



1. Project Data

Project ID P145618	Project Name MX GEF Sustainable Energy Technologies	
Country Mexico	Practice Area(Lead) Energy & Extractives	
L/C/TF Number(s) TF-19403	Closing Date (Original) 31-Dec-2019	Total Project Cost (USD) 13,399,083.07
Bank Approval Date 06-Mar-2015	Closing Date (Actual) 31-Dec-2020	
	IBRD/IDA (USD)	Grants (USD)
Original Commitment	16,880,734.00	16,880,734.00
Revised Commitment	13,399,083.07	13,399,083.07
Actual	13,399,083.07	13,399,083.07

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2. Project Objectives and Components

a. Objectives

According to the Global Environment Facility (GEF) Grant Agreement (p.6) dated May 8, 2015 and the Project Appraisal Document (PAD, p.5), the project objectives are “to improve the institutional capacity of advanced clean energy technology institutions (both public and private) in the territory of the Recipient, and to foster the commercialization of advanced clean energy technologies by providing financial incentives to the private sector, which together are expected to lead to GHG [greenhouse gas] emissions reductions in the future.” The “Recipient” is defined as the United Mexican States—the official name of Mexico.



b. Were the project objectives/key associated outcome targets revised during implementation?

Yes

Did the Board approve the revised objectives/key associated outcome targets?

Yes

Date of Board Approval

29-Aug-2018

c. Will a split evaluation be undertaken?

No

d. Components

According to the grant agreement (p.6) the project consisted of three components:

A. Regional Needs Assessments. *(Appraisal cost: US\$94.58 million; actual cost: US\$2.27 million)*

This component was to provide technical assistance to carry out Regional Needs Assessments (RNAs) to evaluate the capacity of academic and research institutions, private enterprises, and public entities in Mexico to develop and commercialize advanced clean energy (ACE) technologies. The key outputs of RNAs were to be a set of Clean Energy Regional Investment Plans (CERIPs) that would identify the investments and strategic actions to strengthen human capital in science and technology and entrepreneurial disciplines critical to the commercialization of ACE technologies. The Secretariat of Energy (Secretaría de Energía – SENER) was to provide US\$90.00 million, through the public Sustainable Energy Fund (FSE – Fondo Sectorial CONACYT-SENER de Sustentabilidad Energética) to finance the follow-up investments identified in the CERIPs, but this financing did not materialize; hence, the actual component cost was much lower than the cost estimated at appraisal.

B. Incentives to the Private Sector for the Commercialization of Advanced Clean Energy Technologies. *(Appraisal cost: US\$13.35 million; actual cost: US\$11.93 million)*

This component was to provide subgrants, through calls for proposals, to eligible beneficiaries to carry out advanced energy activities, which consisted of proof-of-concept or prototype development activities and/or collaborative clean energy commercialization (CCEC) activities targeting industry-academia collaboration for ACE technologies. It was also to provide technical assistance to eligible beneficiaries to incentivize the commercialization of ACE technologies supported under this component, such as business plans, intellectual property protection and monetization, marketing strategies, access to finance, and safeguards.

C. Project Management. *(Appraisal cost: US\$2.80 million; actual cost: US\$3.04 million)*

This component was to support project implementation unit within SENER in project coordination and management.

Revised Components



In the second project restructuring in August 2018, the implementation of CERIPs was dropped from the project scope that corresponded to US\$90.00 million funding by SENER under the first component (see the entry for Second Restructuring in the following section).

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The total project cost was originally estimated at US\$110.73 million. On December 31, 2020, the project closed with a total cost of US\$17.24 million. The actual project cost was lower than the project cost estimated at appraisal because of the cancellation of the implementation of CERIPs that corresponded to US\$90.00 million.

Financing: At appraisal, the GEF grant was estimated at US\$16.88 million. The project disbursed US\$13.40 million. Private firms were expected to contribute US\$1.85 million under the second component to match grants. The ICR does not report the actual contribution of private sector enterprises. The grant beneficiaries were expected to contribute 15 percent of the cost of the subprojects. Since the total cost of the 15 subprojects financed under the project was US\$12.35 million, the private firms' contribution is estimated to have been around US\$1.85 million.

Borrower's contribution: At appraisal, the borrower's contribution was estimated at US\$92.00 million. Out of this amount, US\$90.00 million did not materialize because of the cancellation of the implementation of CERIPs. The borrower contributed US\$2.00 million under Component 3, Project Management.

Restructurings: There were three project restructurings:

- **First Restructuring (Level 2 – July 26, 2017):** The definition of the eligible beneficiaries was revised to include research centers and higher education centers, in addition to private sector enterprises, which were already included in the Project Operation Manual and the call for proposals for the first round of subgrants under the second component. In this restructuring, the Banco Nacional de Obras y Servicios Públicos (BANOBRAS) was removed as a signatory of subgrant agreements with the beneficiaries, because BANOBRAS executed payments to beneficiaries as instructed by SENER, and the bank's signature was not required in the subgrant agreements.
- **Second Restructuring (Level 2 – August 30, 2018):** At this restructuring, the results framework was substantially revised. The definitions of two indicators, out of three that were classified as project development objective indicators, were modified as follows: (i) first indicator was revised from "CERIPs designed and initiated" to "CERIPs published" because SENER could not obtain the endorsement of the 32 autonomous states that were to implement the CERIPs; and (ii) the second from "Private Capital Mobilized" to "Capital Mobilized for Government programs or initiatives aimed at fostering clean energy innovation (public and private)" because the FSE's eligibility criteria could not be revised to include private firms for ACE projects, and it was recognized that "it would be harder than anticipated to mobilize capital, in addition to GEF funds, for ACE technologies implemented by private enterprises" (ICR, p.11); hence, capital mobilized from public sources was included to the definition. In accordance with these modifications, definitions of some intermediate indicators were modified or some were deleted because they were not relevant any more: (a) The indicator "Number of investment opportunities identified in Component 1 that receive funding through FSE" was modified to "Number of high-relevance investment opportunities identified in Component 1 that could be potentially supported by national and/or international sources of financing;" (b) the indicator "Number of patents for ACE technologies" was modified as "Number of patents or other



industrial/intellectual property schemes for ACE technologies;” and (c) the indicators “Number of ACE program recipients identified from Component 1,” “Number of CCEC grants awarded,” and “Number of prototypes completed” were deleted. Lastly, six new indicators were added to monitor the achievements of outputs under the second component and because of corporate requirements: (1) Web-based platform developed; (2) Number of incentives awarded, with at least 40% of them under the CCEC category with a target value of 15; (3) Number of commercialization plans developed with a target value of 15; (4) Jobs created by the ACE program beneficiaries with a target value of 15; (5) Number of safeguards follow-up plans developed and in place with a target value of 15; and (6) Registered grievances satisfactorily resolved in line with the Grievance Redress Mechanism (GRM) with a target value of 100 percent.

- **Third Restructuring (Level 2 – November 20, 2019):** The project closing date was extended by 12 months from December 31, 2019 to December 31, 2020 to allow time for the completion of the ex-post analysis of the RNAs and CERIPs that was delayed because of slow procurement, and the completion of the sub-projects awarded under the second component in the third round of calls in 2018. Funds were also reallocated among expenditure categories to allow the project implementation unit to operate during the extended 12 months of project implementation using the additional funds that resulted from the depreciation of the Mexican peso against the US dollar, and the savings incurred because of competitive procurement processes under the first component.

Dates: The project was approved on March 6, 2015 and the signing of the grant agreement by various parties on different dates was completed on May 8, 2015. The project became effective on September 21, 2015. The Mid-Term Review was conducted in March 2018. The original closing date was December 31, 2019. It was extended by 12 months, and the project closed on December 31, 2020. The reasons for closing date extension have been outlined in the third project restructuring entry above.

3. Relevance of Objectives

Rationale

The project objectives were substantially relevant to the country context. Mexico is the 12th largest emitter of greenhouse gases in the world and 8th among countries most at risk to the impacts of climate change. In 2016, the Government of Mexico announced the National Climate Change Strategy (p.18) with the objective “to face the effects of climate change and transition to a competitive, sustainable, and low-carbon emission economy.” The government is also committed to reduce greenhouse gas emissions by 22 percent in 2030. However, limited funds and incentives, and insufficient capacity to develop advanced clean energy (ACE) technologies are among the barriers to the achievement of the government’s goals. Therefore, the objectives were appropriately pitched for the development status and capacity in the country, and were also outcome-oriented, but the constraints in the operational context were to be expected to adversely affect the achievement of the project objectives, such as the 32 states having the authority to implement the Clean Energy Regional Investment Plans (CERIPs), which was outside of the project’s control, and political decisions needed for the inclusion of private entities as eligible beneficiaries from FSE funds to implement ACE projects.

The project objectives were aligned with the World Bank’s strategy as defined in the Country Partnership Framework (CPF) for the United Mexican States, FY2020-25. The project sought to address the development problem of insufficient capacity to develop and commercialize advanced clean energy (ACE)



technologies and contribute to the achievement of competitive, sustainable, and low-carbon economy and climate change mitigation goals of the country. The project was to achieve this by supporting a nationwide needs and capacity assessment and piloting a grant program to facilitate private sector involvement and academia-industry collaboration in ACE technologies development and commercialization. The project objectives correspond to the CPF's Objective 7 "Support the Government in reaching its climate change goals" under the third focus area of "Enabling sustainable infrastructure and climate action."

Before this project, the World Bank had already become an important development partner of Mexico in climate change mitigation. The World Bank began implementing the GEF-financed Methane Gas Capture and Use at a Landfill Demonstration Project in 2001. Since then, the World Bank provided funds to Mexico for renewable energy and energy efficiency projects and loans for low-carbon and climate change development policies. The project was designed based on the experience gained and lessons learned during the implementation of previous projects. The project objectives were adequately challenging but overly ambitious in the expectation that the CERIPs—the key outputs of the project that would contribute to the improvement of the institutional capacity of public and private advanced clean energy technology institutions and the commercialization of ACE projects—could be fully concretized during project implementation.

Overall, the relevance of the project objectives is rated Substantial.

Rating

Substantial

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To improve the institutional capacity of ACE technology institutions (both public and private) in the territory of the recipient.

Rationale

Theory of Change for Objective 1

The project's theory of change indicates that the project's inputs, i.e., GEF grants, were to be used to finance consultancy services to conduct Regional Needs Assessments (RNAs) as follows: (a) surveying and mapping the resources and capacities of Mexican universities, research institutions, and clean energy enterprises; (b) identifying the ACE technology needs of enterprises in strategic sectors; (c) identifying each region's comparative advantage in science and technology sectors and the clean energy value chain; (d) reviewing the capacities of subnational government entities to implement sound policy and regulation conducive to the dissemination of clean energy technologies; (e) assessing existing regional and national financing sources;



and (f) assessing financial, regulatory, and policy barriers. The key outputs of these RNAs were to be Clean Energy Regional Investment Plans (CERIPs) for each autonomous state, which were to identify the investments and strategic actions with strong potential over the medium term to boost human capital in science and technology and entrepreneurial disciplines critical to commercialize ACE technologies. These investments and strategic actions were to consist of curriculum changes, creation of new incentives, policy reforms, establishment of chairs in universities in relevant scientific field, support for center of excellence for specific clean energy technologies, joint research initiatives with industry, and purchase of scientific equipment for laboratory upgrades. The CERIPs were to identify ACE investments, advanced research activities, and other initiatives that could be undertaken by FSE to reduce GHG emissions and create a potential pipeline of projects to be financed under the ACE program of the project. Through FSE, SENER was to finance the programs and projects identified in the CERIPs during project implementation. The outcome expected from the implementation of these programs and projects and technical assistance to be given to the firms under the ACE program of the project was improved capacity and means of public and private stakeholders to identify, develop, and commercialize ACE technologies. Overall, the causal pathways from inputs to expected results were valid and direct, and the results achieved could be attributed to the project's intervention, but there were gaps in the theory change. First, it was assumed that the 32 autonomous states would have a strong ownership of the CERIPs and be willing to implement them. Second, it was assumed that the FSE would be reformed, so that its funds could be used to finance private sector projects identified in CERIPs. These were overly optimistic assumptions.

Outputs

- The project financed consultancy services, and 10 RNAs were prepared as planned.
- Based on the findings of the RNAs, 32 CERIPs were prepared, one for each autonomous state, defining the specific areas of investment for SENER and the federal government, local and state governments, and other investors in ACE technologies. The RNAs and CERIPs can be found on SENER's web-based Clean Energy Innovation Observatory (<https://oel.energia.gob.mx>)
- Of the 847 investment projects included in the CERIPs, 94 were identified as high relevance investment opportunities. Original target was 32 investment opportunities that would receive funding through the FSE.
- A total of 55 firms received technical assistance through information workshops organized by SENER. The target was 15 firms.
- An analysis of the RNAs and CERIPs was to be conducted after their implementation. This analysis could not be conducted because of delays in procurement and ineligibility of offers.

Outcomes

- **CERIPs designed and initiated:** This indicator was defined as “the number of CERIPs that are prepared and implemented in Mexico” as a result of the project (PAD, p.18). The CERIPs were to be implemented by each state, during project implementation, with funding from the FSE to finance the programs and projects identified in these plans. However, SENER could not obtain the endorsement of the states to implement the CERIPs. As a result, none of the 94 programs or projects that were identified in the CERIPs received funds from the FSE. Because CERIPs were not implemented, the outcomes expected from projects identified in CERIPs to improve the institutional capacity of ACE technology institutions were not achieved.
- The ex-post analysis of the RNAs and CERIPs could not be conducted. Therefore, the information expected from this analysis did not materialize: (i) an assessment of the relative performance of states



and other entities in implementation of CERIPs; (ii) an assessment of the amount of other resources (private, local government, and other federal agencies) leveraged by the project; and (iii) a detailed accounting of the number of initiatives and subprojects identified for support by the ACE program and the FSE that applied for and/or received support.

- The ICR (p.15) states that the technical capacity of the 55 firms that received technical assistance support under the project to develop ACE technologies was strengthened, and the “strengthened capacity was demonstrated in the quality of the beneficiaries’ final reports and associated presentations to SENER and the World Bank team.” The ICR (p.15) also states that the Collaborative Clean Energy Commercialization (CCEC) scheme implemented under the second component facilitated efficient collaboration between private firms and academic institutions, which maximized the comparative advantage of the partners. The evidence is insufficient to validate these assertions.

The project was successful in conducting the RNAs and preparing the CERIPs, but the outcomes expected from the implementation of project and programs identified in the CERIPs could not be achieved. Therefore, the project’s efficacy in achieving the project objective to improve the institutional capacity of ACE technology institutions (both public and private) is rated Modest.

Rating

Modest

OBJECTIVE 1 REVISION 1

Revised Objective

To improve the institutional capacity of ACE technology institutions (both public and private) in the territory of the recipient (with amended indicators).

Revised Rationale

Theory of Change for Objective 1 Revision 1

At the second restructuring, the implementation of CERIPs was dropped from the project scope. The project’s revised theory of change for Objective 1 indicates that the project’s inputs, i.e., GEF grants, were to be used to finance consultancy services to conduct Regional Needs Assessments and the preparation of the CERIPs, which was identical to the theory of change before restructuring (see Theory of Change for Objective 1 above). However, exclusion of the implementation of CERIPs from project scope created a significant gap in the result chain linking the preparation of the CERIPs to the achievement of the project objective to improve the institutional capacity of public and private ACE technology institutions. The project output, i.e., CERIPs, could not be expected to lead to any outcome, because they were not to be implemented during project implementation, and there were no arrangements made for their implementation after project closure. Overall, the causal pathways from inputs to expected results were not valid, nor direct, and the results achieved could not be attributed to the project’s intervention.

Outputs

Please see output under Objective 1 above.



Outcomes

- **CERIPs published:** The definition of this indicator was revised at the second project restructuring as the number of CERIPs that are prepared as a result of the project. CERIPs were the main outputs of the project. Therefore, this indicator captures the output of the project, not the outcome.
- As explained under Objective 1, the ICR (p.15) states that the technical capacity of the 55 firms that received technical assistance support under the project to develop ACE technologies was strengthened, and the CCEC scheme implemented under the second component facilitated efficient collaboration between private firms and academic institutions. The evidence is insufficient to validate these assertions.

The project was successful in preparing the RNAs and CERIPs—the project outputs—but these outputs did not lead to any outcome. Therefore, the project’s efficacy after the restructuring in achieving the project objective to improve the institutional capacity of ACE technology institutions (both public and private) is rated Modest.

Revised Rating

Modest

OBJECTIVE 2

Objective

To foster the commercialization of ACE technologies by providing financial incentives to the private sector.

Rationale

Theory of Change for Objective 2

The project’s theory of change indicates that the project’s inputs, i.e., GEF funds, were to be used to provide grants through a competitive financing program (ACE program) and technical assistance to private firms for the development and commercialization of innovative ACE technologies. This was a pilot approach that was to give a leading role to private sectors, and, if successful, it would have been expected to increase SENER’s support for private sector led initiatives in ACE technologies. The ACE program was to finance two kinds of projects with technical assistance to the winning proposals: (a) Proof-of-concept or prototype projects aiming to help stimulate entrepreneurship and to incentivize researchers to incorporate and take risks for stimulating innovation and technology transfer; and (b) collaborative clean energy commercialization (CCEC) projects aiming to provide an incentive to stimulate academia-industry collaboration in ACE technologies. The expected output was the implementation of 12 ACE prototype development subprojects and 12 CCEC subprojects. The implementation of these subprojects was expected to lead to the development of commercialization plans and patent applications for ACE technologies by the subproject grantees as intermediary outcomes. The successful implementation of the ACE program and the subprojects would have been expected to have a demonstration effect and facilitate the mobilization of private capital to supplement the GEF grant and SENER’s support to private sector-led initiatives. The outcome would be the scaling-up of the commercialization of ACE technologies that, together with the improvement of institutional capacity in the development of ACE technologies, would have been expected to positively affect the competitiveness of the



industrial and commercial sector in Mexico while mitigating the climate change risk through reduced GHG emissions. Overall, the causal pathways from inputs to expected results were valid and direct, and the results achieved could be attributed to the project's intervention, but the assumptions on which the theory of change was built were overly optimistic, such as adequate collaboration between academia and industry, sufficient private sector interest in the ACE program, adequate subproject implementation capacity by private firms, and availability of additional private and public funds to support the GEF grants in scaling up the ACE program.

Outputs

- **Number of prototypes completed:** This indicator was to count the number of prototypes produced among winning grant recipients, and the target was 12. At project closing, only six subprojects were awarded grants for prototype development, but none of the prototypes were completed at project closing.
- **Number of CCEC grants awarded:** Nine subprojects were awarded grants for CCEC. The original target was 12.
- **Number of patents for ACE technologies:** The number of patents that were produced from ACE program applicants was three. The original target was also three. Six more patent applications were pending approval at project closing.
- **Number of ACE Program recipients identified from Component 1:** The target was six, but none was identified, because of the delayed completion of CERIPs.
- **Number of recipients of technical assistance:** Fifty-five firms (15 grant recipients and 40 firms that were shortlisted for grants) received technical assistance support. The original target was 24.

Outcomes

- **Private capital mobilized:** As a result of the demonstration effect of the project activities in supporting the commercialization of ACE technologies by private firms, it was estimated that US\$6.00 million would be mobilized to sustain the ACE program beyond project closing to support the development and commercialization of ACE technologies. Such private capital mobilization did not materialize.
- The ICR (pp.17-18) states that five subprojects (one prototype and four CCECs) out of 15 (six prototypes and nine CCECs) that were supported by the project were identified as project with good commercialization prospects. This result was not captured by the results framework; hence, there was no target set.

The project was partially successful in supporting subprojects at the proof-of-concept or prototype stage and CECC through grants and technical assistance, and one third of the subprojects were identified as having good prospects for commercialization. However, the project was not successful in mobilizing private funds to ensure the sustainability of the ACE Program beyond project closure. The evidence is insufficient that the project's intervention will have an impact on fostering the commercialization of ACE technologies in Mexico.

On the other hand, the project piloted a new approach to support the commercialization of ACE technologies. In other words, the project tested a new approach on a small scale, and the results of the test was to inform the decision of whether to implement the new approach on a larger scale or not. For such a decision to be made in a pilot project, the project should rigorously monitor and evaluate the approach it was testing, produce information, and distill lessons. Although the approach being tested did not yield positive outcomes, a project could be successful in achieving its goal by implementing a pilot approach that would help decision



makers to make informed decisions. However, the evidence is insufficient that this project produced such information and distilled lessons based on rigorous monitoring and evaluation (M&E) to inform a decision to implement the ACE Program on a larger scale or cancel its implementation. The M&E system did not produce sufficient information to assess the success or the shortcomings of the ACE program.

Overall, the project's efficacy in achieving the project objective to foster the commercialization of ACE technologies by providing financial incentives to the private sector is rated Modest.

Rating
Modest

OBJECTIVE 2 REVISION 1

Revised Objective

To foster the commercialization of ACE technologies by providing financial incentives to the private sector (with amended indicators).

Revised Rationale

Theory of Change for Objective 2 Revision 1

At the second project restructuring the target values of some indicators were revised downward, some indicators were deleted, and additional ones were introduced (see the entry for Second Restructuring in section 2.e. Comments on Project Cost, Financing, Borrower Contribution, and Dates above). These changes did not have an impact on the theory of change for Objective 2 (see the discussion of the theory of change for Objective 2 above).

Outputs

- **Number of incentives awarded, with at least 40 percent of them under the CECC category:** A total of 15 subprojects (six prototypes and nine CCECs) were awarded grants under the ACE Program. Against the target of 15. The share of CECCs was 60 percent above the target of 40 percent.
- **Number of Commercialization Plans developed:** All 15 beneficiaries of ACE Program grants developed commercialization plans for their subprojects against the target of 15, but the ICR (p.37) states that "the depth of the commercialization plans vary greatly."
- **Number of patents or other industrial/intellectual property schemes for ACE technologies:** The number of patents that were produced from ACE program applicants was three. The original target was also three. Six more patent applications were pending approval at project closing.
- **Number of recipients of technical assistance:** This indicator was not revised. Fifty-five firms (15 grant recipients and 40 firms that were shortlisted for grants) received technical assistance support. The target was 24.

Outcomes



- **Capital mobilized for government programs or initiatives aimed at fostering clean energy innovation (public and private):** The project could not mobilize any private capital. The ICR (p.31) states that FSE provided US\$18.93 million for projects implemented by public entities, and Fondo Sectorial de Innovación Tecnológica (FIT – a public fund) provided US\$1.25 million to the ACE projects of small and medium-sized private enterprises, but the mobilization of these funds could not be attributed to the project activities.
- The ICR (pp.17-18) states that five subprojects (one prototype and four CCECs) out of 15 (six prototypes and nine CCECs) that were supported by the project were identified as having good commercialization prospects. This result was not captured by the results framework; hence, there was no target set.

After the revision of the project's results framework at the second project restructuring, the project's efficacy in achieving the project objective to foster the commercialization of ACE technologies by providing financial incentives to the private sector is rated Modest.

Revised Rating

Modest

OBJECTIVE 3

Objective

The project's "Global Environment Objective" was to reduce GHG emissions in the future as a result of the project's intervention in institutional capacity building and commercialization of ACE technologies.

Rationale

Rationale

For the theory of change, please see Objective 2. For the project outputs and outcomes, please see the relevant sections in Objective 1 and 2, and their revised versions above.

The five subprojects supported under the ACE program with good commercialization prospects are expected to generate 4.2 million tons of carbon dioxide equivalent (tCO₂e) of reductions in GHG emissions. The target set at appraisal was 2.4 million tCO₂e. However, the commercialization of these subprojects depends on the beneficiaries' mobilization of additional financing for the investments required to develop their business plans, securing their target market, and establishing business alliances (ICR, p.28). Therefore, given the possibility that some of these subprojects might be commercialized as planned, the actual GHG emissions reduction could be lower than the expectations. Overall, the project's efficacy in achieving GHG emissions reduction in the future is rated Substantial.

Rating

Substantial



OVERALL EFFICACY

Rationale

The project's efficacy in achieving the project objectives to improve the institutional capacity of ACE technology institutions (public and private) and to foster the commercialization of ACE technologies by providing financial incentives to the private sector was both rated Modest. The project is expected to achieve the target set for future GHG emissions reduction, assuming that all five subprojects with high commercialization prospects will be successfully implemented, but it is likely that not all subprojects would be commercialized and the future GHG emissions reduction would be lower than expectations. Overall, the project's efficacy in achieving the project objectives is rated Modest.

Overall Efficacy Rating

Modest

Primary Reason

Low achievement

OVERALL EFFICACY REVISION 1

Overall Efficacy Revision 1 Rationale

Following the second project restructuring, the project scope shrank, and the results framework was revised. The project's efficacy in achieving the project objectives to improve the institutional capacity of ACE technology institutions (public and private) and to foster the commercialization of ACE technologies by providing financial incentives to the private sector was both rated Modest. The project is expected to achieve the target set for future GHG emissions reduction, assuming that all five subprojects with high commercialization prospects will be successfully implemented, but it is likely that not all subprojects would be commercialized and the future GHG emissions reduction would be lower than expectations. The project's overall efficacy in achieving the project objectives after the restructuring is also rated Modest.

Overall Efficacy Revision 1 Rating

Modest

Primary Reason

Low achievement

5. Efficiency

Economic Analysis

At appraisal, the economic impact of the project's intervention in improving the institutional capacity for the development of ACE technologies was expected to be positive (PAD, p12), given that the economic rate of return to public investment in research and development capacity in countries such as Mexico was estimated at 55 percent. The project would support the first nationwide assessment of capacities to develop and commercialize ACE technologies (i.e., Regional Needs Assessments-RNAs), and based on these assessments and the Clean Energy Regional Investment Plans (CERIPs) to be prepared, SENER (through FSE) would support investments in human and institutional capacity building by providing US\$90.00 million during project implementation. Since CERIPs could not be implemented, SENER could not finance investments in human and institutional capacity building. The benefits expected from institutional capacity building did not materialize as expected.



To assess the economic impact of the ACE program of the project, an economic analysis was conducted at appraisal based on the reduction in GHG emissions as a result of the renewable energy or energy efficiency subprojects to be supported by the project. It was assumed that for a US\$10.5 million investment in the ACE program by the project, there would be a US\$60.38 million worth of private investments (US\$24.15 million for renewable energy and US\$36.23 million for energy efficiency) and the success rate would be 10 percent—one in ten subgrants was expected to become a commercial success. The lifespan of energy efficiency projects was assumed eight years, and renewable energy projects 20 years. Both direct GHG reductions (because of subprojects funded by the project) and indirect GHG emissions (achieved after project closing by scaling up the ACE program) were estimated at a total of 2.4 million tCO₂e. In terms of cost effectiveness, the estimated GHG reductions were to be achieved at an overall cost of US\$7.01 per tCO₂e. At project closing, the economic analysis was repeated using actual data from five subprojects supported by the project that had good commercialization prospects. The calculations resulted in an expected emissions reduction of 4.2 million tCO₂e with an overall cost of US\$3.2 per tCO₂e. These calculations assumed that the direct and indirect emissions reductions will be in the same amount, whereas at appraisal it was assumed that indirect emissions reduction would be three times of direct emissions reduction. However, given that the project was not successful in mobilizing capital to replicate the ACE program, there is a high probability that indirect emissions reductions might not materialize. The analysis at project closing assumed that all five projects, out of 15 supported by the project, would be commercially successful. This corresponds to a ratio of 1:3, much higher than 1:10 assumed at appraisal. As the ICR (p.28) notes, these projects' actual success is uncertain; therefore, the future GHG emissions reductions because of these projects could be significantly lower than the expectations (see Objective 3 under section 4. Efficacy above).

Operational and Administrative Efficiency

The CERIPs could only be completed after the launch of the second call for proposals to be supported by the ACE program. This mismatch in sequencing the completion of CERIPs and announcement of calls for proposals prevented the subprojects identified in these investment plans to participate in the first and second calls for proposals. Project implementation slowed down following the elections in December 2018 that resulted in changes in the SENER management and was suspended for almost six months due to budget restrictions imposed on the federal administration in 2019. The implementation of the ACE program was adversely affected by the change in government priorities towards development through public sector rather than promoting private sector led ACE technology development. Since the elections, no calls for proposal have been announced for innovative clean energy projects to be financed by the FSE, because the funds are channeled to address other economic and social issues. The reform of FSE to allow it to finance private firm projects is not expected to happen under the new government. The shortcomings in appraising and preparing the project at entry resulted in three project restructurings. The second restructuring resulted in the deletion of some project activities, such as the implementation of CERIPs, that adversely affected project efficiency.

While the project was completed without a cost overrun, the economic and social benefits from improved institutional capacity in ACE technologies development did not materialize and the methodology used to calculate the benefits from reduced GHG emissions could not be adequately validated. There were also some moderate shortcomings in operational and administrative efficiency of the project. Overall, the project's efficiency in achieving the project objectives is rated Modest.

Efficiency Rating



Modest

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal		0	0 <input type="checkbox"/> Not Applicable
ICR Estimate		0	0 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The relevance of the project objectives to the country context and their alignment with the World Bank strategy for Mexico were rated Substantial. The project’s efficacy in achieving the project objectives based on the original and revised indicators is rated Modest because the CERIPs could not be implemented, and sufficient capital could not be mobilized to sustain the ACE program beyond project closure. These were expected to improve the institutional capacity in ACE technologies development and to foster the commercialization of these technologies. The project’s efficiency in achieving the project objective was rated Modest, because the benefits from improved institutional capacity did not materialize, the methodology used in the calculation of GHG emissions reductions have some gaps, and there were moderate shortcomings in the operational and administrative efficiency of the project. Overall, the project’s outcome is rated Moderately Unsatisfactory*.

* The changes to the results framework require a split rating, but because the efficacy of the project in achieving the project objectives is rated Modest both before and after the second restructuring, a split rating is not undertaken.

a. Outcome Rating

Moderately Unsatisfactory

7. Risk to Development Outcome

Financial: Insufficient funds to support the private sector-led development of ACE technologies stands out as the major risk to the limited results achieved under the project. The project was not successful in mobilizing private funds to supplement GEF funds to support ACE technologies development. Public funds through FSE are exclusively allocated to public projects. Private firms have limited access to funds to finance their ACE projects through the Technology Innovation Fund (FIT – Fondo Sectorial de Innovación Tecnológica)—only US\$1.2 million between 2015 and 2020. Public support to private firms in developing



ACE technologies will not be likely unless eligibility criteria for FSE funding are revised to include private firms.

Commercial: The project supported 15 subprojects, five of which have good commercialization prospects, but the actual success of these subprojects remains uncertain. Innovation projects have in general a success rate of 10 percent. All 15 subprojects developed their business plans, with varying qualities, but their actual commercialization depends on mobilizing financing for actual investments, securing a target market, and establishing business partnerships. If these conditions are not met, subprojects supported under the project might not move to the commercialization stage, and the expected GHG emissions reduction might not materialize.

Government commitment: The federal government in Mexico is committed to addressing the climate change through renewable energy and energy efficiency projects. However, it is not clear how committed the government is in supporting innovation and development of ACE technologies led by private sector. Currently, revision of the FSE's eligibility criteria to include private firms is not on the government's agenda. At the local government level, the project was not successful in obtaining commitment from 32 autonomous states to the implementation of the CERIPs. There is no indication that autonomous states would be committed to the implementation of CERIPs beyond project closing.

8. Assessment of Bank Performance

a. Quality-at-Entry

At project entry, the goal of reducing greenhouse gas emissions in accordance with the low-carbon development program of the Government of Mexico was of high strategic priority. The project was to support the achievement of this objective by strengthening the institutional capacity in developing ACE technologies and supporting the development of such technologies by private firms. The project's approach was straightforward; the project was to provide financing for the preparation of RNAs and CERIPs. SENER would provide financing, through FSE, for the implementation of the subprojects identified in CERIPs, and to private subprojects for the development and commercialization of ACE technologies. However, the implementation of CERIPs depended on the endorsement by 32 autonomous state governments. At entry, the commitment of the local governments was not obtained; hence, the CERIPs could not be implemented. Similarly, it was assumed that FSE would be reformed to provide funds to private firms' subprojects for the development and commercialization of ACE technologies. This was an overly optimistic expectation because reforming FSE was a politically difficult process. Hence, FSE's reform did not materialize and the absence of FSE funding to private firms adversely affected the sustainability of the project's ACE program. These two significant shortcomings resulted in a shrinking of the project scope during implementation. The expectation that RNAs would be completed within one year and the CERIPs implementation in the following three years was not realistic, either. The preparation of CERIPs took longer, and the subprojects identified in these investment plans could not participate in the first two calls for proposals under the ACE program.

The project's monitoring and evaluation system was sufficient to measure the project's outputs, but it did not adequately capture the outcomes that would support the achievement of the project objectives to improve the institutional capacity in the development of ACE technologies and foster their commercialization. The risks were adequately assessed, and mitigation measures were identified, except



the risk of changing government priorities due to a change in government. As the subprojects were not known at appraisal, only an Environmental and Social Safeguard Framework was prepared at entry. The fiduciary aspects were adequately identified. SENER had sufficient capacity to implement the project. The project benefited from the lessons learned from prior projects implemented in Mexico to prevent implementation delays, such as avoiding output-based disbursements and construction of large-scale new technologies.

Overall, because of significant shortcomings at entry that led to a shrinking in project scope and weaknesses in the M&E system, the quality-at-entry is rated Moderately Unsatisfactory.

Quality-at-Entry Rating
Moderately Unsatisfactory

b. Quality of supervision

There was continuity in the project team. The task team leader located in Mexico had been with the project from the start of project implementation until project closure. Supervision missions were held once a year because of the limited budget allocated by GEF for supervision (ICR, p.27). After the onset of COVID-19, two supervision missions were held virtually. The candor and quality of performance reporting in the Implementation Status and Result Reports and Aide Memoires were high. The project team's supervision of fiduciary and safeguard aspects of the project was sufficient. The project team organized training workshops with SENER on procurement, financial management and safeguards to increase stakeholder awareness and compliance with the relevant World Bank guidelines (ICR, p.28). However, the project team's focus on development impact had gaps. The project restructurings resulted in the inclusion of public entities, which was contrary to the project's original intention of supporting the development of ACE technologies by private firms. The restructurings also changed the project's theory of change, and the reduced project scope, i.e., publication of CERIPs rather than publication and implementation of CERIPs as originally planned, did not support the achievement of the project objective to improve technical capacity to develop ACE technologies. There were also shortcomings in ensuring the sustainability of the ACE program and the implementation of CERIPs beyond project closing. Sufficient funds could not be mobilized for the continuation of the ACE program, and there is no indication that the autonomous state governments will implement the CERIPs.

Overall, the quality of supervision is rated Moderately Unsatisfactory.

Quality of Supervision Rating
Moderately Unsatisfactory

Overall Bank Performance Rating
Moderately Unsatisfactory

9. M&E Design, Implementation, & Utilization



a. M&E Design

The project objectives were clearly specified and the causal pathways from inputs to outcomes were valid and direct, but with some gaps (see the sections of Theory of Change for Objective 1 and 2 above). The results framework did not adequately capture the outcomes of the project. The objective level indicators, i.e., CERIPs designed and initiated, and private capital mobilized, were at the output level rather than outcome level. The outcomes of the activities to improve institutional capacity of the ACE technology institutions were not defined nor captured in the results framework. However, the intermediate outcome indicators were adequate to capture the project outputs toward achieving the project objectives. The indicators were specific, measurable and time bound with baselines and target values, but not relevant to capture the project outcomes, nor achievable during the project implementation because the implementation of CERIPs required the endorsement of 32 autonomous states, and ACE program required the reform of the FSE. The indicator defined to estimate the reduction in GHG emissions reduction had some weaknesses, because it was “based on a proxy methodology that entailed considerable uncertainty, since the project that would be financed from the subgrants program were not defined” at appraisal (ICR, p.23). The indicator measuring the number of female participants was not relevant to capture project outputs or outcomes that would lead to the achievement of project objectives. SENER, the project implementation entity, had sufficient capacity to implement M&E as designed.

b. M&E Implementation

The revision of the indicators at the second restructuring weakened the results framework rather than addressing its shortcomings. The project objective level indicator “CERIPs initiated and implemented” was revised to “CERIPs prepared,” which was at the output level, and did not capture any project outcomes. Other changes in the definitions of the indicators expanded project eligibility to cover public entities. Without a revision of the project objectives, these changes in the indicators created significant gaps in the project’s theory of change; the project activities did not support the achievement of the project objectives. Some new indicators introduced at the same restructuring were not relevant to capture the project’s outputs or outcomes, but were required as corporate indicators, such as number of jobs created by the ACE program beneficiaries, number of safeguards follow-up plans developed and in place, and registered grievances satisfactorily resolved in line with the grievance redress mechanism. SENER measured the indicators in the results framework and reported in semiannual progress reports including procurement and financial management results. Most of the indicators consisted of counting the number of project outputs, such as number of incentives awarded, number of commercialization plans developed, number of recipients of TA, and number of CERIPs published; therefore, the M&E methodology was simple. SENER established a web site for the project including a clean energy observatory database that “provides useful information for the design and implementation of clean energy technologies by subnational and private actors, including existing projects, actors and regulations related to clean energy development in each state” (ICR, p.24). This database is expected to monitor the progress of the subprojects supported under the project.

c. M&E Utilization

M&E activities that led to project restructuring resulted in the shrinking of the project scope and the weakening of the results chain in achieving the project objective (see M&E Implementation above and Theory of Change for the revised Objective 1 and 2 in the Efficacy section). The M&E data were used to



provide evidence of achievement of outputs, not outcomes. Although the project piloted the ACE subgrant program for private sector, the results framework did not provide sufficient data to assess the success of the program or to decide to scale it up or not. The M&E data or findings did not inform any subsequent interventions.

Overall, the M&E quality is rated Modest because of the weaknesses in the M&E design to capture the project outcomes, the shortcomings in the implementation of M&E that created gaps in the results chain, and the insufficient utilization of M&E findings to shift the direction of the project's intervention to achieve the project objectives.

M&E Quality Rating

Modest

10. Other Issues

a. Safeguards

The project was assigned an environment Category B under Environmental Assessment (OP/BP 4.01) and did not trigger any other safeguards policy.

Environmental Assessment (OP/BP 4.01): The subprojects to be financed by the project were expected to have limited environmental impact. To screen subprojects and help subproject applicants prepare their proposals for financing under the ACE program, an Environmental and Social Management Framework (ESMF) was prepared and disclosed in Mexico by SENER and on the World Bank's InfoShop. The World Bank project team provided training to the key SENER personnel and the members of the investment committee on safeguards policies and implementation. The grant beneficiaries prepared work plans to implement their subprojects in accordance with the requirements of the ESMF. Starting from April 2020, the beneficiaries prepared COVID-19 contingency plans. As of May 2021, all beneficiaries prepared environmental and social follow-up action plans, as required, and 14 of them were approved. One plan is still pending approval. However, the delay in hiring the environmental specialist towards the end of project implementation was a major shortcoming in the implementation of this safeguard policy (ICR, p.25).

b. Fiduciary Compliance

Financial Management

SENER had sufficient financial management capacity. The project's financial management was supported by a specialist financed under the project. The funds were allocated to project activities without delay until 2019. Except for the suspension of project activities for about six months in 2019 due to budget restrictions, the project did not encounter any major issues in financial management. SENER submitted interim financial reports as scheduled, and they were acceptable to the World Bank. External audits of the project were unqualified. SENER implemented the recommendations of the auditors to improve internal



control procedures. The ICR does not report any issues of corruption or misuse of funds associated with the project. All project funds were accounted for at project closing.

Procurement

Procurement was conducted according to the World Bank guidelines. SENER had adequate procurement capacity. Technical assistance supported the beneficiaries to improve their procurement capacity in accordance with the World Bank guidelines. Their implementation of procurement processes was satisfactory. The National Financing Agency (NAFIN – Nacional Financiera) reviewed the procurement processes to ensure compliance with the World Bank guidelines and procedures. However, the procurement of the consultancy services for Regional Needs Assessment was delayed, resulting in late delivery of these assessments and their key outputs of CERIPs. The project also could not complete the procurement of consultancy services for the ex-post evaluation of the RNAs and CERIPs because of the need to align the terms of reference in the first procurement process, which was about to be completed, with national development plans, and the failure of the proposals to meet the minimum technical rating requirements in the second procurement process (ICR, p.16).

c. Unintended impacts (Positive or Negative)

None.

d. Other

None.

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Moderately Satisfactory	Moderately Unsatisfactory	The relevance of objectives was substantial but the project's efficacy and efficiency in achieving the objectives are rated Modest, because of low achievement of outcomes and non-materialization of project's economic benefits, in addition to shortcomings in administrative and operational efficiency. Hence, outcome is rated Modest.
Bank Performance	Moderately Satisfactory	Moderately Unsatisfactory	There were significant shortcomings at entry regarding



			the implementation of CERIPs and reform of FSE. During implementation, the restructurings resulted in weakening the project's theory of change and under achievement of the project's outcome. Overall, Bank performance is rated Moderately Unsatisfactory.
Quality of M&E	Substantial	Modest	Overall, the M&E quality is rated Modest because of the weaknesses in the M&E design to capture the project outcomes, the shortcomings in the implementation of M&E that created gaps in the results chain, and the insufficient utilization of M&E findings to shift the direction of the project's intervention to achieve the project objectives.
Quality of ICR	---	Modest	

12. Lessons

This review has drawn two lessons incorporating material in section 5. Lessons and Recommendations of the ICR.

Lack of local governments' commitment to a project can adversely affect the achievement of project objectives if project's implementation depends on the endorsement of the same local governments. Through technical assistance, the project successfully completed the RNAs and CERIPs. The 32 autonomous states were to implement these CERIPs. However, at appraisal, SENER's limitations in obtaining local governments' commitment to the project and the implementation of CERIPs was not adequately assessed. During project implementation SENER could not obtain the autonomous governments' endorsement; hence, the subprojects identified in the CERIPs could not be implemented, and the project objective to improve the institutional capacity of ACE technology institutions, both private and public, could not be achieved.

A reduction in the project scope without a revision of the project objectives can create gaps in the theory of change resulting in project activities not supporting the achievement of the project objectives. When the project scope was decreased from publication and implementation of CERIPs to only the publication of CERIPs, this weakened the project's theory of change and created gaps in the result chain that did not support the achievement of the project objective to improve the institutional capacity of ACE technology institutions both public and private. The implementation of the investments and strategic actions identified in CERIPs was to boost human capital in science and technology and entrepreneurial disciplines critical to commercialize ACE technologies. Since the



project scope was reduced to the publication of CERIPs, the project's intervention could not support the achievement of the project objectives, which depended on the implementation of investments and strategic actions.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR is candid and provides a comprehensive overview of the project. The report covers a wide range of issues and follows most of the Bank's guidance. While it is mostly internally consistent, there are some gaps in logical linking and integration of various parts of the report. For example, the ICR (p.16) states that non-implementation of the RNAs and CERIPs reduced the impact of the project on improving the institutional capacity for ACE development; therefore, the efficacy of the project in achieving the Objective 1 is rated Modest. On the other hand, the publication of CERIPs is assessed as sufficient to improve the institutional capacity; hence, the efficacy of the project in achieving the same objective is rated Substantial after the restructuring. The ICR falls into the trap of assessing the achievement of the project objectives by only focusing on the achievement of the project outputs, not the expected outcomes. The report does not adequately emphasize and highlight how activities produced outcomes that led to the achievement of project objectives. The ICR does not present a robust evidence base to support the achievements of the project outcomes and objectives. The ICR (p.28) acknowledges that innovation projects have a success rate of 10 percent that might result in a significantly lower achievement of GHG emissions reductions compared to expectations, but this substantial risk is not reflected in the assessment of the project's efficacy in achieving Objective 3—related to the reduction of GHG emissions in the future—that was rated High. The ICR's lessons are useful and respond to the specific experiences of the project, but they are mostly in the form of findings and not sufficiently linked to the report's narrative.

a. Quality of ICR Rating

Modest