PROJECT INFORMATION DOCUMENT (PID)
CONCEPT STAGE

Report No.: PIDC2499

Project Name	MEXICO Sustainable Energy Technologies Development for Climate Change (P145618)
Region	LATIN AMERICA AND CARIBBEAN
Country	Mexico
Sector(s)	General energy sector (100%)
Theme(s)	Climate change (100%)
Lending Instrument	Investment Project Financing
Project ID	P145618
GEF Focal Area	Climate change
Borrower(s)	SENER, Government of Mexico, Secretaria de Hacienda y Credito Publico, Unidad de Asuntos Internacionales
Implementing Agency	SENER
Environmental Category	B-Partial Assessment
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Concept Review Decision	Track II - The review did authorize the preparation to continue

I. Introduction and Context

Country Context

1. Mexico has made significant economic progress over the past 20 years, raising average incomes and maintaining a stable and resilient macroeconomy. Among the factors that have led to GDP growth are the dramatic increase in the share of manufacturing and a doubling in the share of trade as a percentage of GDP. In fact, the share of Mexico's trade and inward FDI as a percentage of GDP were similar to the levels reached by China. But while GDP per worker increased by an average of 8.2 percent per year in China between 1985–2008, in Mexico the comparable figure grew by only 0.4 percent per year. Studies suggest that Mexico's trade performance over the past 20 years has been more to do with its proximity to the US and comparatively low wages than to high and rising productivity and innovative capacity. Factors inhibiting the growth in productivity include an inefficient financial sector, lack of contract enforcement, and rigidities in the labor market. In

addition, measures of technology development and innovation, such as patents and R&D investment in Mexico are much lower than their peers.

2. A study of technology development and innovation by the OECD suggests that "the preference for imported technology over the development of domestic innovation capacity has limited technology diffusion and transfer" in Mexico. Specifically, they found that industries classified as high-technology in Mexico do not invest significantly more in research and development than low technology industries and as such do not contribute to the dissemination of knowledge and technology throughout Mexico's business sector. Overall, Mexico has a low rate of productivity growth and Mexico's science, technology, and innovation system lags that of other OECD countries, while the ratio of R&D expenditures to GDP is the second lowest in the OECD.

3. To reduce poverty, build shared prosperity and avoid becoming stuck in the 'middle income trap,' Mexico will need to shift economic activity towards higher value-added activities by improving its productivity through innovation and the adaptation of technology. Research has shown that a substantial share of differences in economic productivity over time and between countries are explained by technological progress or innovation broadly defined. Innovation can take the form of organizational changes, reforms in managerial practices, new production methods, new sources of supply, the introduction of new products, or upgrades to the quality of existing products. Technological progress can occur by acquiring or adapting knowledge from abroad or by developing new knowledge domestically.

4. One of the fields where Mexico has pledged to make technological progress is the area of clean energy development. In recent years, the Government of Mexico has made strong commitments to address climate change and reduce its GHG emissions. In order to achieve its climate and energy security objectives, Advanced Clean Energy (ACE) technologies must be expanded and deployed across all sectors of the economy. While Mexico has significant research capabilities and potential to expand ACE technologies, enterprise activity in the sector is limited. Targeted public support, combined with the implementation of a robust national innovation strategy, is needed. Government intervention in this sector is particularly important due to two unique market failures: (i) the environmental costs of polluting technologies are not internalized, which reduces the demand for clean alternatives; and (ii) private investors are unable to determine the proper level of investment in new technologies due to lack of awareness, uncertainty of risks and rewards, and the incentive to free-ride on early adopters. The optimal policy approach typically calls for addressing both market failures.

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5. Broadly speaking, public policy to support technology transfer has centered on two approaches: technology-push and demand-pull.

6. Technology-push approaches include funding for human capital formation and basic and applied research and development (R&D); regulations to create a research- and innovation-conducive intellectual property rights (IPR) regime; the creation of appropriate incentives to commercialize technology; measures to deepen relationships between academia and the productive sector; and financing for prototype development and patent protection. Demand-pull emphasizes the use of instruments to increase the demand for lower-emission technologies, such as taxes on polluting fuels or emissions, or more direct approaches such as renewable energy portfolio standards, adoption subsidies, or direct public-sector investments.

7. Financing technology transfer is a particularly acute challenge. While pure (basic) research is globally recognized as a public good and is funded primarily by the public sector in most countries, and mature and commercial products and processes are typically funded by the private sector, both public and private financing for technology transfer is insufficient. The result is that many promising ideas are stranded in the "valley-of-death," that is, the period between when a new product is launched, and when it becomes profitable. For the private sector, the risks of investing in firms at early stages are often too high. On the public sector side, government agencies are generally not well-equipped nor incentivized to invest in risk assets. The fact that the commercialization process is very complex exacerbates the situation.

Sectoral and Institutional Context

Sectoral and Institutional Context

8. Over the past decade, Mexico has taken important steps to build its national innovation system and to support the creation of new technology-based firms. The strategy has been implemented by several government agencies including the Ministry of Science and Technology (Consejo Nacional de Ciencia y Tecnología, CONACyT), the Ministry of Economy, the Ministry of Education, and the National Development Bank (NAFIN). The strategy has included investments throughout the innovation value chain, including in (i) human capital and education; (ii) basic and applied research & development (R&D); (iii) collaboration and connectivity between academia and the productive sector; (iv) training, mentoring, and incubation services for start-ups; and (v) seed and venture capital.

9. Although Mexico has made remarkable progress in developing its national innovation system, its innovation capacity lags behind other middle income countries. Intermediary output indicators for technology-based innovation, including investments in R&D and the number of patents filed, suggest that Mexico faces an innovation shortfall.

10. To overcome its innovation deficit, Mexico must address both demand and supply side challenges. On the supply side, the market is constrained by inadequate or misdirected human capital and research capabilities, weak incentives for researchers to commercialize their research, inadequate technical assistance for start-ups, risk-aversion, and insufficient financing for early-stage companies. On the demand side, the market for ACE technologies has been constrained by state-owned enterprise dominance of both the electric power and hydrocarbons sectors, and weak industry demand for innovations coming from Mexican research and academic institutions. Critical to the success of Mexico's innovation strategy is a coherent policy approach that focuses on outcomes, which has been lacking.

11. Given these challenges on both the demand the supply side for clean energy technologies, it is critical for Mexico to adopt and implement a coherent national innovation strategy for the sector. The Ministry of Energy (Secretaría de Energía, SENER) has assumed a leading role in the effort to develop ACE technologies in Mexico. SENER channels public support to promote applied research in innovative and ACE technologies primarily through the Sustainable Energy Fund (Fondo Sectorial CONACYT-SENER de Sustentabilidad Energética, FSE).

12. FSE is an instrument created by the Government of Mexico in 2007 and financed through a special royalty levied on petroleum and natural gas production in Mexico. At the end of 2012, FSE had assets of US$204 million. The FSE is operated by SENER in collaboration with CONACyT. Its overall objective is to promote the development of clean energy technologies in Mexico. From

2009-2011, it sought to achieve this objective by providing grants for applied research to higher education institutions and research centers (both public and private) that meet certain eligibility criteria. While private enterprises were allowed to compete under certain circumstances , for the most part FSE funds are directed towards the public sector.

13. From 2009-2011, FSE launched calls for proposals (convocatoría) to support applied research and technology development. 48 proposals received funding, for a total of US$28 million in support. While it is too early to tell whether projects funded under FSE will lead to innovative technologies, early indicators have been somewhat disappointing. Moreover, the pipeline of qualified proposals to the FSE has been far less than available resources in the fund due to the limited capacity and the incentive structure of Mexican academia. In addition, while incentivized collaboration between academia and industry, only 6 of the 48 projects that were approved met these criteria. The restrictions against funding the private sector under the FSE are viewed as an obstacle to catalyze entrepreneurial activity in the energy sector, since private sector participation is viewed as a critical part of the solution.

14. In addition, in 2012 the FSE launched a call for proposals to set up Mexican Centers of Energy Innovation (Centros Mexicanos de Innovación en Energía, CEMIEs) for geothermal, wind, and solar energy. CEMIEs for bio and tidal energy will be launched in the coming year. CEMIEs are virtual collaboration centers which aim to coordinate research and development efforts by public and private entities related to clean energy technologies in order to accelerate their diffusion in Mexico.

15. In summary, the key challenges facing clean energy technology innovation today are:

- Insufficient/inadequate human capital in S&T disciplines linked to clean energy
- Limited academia-industry collaboration on applied research
- Weak incentives to pursue entrepreneurship and excessive public sector focus of GoM's innovation strategy for clean energy
- Underdeveloped technical assistance services for S&T based entrepreneurs
- Limited public/private resources for early stage investment (prototyping, piloting)

Relationship to CAS

Relationship to CAS

16. The proposed Project is clearly aligned with the World Bank's Country Partnership Assistance Strategy (CAS) for FY14-FY19, endorsed by the Board of Executive Directors on December 12, 2013. The CPS focuses on four strategic pillars. These include Pillar I: Unleashing Productivity by, among other things, facilitating access to finance and enhancing the competitiveness of the private sector; and Pillar IV: Promoting Green and Inclusive Growth, including scaling up renewable energy. The proposed objective seeks to advance both strategic objectives by facilitating access to finance and enhancing enterprise competitiveness among firms in the clean energy sector. The success of private enterprises in developing clean energy solutions for Mexico is critical to achieve green and inclusive growth in the future. The Project builds upon lessons learned from previous World Bank engagements related to innovation in Mexico, and in other countries, both in Latin America and afar.

17. In addition, the proposed Project supports the broader World Bank strategy to reduce poverty and boost shared prosperity. Adoption of ACE technologies across all sectors of the economy can

increase competitiveness, which can lead to GDP growth, increased foreign investment, and job creation; and GHG emissions reductions, which can lower the risks of negative climate change impacts, which disproportionately affect the poor. The GEF also recognizes that innovation in low-carbon technologies is critical to achieve global GHG emissions reductions and to promote green and inclusive growth. The GEF has indicated that it will increasingly provide support for "market demonstration and commercialization of innovative, emerging technologies."

II. Proposed Development Objective(s)

Proposed Global Environmental Objective(s) (From PCN)

The Project's Development Objective is to improve the institutional capacity of advanced clean energy (ACE) technology institutions (both public and private) in Mexico, foster the commercialization of ACE technologies by providing financial incentives to the private sector, and in the process reduce GHG emissions.

Key Results (From PCN)

The results indicators at the PDO level are: (i) investments and strategic action plans designed and initiated with stakeholders to advance the commercialization of ACE technologies; (ii) the number of clean energy enterprises that receive a grant from the ACE Fund; and (iii) the reduction of 24.48 mtCO2e. The Project's results and intermediate indicators are presented in Annex 1.

III. Preliminary Description

Concept Description

The proposed Project would consist of three components:

Component 1: Regional Needs Assessments (RNA) for ACE technologies and Clean Energy Regional Investment Plans (CERIPs). (Funding: GEF US$5 million; SENER US$90 million)

The objective of this component is to: (i) conduct RNAs to assess the capacity of academic and research institutions, private enterprises, and sub-national government entities across Mexico; (ii) prepare CERIPs that will aim to boost institutional capabilities to produce clean energy technologies; and (iii) identify promising initiatives that could be considered for financial support by the ACE or the FSE Fund. Together, these initiatives are designed to assess and improve the capacity and means of public and private stakeholders to identify and commercialize ACE technologies that can lead to reductions in GHG emissions.

Component 2: Grants and technical assistance for private enterprises in the ACE sector. (Funding: GEF US$11.05 million: Private sector enterprises: US$3.23 million).

This component will finance grants targeting: (i) proof-of-concept stage of development of ACE technologies for SMEs; and (ii) Collaborative Clean Energy Commercialization grants (CCEC) targeting industry-academia collaboration on advanced ACE R&D. In both cases, the grants will target ACE technologies with strong commercialization potential.

Component 2 seeks to fill a void in the current public and private financing landscape for early-stage technology commercialization, and to incentivize industry-academia technology development collaboration through a pilot grant program (the "ACE Fund"). The fund will focus on specific technology areas for development where there is both regional demand and a comparative

advantage for Mexico. For example, among the technical areas which are a priority for Mexico are energy efficiency, geothermal, wind, and solar energy technologies. Over time, the technology focus will be further narrowed and refined by the results of the analysis carried out in Component 1 and promising ideas will be recommended for participation in the ACE Fund competition.

Component 3: Project Management. (Funding: GEF US$0.83 million: SENER US$1.5 million).

The Project will utilize the existing World Bank Project Implementation Unit (PIU) within SENER to coordinate and manage the Project. This arrangement is preferred in order to increase overall program efficiency, to minimize start-up delays, and to build on SENER's existing capabilities related to other World Bank operations in Mexico. The GEF will finance the costs of hiring additional personnel with expertise in financial management, procurement, and project management, as well as operating costs.

IV. Safeguard Policies that might apply

Safeguard Policies Triggered by the Project	Yes	No	TBD
Environmental Assessment OP/BP 4.01	×		
Natural Habitats OP/BP 4.04		×	
Forests OP/BP 4.36		×	
Pest Management OP 4.09		×	
Physical Cultural Resources OP/BP 4.11		×	
Indigenous Peoples OP/BP 4.10		×	
Involuntary Resettlement OP/BP 4.12		×	
Safety of Dams OP/BP 4.37		×	
Projects on International Waterways OP/BP 7.50		×	
Projects in Disputed Areas OP/BP 7.60		×	

V. Financing (in USD Million)

Total Project Cost:	16.88	Total Bank Financing:	0.00
Financing Gap:	0.00		

Financing Source	Amount
Borrower	0.00
Global Environment Facility (GEF)	16.88
Total	16.88

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