff ▪ Project documents relating to budget and output delivery date information, particularly PSRs and ASOP data ▪ Terminal evaluations of other Geofund sub-projects ▪ Third-party reports on other donor activities and levels of resources used ▪ Project staff views on IFI programs worthy of comparison	▪ Review Project documents to assess budget utilization ▪ Review Project documents to understand resource allocation to produce Project outputs ▪ Interview Project staff to get views on use of resources and potential benefits derived from the Project ▪ Desk research to understand level of resources used by other projects/programs or institutions to produce similar outputs

Evaluation question	Information required	Information source	Data analysis method
			(to try to establish parameters of comparison)

Appendix Table G..G.4: Evaluation Questions by Approach: Impact

Evaluation question	Information required	Information source	Data analysis method
What long-term changes, direct and indirect, positive and negative, intended and unintended, are likely to result from the Project?	▪ Outputs and outcomes achieved to date as compared to targets ▪ Unintended outcomes achieved ▪ Likelihood of long-term impacts from the outputs and outcomes	▪ Project documents relating to outputs and outcomes achieved to date, particularly PSRs and ASOP data ▪ Project staff and (as appropriate) other implementing partners ▪ Clients	▪ Review of Project documents on outcomes achieved ▪ Interview questions, for Project clients and staff, of likely impacts (intended and unintended) ▪ Assessment (by evaluation team) of likely impacts (intended and unintended)
To what extent has Geofund Turkey achieved its intended impacts by completion as set in its objectives?	▪ Intended impacts ▪ Understanding of Project activities and projects to date that have contributed to achieving intended impacts	▪ Project documents related to planned versus actual schedule of activities, particularly PSRs, ASOP data and work plans ▪ Project staff and clients	▪ Interview questions, for Project clients and representatives, of intended impacts of the Project ▪ Interview questions, for Project clients and representatives, of intended impacts of the Project ▪ Review of Project documents to compare planned schedule of activities with actual activities ▪ Assessment (by evaluation team) of the extent to which intended impacts were achieved

Evaluation question	Information required	Information source	Data analysis method
What were the major factors influencing the achievement/non-achievement of results to date, and likely to influence post-completion results?	▪ Understanding of intervening factors and their influence on the achievement/non-achievement of the Project's post-completion results	▪ Clients ▪ Project staff ▪ Project documents relating to intervening factors, particularly PSRs, ASOP data, the original AS plan, work plans, and meeting notes ▪ Third-party reports (media reports, other IFI reports) and data (on intervening factors)	▪ Interview questions, for Project staff, on effect of intervening factors on Project activities ▪ Interview questions, for Project clients and representatives, on intervening factors ▪ Review of Project documents for evidence of intervening factors ▪ Desk research on macroeconomic, political and, access to finance in the target countries and the historic (or likely) timing of those factors ▪ Assessment (by evaluation team) of major factors influencing achievement the Project's post-completion results
To what extent was the Project able to demonstrate catalytic or replication effect?	▪ Lessons learned and recommendations ▪ Lessons and recommendations from other Geofund sub-projects and comparable third-party initiatives (e.g. IDB Geothermal Financing and Risk Transfer Program; KfW Geothermal Risk Mitigation Facility for Eastern Africa)	▪ Project staff ▪ Clients ▪ Other donors ▪ Project documents related to lessons learned, particularly PSRs, ASOP, donor reports, and meeting notes ▪ Lessons and recommendations from comparable third-party initiatives	▪ Interview questions for Project staff, clients and other implementing partners, on lessons learned and recommendations ▪ Review of Project documents for lessons learned and recommendations ▪ Comparison to other, similar Projects (in other countries or other sectors) for lessons or recommendations that apply

Appendix Table G..G.5: Evaluation Questions by Approach: Work Quality

Evaluation question	Information required	Information source	Data analysis method
What was the quality of the outputs?	▪ Information on outputs produced as part of the Project ▪ Information about the quality of outputs produced as part of the Project	▪ Clients ▪ Project staff (as appropriate) other implementing partners ▪ Project outputs such as reports and workshop/conference materials ▪ Project documents describing outputs and work quality such as the PCR, feedback surveys from workshops etc.	▪ Interview questions for Project staff, clients and other implementing partners, on the quality of outputs produced ▪ Evaluation team review of Project documents for the work quality of outputs
To what extent have the operational risks been well managed?	▪ Understanding of the Project's risks and ratings history ▪ Understanding of internal and external risks of the Project ▪ Understanding of the Project's risk management processes	▪ Project staff ▪ Project documents relating to risk identification and mitigation such as AS plans and approvals, PSRs, and ASOP data ▪ Third-party reports and data on intervening factors in Turkey	▪ Interview Project staff to collect views on risk identification and mitigation practices ▪ Review Project documents to assess risk identification and mitigation practices ▪ Assessment (by evaluation team) of whether correct operational risks were identified, monitored and mitigated effectively ▪ Desk research to confirm our understanding of operational risks and intervening factors

Evaluation question	Information required	Information source	Data analysis method
How well did Geofund Turkey communicate and involve with donors and other stakeholders?	▪ Understanding of the Project's communications with other donors and stakeholders	▪ Project staff ▪ Clients ▪ Project documents relating to stakeholder outreach and stakeholder and client feedback, particularly PSRs, work plans and strategies, meeting notes, and correspondences	▪ Review Project documents to understand extent of stakeholder outreach and review feedback provided by stakeholders and clients ▪ Interview Project staff, clients and other implementing partners to understand their points of view on communications and involvement with the Geofund Turkey Project
To what extent was a sound M&E plan to monitor progress and track results towards achieving objectives designed and implemented, and adequately budgeted for?	▪ Understanding of the Project's M&E plan, progress and revisions over the course of implementation ▪ Project budget for M&E (planned and actual)	▪ Project staff ▪ Project documents relating to M&E plan and results framework, particularly AS approval reports, PSRs, PCR, and ASOP	▪ Interview Project staff to understand key revisions to the M&E plan over the course of implementation ▪ Desk research to understand indicators and targets used in comparable initiatives ▪ Assessment (by evaluation team) of the adequacy of the M&E plan design, implementation and budget
To what extent was the Project's results measurement system appropriate and well managed? Were quantitative and qualitative data available for the indicators defined in the results framework? Were selected indicators adequate?	▪ Understanding of results measurement practices and indicators ▪ Indicators used in comparable initiatives	▪ Project staff ▪ Project documents related to indicator data and results, particularly, PSRs, ASOP, PCR, and work plans and strategies ▪ Indicators used in identified comparable initiatives	▪ Interview Project staff about the appropriateness of the results measurement system ▪ Desk research to understand indicators and targets used in comparable initiatives and by other IFI projects/programs ▪ Assessment (by evaluation team) of adequacy of indicators and suitability of targets

Appendix Table G..G.6: Evaluation Questions by Approach: Sustainability

Evaluation question	Information required	Information source	Data analysis method
What is the likelihood of sustainability of outcomes and impacts?	▪ Information on the replicability of the GRMI designed ▪ Information on the useful life of various knowledge products produced by the Project ▪ Information on the environmental and social sustainability of geothermal thermal and electricity generation	▪ Project staff ▪ Clients ▪ Project documents relating to the evidence of sustainability, particularly PSRs, the PCR, workshop and conference feedback, correspondences, and meeting notes ▪ Project documents discussing the environmental and social risks of geothermal thermal and power development ▪ Project output discussing the emissions from geothermal power generation	▪ Interview questions for Project clients on the likely sustainability of the work ▪ Interview questions for Project staff on the likely sustainability of the work ▪ Identification, in Project documents or through interviews of steps specifically taken to promote sustainability ▪ Identification, in Project documents or through interviews of activities that have already proven to be unsustainable (for example, fallen into disuse or no longer relevant to the market context) ▪ Assessment (by the evaluation team) of the extent to which Project activities are likely to be sustainable

Evaluation question	Information required	Information source	Data analysis method
What were the main internal and external risks and factors (financial, sociopolitical, institutional framework and governance, environmental etc.) that are likely to affect the persistence of Project outcomes and impacts after the Project's completion? To what extent are the Project results/benefits likely to be resilient to these risks?	▪ Understanding of the Project's risks and intervening factors ▪ Understanding of the Project's outcomes and impacts ▪ Understanding of the Project's benefits	▪ Project staff ▪ Project documents identifying Project risks and achieved outcomes and impacts including PSRs, PCR, ASOP ▪ Third-party reports and data on risks and intervening factors in particular information on the operational environment (political, economic, financial, institutional, governance changes over the lifetime of the Project)	▪ Review Project documents to understand risks and intervening factors ▪ Review third-party reports and data to understand risks and intervening factors, particularly key changes in the operational environment that are likely to affect the persistence of Project results/benefits ▪ Interview Project staff to understand risks and intervening factors that are likely to affect the persistence of Project results/benefits ▪ Assessment (by evaluation team) of the key risks and factors that are likely to affect the persistence of Project results and benefits as well as the extent to which Project results/benefits are likely to be resilient to these risks/intervening factors

Evaluation question	Information required	Information source	Data analysis method
To what extent has the Project established/enhanced capacity, processes and systems that are likely to be sustained?	▪ Capacity building activities undertaken by the Project ▪ Information on processes and systems put in place by the Project to support sustainability ▪ Information on any activities that have already proven to be unsustainable	▪ Project staff ▪ Clients ▪ Project documents relating to evidence of sustainability, particularly PSRs, original AS plan, work plans and strategies, client and workshop feedback forms, and meeting notes	▪ Interview questions for Project clients on the likely sustainability of the work ▪ Identification, in Project documents of whether processes and systems were formalized (for example best practice guidelines or drilling success analysis) ▪ Identification, in Project documents or through interviews of steps specifically taken to promote sustainability ▪ Identification, in Project documents or through interviews of activities that have already proven to be unsustainable (for example, have been repealed, superseded or fallen into disuse) ▪ Assessment (by the evaluation team) of the extent to which Project activities are likely to be sustainable

Evaluation question	Information required	Information source	Data analysis method
What is the likelihood of the implementation of geothermal projects in Turkey in the long run? What incentives are needed to facilitate this process?	▪ Understanding of market barriers to geothermal development in Turkey ▪ Understanding of existing and tried incentives to facilitate geothermal development in Turkey and globally ▪ Understanding of the present and expected investment climate for geothermal developments in Turkey in the long run	▪ Project staff ▪ Clients ▪ Industry stakeholders (developers, financiers, insurers, professional associations, government) ▪ Project output on best practices for geothermal development ▪ Third-party documents on geothermal development trends, barriers, and incentives	▪ Interviews with Project staff to obtain their views on geothermal development in Turkey in the long run and the incentives required (if any) to facilitate this process ▪ Interviews with industry stakeholders to obtain their views on geothermal development in Turkey in the long run and the incentives required (if any) to facilitate this process ▪ Review Project outputs to understand best practices for geothermal development ▪ Review third-party documents to understand geothermal development trends, barriers, and incentives ▪ Assessment (by evaluation team) of potential incentives (if any) that are required to facilitate geothermal development in Turkey
To what extent did the Project undertake actions and succeed to establish a long-term monitoring system?	▪ Understanding of the Project's plans for monitoring & evaluation	▪ Project staff ▪ IFC M&E team ▪ Project documents relating to the systems for monitoring the Project's progress, in particular PSRs, PCR and the ASOP	▪ Interviews with Project staff on the actions they took to establish a monitoring system for the Project

Evaluation question	Information required	Information source	Data analysis method
What are the prospects for replication and scaling-up?	▪ Understanding of developer, financiers, and insurer's interest in using GRMI in developing geothermal projects (e.g., does a GRMI sufficiently reduce exploration and drilling risks, is GRMI suitable collateral in obtaining debt financing for exploration and drilling, is GRMI a marketable insurance product) ▪ Understanding of any existing replication of project outcomes for other geothermal developments in Turkey and globally	▪ Project staff ▪ Clients ▪ Industry stakeholders (financiers, insurers, and developers) ▪ Third-party research and data on geothermal risk mitigation instruments/measures that are available and used in Turkey and globally	▪ Interview questions for Project staff and clients on how the Project outputs could and have been used and replicated else where ▪ Desk research to inform assessment of GRMI by evaluation team ▪ Assessment (by evaluation team) of the likelihood that Project outputs and outcomes are scaled up in Turkey and globally ▪

Appendix H: RISE Renewable Energy Indicators

The Readiness for Investment in Sustainable Energy (RISE) indicators were developed jointly by the World Bank and IFC to compare the investment climate of countries across the three focus areas of the Sustainable Energy for All (SE4ALL) initiative: energy access, renewable energy and energy efficiency; and in four categories: planning, policies and regulations, pricing and subsidies, and procedural efficiency. The RISE indicators are a result of wide-ranging stakeholder consultations with external and internal advisory groups and more than 200 private sector representatives in more than 30 countries.

Appendix Table H.1: RISE Renewable Energy Indicators

Indicator	Sub-indicator	RISE Evaluation Questions	Scoring	Maximum Score	Traffic Light
Planning for renewable energy expansion	Renewable energy in expansion planning	Does an electricity expansion plan that includes renewable energy development exist?	Yes - 100; No - 0	100 (Sum and divide by 4)	**Green: 75 or greater** **Yellow: 25 to 75** **Red: Less than 25**
	Renewable energy in transmission planning	--Does current transmission planning consider renewable energy scale-up? --Is there an anticipatory planning process for least-cost expansion of transmission network infrastructure in order to connect one or more renewable energy plants?	For each: Yes - 50; No - 0		
	Target with an action plan	--Does a renewable energy target exist? --If yes, does a renewable action plan to attain the target exist?	For each: Yes - 50; No - 0		
	High quality resource mapping	--Does a high quality validated national atlas of renewable energy resource potential exist? --Does strategic planning or zoning guidance for renewable energy resources exist?	See note		

Indicator	Sub-indicator	RISE Evaluation Questions	Scoring	Maximum Score	Traffic Light
Legal framework for renewable energy	--	Does a legal framework for renewable energy development exist?	Yes - 100; No - 0	100	**Green: 100** **Red: 0**
Regulatory policies	Incentives to grid-connected renewable energy	Are there incentives for grid-connected renewable energy generation?	Yes - 50; No - 0	100	**Green: 100** **Yellow: 50** **Red: 0**
	Incentives to distributed renewable energy	Are there incentives for distributed renewable energy generation?	Yes - 50; No - 0		
Regulatory policies - policy design attributes	Predictability	Does the policy possess the following attributes: -- renewable purchase obligation? -- rules on price level modification and frequency? -- provisions in auctions to deter aggressive pricing?	For each: Yes - 100; No - 0 (Choose the maximum)	100 (Sum and divide by 3)	**Green: 75 or greater** **Yellow: 25 to 75** **Red: Less than 25**
	Sustainability	Does the policy possess the following attributes: -- the renewable energy subsidy is passed through to the consumer tariff? -- the renewable energy subsidy is less than 2% of total residential electricity bill?	For each: Yes - 50; No - 0		
	Accessibility	Does the policy possess the following attributes: -- prioritized access to the grid (priority dispatch)? -- grid code with measures or standards to manage/operate variable renewable energy? -- clear policies/rules on curtailment cost (full, partial, or no compensation)?	For each: Yes - 33.3; No -0		

Indicator	Sub-indicator	RISE Evaluation Questions	Scoring	Maximum Score	Traffic Light
	Remuneration efficiency	Does the policy lead to a price incentive that is sufficient to cover the costs of generation?	Not scored during pilot stage		
Network connection and pricing	Connection cost allocation	--Are there rules about the allocation of connection costs? --If yes, what is the type of the connection cost allocation policy (super shallow, shallow, or deep)?	1. Yes - 50; No - 0 2. Super shallow - 50; Shallow - 25; Deep - 0	100 (Sum and divide by 2)	**Green: 75 or greater** **Yellow: 25 to 75** **Red: Less than 25**
	Network usage pricing	Are there rules defining who pays for transmission and distribution wheeling charges?	Yes - 100; No - 0		
Public financial support mechanisms	Credit enhancement	Does the government offer credit enhancement or risk mitigating (through reserve accounts, sovereign guarantees or other)?	Yes - 25; No - 0	100	**Green: 75 or greater** **Yellow: 25 to 75** **Red: Less than 25**
	Utility payments guarantee	Does the government offer backing of utility payments (with letter of credit or other)?	Yes - 25; No - 0		
	Fiscal incentives	Does the government offer fiscal incentives for renewable energy?	Yes - 25; No - 0		
	Public financing supports	Does the government offer public financial incentives for renewable energy?	Yes - 25; No - 0		

Note: Scoring for the “high quality resource mapping” sub-indicator is as follows:

A full score of 50 for resource mapping requires that it possess three standards: 1. Modeling outputs that are validated by ground level measurements for at least one year; 2. A spatial resolution of 10km or better; and 3. Temporal coverage equal to or greater than 10 years. The standards have equal weight and the resource with the most attributes is chosen for the final score.

A full score of 50 for the strategic planning and zoning guidance requires that it possess four attributes: 1. Considered systematic renewable energy mapping outputs alongside other factors; 2. Undertaken as part of a strategic environmental social assessment; 3. Included appropriate stakeholder engagement; and 4. Is

consolidated into government policy and communicated to stakeholders. The attributes have equal weight and the resource with the most attributes is chosen for the final score.

Source: *RISE: Readiness for Investment in Sustainable Energy – A Tool for Policymakers: Pilot Report*, Washington, DC, World Bank, 2014.

Appendix I: Terms of Reference

TERMS OF REFERENCE

SEGEF Geofund Turkey project
Terminal (final) evaluation of the GEF-funded Geofund Turkey project

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IFC invites interested consultants to design and implement the terminal (final) evaluation of the SEGEF Geofund Turkey project; the implementation phase of the project completed on June 30, 2016. The review will respond to the requirement of the donor, the GEF, and provide a comprehensive and systematic account of the performance of the project by assessing its design, the performance of the project and impact of the project's operations and management, as well as derive lessons learned that can be used for the development of similar projects.

A. Objectives/Purpose of Assignment

Background of the Project

The IFC is the private sector arm of the World Bank Group and pursues its mission of reducing poverty and improving people's lives by promoting sustainable private sector development through investment and advisory services. As part of its global mandate, IFC is supporting activities to address climate change by promoting RE and energy efficiency investments in emerging markets.

IFC also implements projects financed by the Global Environment Facility (the GEF, www.thegef.org).

The GEF-funded Geofund Turkey project (the Project) was launched in June 2007. Originally a World Bank project approved by the GEF Council in May 2003, Geofund was a multi-country facility with the objective of systematically promoting the use of geothermal energy in the ECA region by removing the most serious barriers to the development of geothermal energy, which included: (i) knowledge and information barriers; (ii) institutional, policy, legal and regulatory barriers, and (iii) financial barriers. In the context of this umbrella program, SEGEF Geofund Turkey received GEF CEO Endorsement on May 04, 2010 to address the removal of barriers in the geothermal sector in Turkey.

The full Project was funded with USD 10 million (USD 8.0 million concessional financing, USD 1.7 million TA, and USD 0.3 million as contingency that could be used for either purpose) and had the objective to promote geothermal energy utilization in Turkey by addressing the main market barriers. The identified barriers of geothermal energy utilization were:

a. limited technical know-how and experience on part of both project developers and financial investors;
b. high upfront costs and risk relative to other heat/power technologies, especially for geothermal resource confirmation;
c. limited access to long-term financing required for the investments.

While these barriers had been assessed specifically for Turkey, to some degree they were intrinsic to geothermal energy globally. Therefore, it was expected that the approach, tools and learnings from this Project in Turkey could be replicated in other countries and regions by IFC.

The increase of geothermal energy production capacity by developing and implementing a number of financially viable projects in Turkey was expected to help to accelerate the use of geothermal energy, build private sector confidence in investing in this resource, and demonstrate to the regulatory bodies at national and local government levels approaches to address geothermal resource risks cost effectively.

The Project had three components:

1. Develop and pilot geothermal GRI for Turkey;
2. Replication of the insurance to the broader market;
3. Develop and establish geothermal exploration best practice, build the capacity of developers to improve project quality and aid financial institutions in assessing the merits of different geothermal projects.

The Project expected to achieve the following key impacts:

- Facilitate direct investment in geothermal energy - USD 420 million investment facilitated directly by the Project with an additional USD 600 million facilitated indirectly;
- Increase the amount of energy produced from renewable resources - 840,000 MWh/year from RE produced directly with an additional 1,200,000 MWh/year indirectly produced;
- Avoid the production of greenhouse gases (GHGs) - 451,080 tons/year GHG emissions avoided directly with an additional 644,400 tons/year GHG emissions expected to be avoided indirectly.

Objectives of the Assignment

Terminal evaluations have four complementary purposes:

a. To promote accountability and transparency, and to assess and disclose levels of project accomplishment;
b. To synthesize lessons that may help improve the selection, design, and implementation of future GEF and IFC activities;

c. To provide feedback on issues that are recurrent across the portfolio and need attention, and on improvements regarding previously identified issues;
d. To contribute to the GEF Evaluation Office databases for aggregation, analysis, and reporting on the effectiveness of GEF operations in achieving global environmental benefits and on the quality of M&E across the GEF system.

The lessons and recommendations prepared by the Consultant should include examples of good practices for all aspects of the Project that are relevant to the type of project at hand or to the GEF's overall portfolio, or applicable for other projects in the country, region or the focal area.

The Consultant will assess the factors and processes that affected the attainment of Project's results, as well as different types of risks to the sustainability of the project's outcomes, and rate those risks. The evaluation should also describe the catalytic or replication effect of the Project (if any). The Consultant will also assess the design of the Project's M&E framework and the implementation of the Project's M&E plan, and provide an assessment of the Project's plan for the monitoring of long-term changes which was scheduled for the post-implementation phase of the project.

The Consultant may suggest additional areas for the evaluation in its Inception Report.

B. Scope of Work

The final evaluation will include activities undertaken by the Geofund Turkey project from June
14, 2007 to June 30, 2016, in Turkey.

The evaluation will cover two key evaluation tasks:

1. The Consultant shall assess the performance of the Project in accordance with to the OECD/DAC and the GEF's Guidelines in conducting terminal evaluations, addressing the following questions:

Relevance—the extent to which the Project's activities were suited to local and national environmental priorities and policies and to global environmental benefits to which the GEF is dedicated. This analysis will include an assessment of changes in relevance over time.

- To what extent were the design and implementation of the Project relevant to and aligned with the priorities, policies/strategies of IFC and the World Bank in Turkey?
- To what extent were the interventions undertaken under the Project relevant to the country's context (at the time of the evaluation and at the time the

Project was being developed)? To what extent has the Project fostered client buy-in and contributions?
- To what extent were resources allocated appropriately and efficiently across the three
- Project components and activities under each component?
- To what extent was the Project's design appropriate to meet its objectives and expected results in terms of i) the selection and sequencing of activities/components, ii) funding, iii) time frame, and iv) human resources?
- To what extent did the Project respond adequately to changes in the macroeconomic and market context that occurred over the course of its implementation?
- Have potential synergies between Geofund Turkey and other related E&RE projects both in the country of implementation and in the ECA region, whether ongoing or completed, been optimized?

Efficiency—the extent to which results have been delivered with the least costly resources possible.
- To what extent has the Project been cost-effective in achieving results, relative to comparable initiatives of GEF, IFC and/or other stakeholders in the sector? Considering the costs and results, to what extent has Geofund Turkey provided value-for-money?
- To what extent was the Project appropriately staffed, and could field the right expertise?
- Have links with E&RE global resources been leveraged?
- What could have been done to improve efficiency?

Effectiveness—the extent to which objectives have been achieved or may be achieved in future.

- What were the expected outputs of Geofund Turkey? To what extent were these delivered, in a timely manner and with satisfactory quality?
- What were the intended outcomes of Geofund Turkey? To what extent have intended outcomes been achieved?
- What unintended outcomes (positive and negative) have occurred?
- Are the achieved outcomes of the Project commensurate with the Project's objectives?
- Differentiating between Project components, where has Geofund Turkey achieved significant traction/results, and where not?
- To what extent was the Project able to facilitate the development of the market?
- What were the major factors influencing the achievement/non-achievement of results?

Impact
- What long-term changes, direct and indirect, positive and negative, intended and unintended, have occurred as a result of the Project?

- To what extent has Geofund Turkey achieved its intended impacts by completion as set in its objectives?
- What were the major factors influencing the achievement/non-achievement of results to date, and likely to influence post-completion results?
- To what extent was the Project able to demonstrate catalytic or replication effect?

Work Quality
- What was the quality of the outputs?
- To what extent have resources been well used in achieving outputs and outcomes?
- To what extent have the operational risks been well managed?
- How well did Geofund Turkey communicate and involve with donors and other stakeholders?
- To what extent was a sound M&E plan to monitor progress and track results towards achieving objectives designed and implemented, and adequately budgeted for?
- To what extent was the Project's results measurement system appropriate and well- managed? Were quantitative and qualitative data available for the indicators defined in the results framework? Were selected indicators adequate?

Sustainability—the likely ability of an intervention to continue to deliver benefits for an extended period of time after completion; projects need to be environmentally as well as financially and socially sustainable.
- What is the likelihood of sustainability of outcomes and impacts?
- What were the main internal and external risks and factors (financial, socio-political, institutional framework and governance, environmental etc.) that are likely to affect the persistence of Project outcomes and impacts after the Project's completion? To what extent are the Project results/benefits likely to be resilient to these risks?
- To what extent has the Project established/enhanced capacity, processes and systems that are likely to be sustained?
- What is the likelihood of the implementation of geothermal projects in Turkey in the long run? What incentives are needed to facilitate this process?
- To what extent did the Project undertake actions and succeed to establish a long-term monitoring system?
- To what extent did the Project effectively generate, manage, apply and share knowledge and learning?
- What are the prospects for replication and scaling up?

Where appropriate, the Consultant shall try to assess the counterfactual, i.e. what would have happened without the Project.

2. The Consultant shall derive and synthesize in detail the lessons learned from the implementation of the Project and suggest specific, actionable recommendations for future projects, including answers to specific questions:

- Under what framework conditions it is most appropriate to cover drilling risk from public sources / request full coverage from private investors / develop an insurance product that is likely to be demanded?
- Which alternatives to the development of an insurance product shall be considered if a similar project is considered elsewhere?
- What lessons are relevant to this type of projects, to the GEF's overall portfolio, or applicable for other projects in the country, region or the focal area?

Approach and Methodology

The Project has been collecting operational data and reporting its progress internally on a regular, biannual basis, and has already delivered its PCR, providing an internal assessment of the Project's performance. This report along with other non-confidential documentation will be made available to the Consultant and may be complemented by additional primary and secondary data agreed between IFC and the Consultant. The evaluation will involve a review of the Project's documentation and individual interviews or focus group discussions with key stakeholders and clients.

The Consultant shall use the following sources and methods:

Sources

Data and information will need to be collected from:

i. The Project's documentation and reports;
ii. The records of the Project's activities;
iii. Internal clients: former staff and management, staff of other departments of IFC, other IFC and WBG staff;
iv. The Project's implementation partners;
v. External clients and stakeholders in the geothermal industry, clients/recipients or beneficiaries of the Project's advisory services, technology and service providers, project developers, financial institutions, etc.

Methods

Data collection methods are expected to include:

i. Structured interviews with relevant stakeholders (by telephone or in person);
ii. Desk review and analysis of materials prepared by the Project, surveys and secondary data analysis;
iii. Reviews of market data and literature.

Other innovative techniques to collect data on the effect of the Project can also be proposed by the Consultant.

Evaluation Principles and Criteria

The projects will be assessed according to the OECD/DAC and the GEF's Guidelines in conducting terminal evaluations (https://www.thegef.org/gef/sites/thegef.org/files/documents/Policies-TEguidelines7-31.pdf) - the internationally recognized professional standards that need to be applied to the specific evaluations the GEF undertakes or in which GEF partners collaborate.

Deliverables / Specific Outputs Expected from Consultant

Throughout the execution phase of this assignment, the Consultant(s) shall be responsible for delivering the following:

a. An Inception Report, covering the evaluation objectives, the Project's theory of change (a graphic, underpinned by a narrative, describing how the Project's activities and deliverables were intended to achieve its overall objectives), the proposed methodology, an evaluation matrix, a list of interviews and proposed questionnaires for different stakeholders, as well as a detailed workplan and timeline for executing this assignment.
b. Records/reports of interviews and meetings (in English).
c. Regular weekly updates on the progress of the assignment.
d. A draft Evaluation Report and a draft Executive Summary for Public Disclosure. The Evaluation Report will include an executive summary, the findings for each of the evaluation criterion, conclusions, recommendations and lessons learned. The annexes should include the ToR, an evaluation matrix, a list of interviews, sources of evidence, and tracking tools for impact indicators. The Executive Summary for Public Disclosure should not disclose information of a commercially sensitive nature or operational deliberations conducted by IFC staff.
e. The final report and the final Executive Summary for Public Disclosure.
f. A PowerPoint presentation summarizing the results of the evaluation. The presentation of the final results of the evaluation to IFC and/or GEF may be requested to be conducted in the form of a face-to-face meeting or through a video or web-based conference.

All GEF-funded projects that undergo a terminal evaluation are required to submit tracking tools for impact indicators. The purpose of this document is to capture results on key indicators at the achieved by project completion and then compare them with results captured during the mid- term review. The Consultant will fill in the final results of the project into the GEF indicator tracking tool (for GEF's information only).

The evaluation is expected to be conducted between April 1 and July 31, 2017, with the following tentative schedule:

Phase	***Timing / completion***

Literature review, Submission of Inception Report	By 30 April, 2017
Data Collection/Interviews and Progress Reports	May 15 – June 30, 2017
Submission of Draft Terminal Evaluation/Review Report	June 30, 2017
Submission of Final Terminal Evaluation/Review Report	July 31, 2017
Submission of PPT / Presentation of Results	Before August 31, 2017

Acceptance of Deliverables

The deliverables will be accepted by IFC if they if they meet the OECD DAC Quality Standards for Development Evaluation and GEF evaluation guidelines, cover all the evaluation tasks specified in Part B of this ToR and, when presented together, form an in-depth analysis of the requested areas of the Project's performance.

The deliverables are to be submitted on time, in English; they should be precise and technically correct, their minimum content should correspond to the particular tasks described in the ToR. All reports should be written in clear and concise language, free of grammatical and mistyping errors and presented in electronic form as Microsoft Word documents. All electronic files shall be readable and editable without restrictions. If parts of the files need to be locked to avoid unintended modifications or to protect key parameters/calculations, the necessary passwords/permits should be provided to IFC.

All deliverables are subject to approval by IFC and/or GEF and deemed to be final upon IFC approval. IFC reserves up to ten working days to provide its comments on the deliverables in writing to the Consultant.

The GEF Evaluation Office may review the final evaluation report to verify the ratings assigned by the Consultant and assess the quality of the report, and may carry out special reviews of issues not addressed by the final evaluations.

Supervision and Management of the Evaluation

The evaluation shall be managed and supervised by the Project Manager, working in close collaboration with the Regional E&RE Lead, the former manager of the Project, members of the M&E Unit and a representative of the donor (if applicable). The Regional E&RE Lead will be responsible for proposal rating and selection of consultants, final decisions on scope, methodology, approach and interpretation of context. The Project Manager will lead mediation and conflict resolution, vet consultants and provide advice on administrative, operational and financial matters relevant to the successful conduct of the evaluation.

The Project Manager will appoint a Coordinator who shall provide support and technical advice in the administrative aspects of the evaluation on a day-to-day basis.

The Coordinator will also participate in validating evaluation issues and scope. She/he will provide information sources and contacts for data collection and will provide access to the Project's files and data.

Specific Inputs to be provided by the Client

The Project shall make available to the Consultant all non-confidential files, databases and materials developed by the Project, as well as the contacts of its partners, stakeholders and other prospective interviewees. The Coordinator shall facilitate interviews with internal stakeholders.

The inputs from IFC shall include:

• Donor guidelines:

- the GEF's Guidelines in conducting terminal evaluations and the GEF's Tracking Tool
- Manual for Calculating GHG Benefits of GEF Projects for Energy Efficiency and
- RE (http://www.thegef.org/gef/node/313);
- Tracking tool for Mitigation Projects (spreadsheet specifically for Final Evaluation).

• IFC procedures, guidelines, standards and templates:
- Executive Summary for Public Disclosure template;
- IFC Role and Additionality Primer;
- Internal guidelines for impact reporting;
- PSR rating guidelines.

• Project documents:
- Implementation Plan, PSRs and supporting evidence, other reports that contain information about the key activities implemented by the project
- Mid-term evaluation report and GEF Tracking Tool;
- PCR;
- Clients surveys;
- Other non-confidential documents requested by the Consultant for the purpose of this assignment.

C. <u>Special Terms & Conditions / Specific Criteria</u>

The successful Consultant shall be characterized by the following:

At least one key Team Member of the Consultant shall have fully satisfied each of the following requirements:

a. Knowledge of the local context and a very good understanding of the geothermal energy market;
b. Current membership (in-good-standing) of an Evaluation Society or Association of International Repute;

c. Key involvement/Role in a recent (not more than five years ago) evaluation of a donor- funded TA (or Advisory Service) Program/Project and a solid track record of successfully conducting similar evaluations;
d. Competent use of data collection, statistical analysis and sound evaluation techniques, including software tools;
e. Excellent analytical skills;
f. Availability for the duration of the assignment and full commitment of time to the assignment as per the detailed work plan.

The evaluation will also require strong evaluation expertise and experience, including:

a. An understanding of the challenges of development evaluation and notably in the Turkey context;
b. Experience in business development, key products/services/business lines;
c. Sound experience in private sector market development and ideally demonstrate good understanding of market transformation/development approaches;
d. Experience in evaluation methods, data collection and analysis skills;
e. Process management skills in interviewing, facilitation and presentation;
f. Extremely high proficiency in written and spoken English language.