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# CLEANTECH MÉXICO 2015

## OUTLOOK AND POLICIES FOR UNLOCKING ECOINNOVATION

# EXECUTIVE SUMMARY

There is a strong case for promoting cleantech entrepreneurship in Mexico. Not only has cleantech been one of the fastest growing sectors in developed and developing countries in the last 15 years, but also cleantech-related products, services and processes have proven to be capable of significantly reducing carbon and water footprints. Through the productive and responsible use of resources, this diverse range of products, services, and processes improve operational efficiency across across many industrial sectors. According to the latest CO2 Abatement Cost Curve for Mexico published by the National Institute of Ecology and Climate Change (INECC), a public think tank, cleantech-related levers have an abatement potential in 2020 of 108 MtCO2e, equivalent to one-third of the country's total abatement potential. The net financial and social benefit of these abatement measures is summed up in their average negative abatement cost of -26 USD/ tCO2e in 2020.

An extensive survey was conducted into the current state of the cleantech industry in Mexico, its potential and the specific opportunities it represents, receiving input from 200 cleantech entrepreneurs along with 30 direct interviews and an experts' workshop with research centers, government officials as well as public and private financial institutions. These findings served as the basis for a series of policy recommendations aimed at promoting the development of innovations in clean technologies, improving incentives for their development, financing and adoption, as well as fostering new investment opportunities in cleantech startup companies.

The survey assessed the current state of the cleantech sector, analyzing key innovation and commercialization indicators based on the methodology used in the Global Cleantech Innovation Index, developed by WWF and the Cleantech Group.

| INNOVATION | SCORE | COMMERCIALIZATION | SCORE |
|---|---|---|---|
| INVESTMENT IN R&D | LOW | REVENUE | LOW |
| CLEANTECH PATENTS | MEDIUM | LEVEL OF INVESTMENT IN SCALE-UP PHASES | NON-EXISTENT |
| CLEANTECH COMPANIES | LOW | CONTRIBUTION TO GDP | LOW |
| HUMAN CAPITAL | MEDIUM | CONGLOMERATION DEGREE | NON-EXISTENT |
| SOPHISTICATION OF COMPETITIVE ADVANTAGE | LOW | INTERNATIONALIZATION | LOW |

Both groups of indicators revealed low scores for most variables when compared to other OECD countries: limited patent solicitation (less than 3% of all patents), limited investment in the scale-up phase (almost no private or public funding), low number of consolidated firms (only one cleantech company has had an initial public offering), lack of conglomeration (there is not one cleantech cluster), and only a small percentage of companies competing in international markets.

These results can be explained by the following reasons:

1. Existing policies are not aligned between agencies, and have proved ineffective in triggering cleantech innovation. Even though multiple policies exist to foster innovation and entrepreneurship and many of these could be used for cleantech, for the most part they are uncoordinated, lack common goals, share little information (e.g., no study has yet been conducted of the country's cleantech competitive advantages), and seldom produce incentives for innovators and potential adopters.

2. Limited compliance with environmental regulation and perverse incentives. These factors inhibit demand for clean technologies and are detrimental to environmental conservation. The weak institutional framework fails to enforce environmental compliance and sanctions, constituting a serious setback to greener growth in all sectors. Moreover, water and electricity subsidies in the agricultural sector are not only delaying cleantech adoption but fostering the irresponsible use of natural resources.

3. Lack of incentives for academia and industry linkages. In Mexico, most of the available funding for cleantech startup companies comes from the federal government (60%); however, these resources only amount to 0.5% of Mexico's GDP (versus 2.4% in OECD countries). In addition, only 2% of the federal R&D budget (which is lowest among OECD countries) is used for clean energy, making it necessary to focus only on financing early-stage innovation instead of scaling-up, field-testing or market trials. The low allocation of federal funds, coupled with the lack of incentives for industry-academia collaboration programs, has led to a low output in terms of market-ready innovation. Additionally, the lack of collaboration among industry participants has proven to be a barrier to the formation of cleantech clusters, further limiting the opportunities for collaborations between industry and academia.

4. Lack of diverse and sophisticated financial mechanisms. Few financial instruments can be used to fund both cleantech innovation and the scaling-up of clean technology. The lack of sophistication in the development of intangible assets has forced investors to seek other types of guarantees prior to agreeing to invest in early-stage cleantech companies. Also, scarce demand for cleantech products and services (close to 50% of startups surveyed have an average revenue of less than USD 70,000 their first year) have left financing options in the hands of the public sector and informal investors. Forty three percent of the surveyed entrepreneurs had to rely on their own funds to bootstrap their cleantech ventures (less than five cleantech projects have been funded in the past five years by NAFIN's seed capital funds). Consequently, the scale-up market stage tends to rely on mostly corporate funding or conventional financing mechanisms that require further guarantees, while offering prohibitively high-interest rate loans. This contrasts strongly with other regions, including Scandinavia, Israel and the US, where most capital is concentrated on this stage.

5. Low diversity and lack of specialization in academic programs. Despite having an increasing number of engineering graduates (according to OECD, Mexico produced approximately 90,000 engineers in 2014, half of the number produced in the US),

academic curricula in most cases do not consider industry or market requirements, resulting in a lack of specialized human capital in key areas such as renewables and energy efficiency.

6. Insufficient incentives for the development, protection and commercialization of intellectual property. According to the Mexican Industrial Protection Institute (IMPI), Mexico has a comparatively low number of patent filings by Mexican citizens (8% during 2013). This is mostly attributed to the limited information currently available for independent technology developers, limited incentives for research centers and the ineffective enforcement of intellectual property protection laws. However, according to the World Intellectual Property Organization (WIPO) Mexico has accounted, on average, for about 5% of the total patents filed by country of origin within the first decade of the current century.

There is no doubt Mexico´s cleantech industry is on the rise. Though figures for pure-play cleantech firms, cleantech patents, and specialized workforce are currently low, they continue to increase year by year. One concern that remains despite the aforementioned low but sustained growth is the lack of congruence between international commitments and domestic public policies to promote and accelerate green-economic growth. Even though progress has been made in terms of public funding for innovation, more needs to be done in terms of cleantech innovation. Likewise, despite progress in climate and energy efficiency legislation, further action is required to reduce uncertainty for corporate and private investors, as well as to incentivize the early adoption of cleantech solutions.

Today, Mexico's political, economic and environmental landscape presents a bright new opportunity to incentivize growth in the cleantech space. Once the recently approved Energy Reform is implemented, it will incentivize the private sector to participate in the energy industry. This will serve as a catalyst for innovation in clean technologies, with specific emphasis in renewable energy, as well as energy efficiency and smart grids. Energy is today the most important area within cleantech: 44% of surveyed startups are in this sector, 29% in renewables and 14% in energy efficiency.

For all these reasons, after evaluating policies, consulting with experts and understanding the needs of cleantech entrepreneurs, we can summarize the main conclusions in this report as a need to develop a national industrial policy to trigger cleantech growth.

Building any kind of industrial policy or strategy requires considerable coordination between federal and local institutions and much leadership to monitor its course of action. Thus, we have focused on intervention opportunities with a bottom-up approach as the basis of a new industrial policy, which consist of the following actions::

From a demand side perspective:

1. Improve environmental regulation and strengthen its enforcement. Among the primary recommendations for policy change are adaptations and improvements to environmental standards for waste management, energy efficiency, renewable energy and water disposal within industry. Other key goals include incorporating natural gas and jet fuel into the carbon tax and aligning environmental laws within the countryIn order to improve the enforcement of existing policies, financial and institutional autonomy ought to be given to the National Environmental Protection Agency, which should also be empowered to impose criminal and tougher administrative sanctions. Likewise, energy efficiency standards in the housing sector require institutions that can measure their impact and compliance.

2. Modify and develop effective policy incentives. We recommend eliminating incentives and subsidies aimed at minimizing costs in diverse industries, which come at the cost of efficient use of natural resources (e.g. water subsidies in the agricultural sector preclude the adoption of energy and water efficient technology). In their place we recommend creating incentives to incorporate a new "green catalogue" of products into public procurement policies, including products that would result in substantial efficiency improvements, rely on renewable sources such as solar and wind power, or promote efficient waste treatment and disposal.

3. Maximize the impact of the Energy Reform. We recommend that the new regulation guarantees a simple and effective system of compliance for Clean Energy Certificates (CELs), so that it is easy to manage and to collect sanctions. Furthermore, we suggest the possibility of differentiating CELs for generators at a small scale, less than 10 kW, and allowing a portion of the estimated generation over the lifetime of the system to be claimed in advance (similar to Australia's solar incentives, where 2% of electricity is generated by systems smaller than 5kW). We also recommend that the national-content laws included in the Reform also serve to ensure that companies will demonstrate that they can remain competitive according to international standards.

   From a supply side perspective:

4. Improve the perceived value of intellectual property: We recommend the creation of a Sistema Nacional de Inventores (National Independent Research System) that recognizes and protects the work of independent inventors and facilitates the registration of patents in relevant domestic and international markets (e.g. providing guidance and financing). Moreover, we suggest signing international agreements to facilitate the registration, commercialization and licensing of cleantech patents in Mexico and its main markets (e.g. in the United States), while protecting the work developed by the intellectual property owners, including research centers, researchers, independent scientists and students.

5. Promote investment in both early stage and commercialization of clean technology. We recommend creating new public financing mechanisms that could accompany cleantech innovations from conception to commercialization. Specifically, we recommend the expansion in scope of the Energy Sustainability Fund (CONACYT-SENER), Innovation Stimuli Fund (CONACYT-SE) and FINNOVA (CONACYT-SE) to finance early stage, prototype, field trials and market testing of clean technology. Coupled with this, it will be useful to have a private-public co-investment funds for cleantech late-stage ventures (i.e. commercialization).

6. Strengthening linkages between industry and academia. We recommend expanding post-doctoral support programs such as SENER-CONACYT "Mexican Postdoctoral Projects on Energy Sustainability" to include internships at relevant international cleantech companies. Moreover, we also recommend the development of industry-led mentoring and training programs (for the development of technical, business administration, marketing and financial skills) at technical universities and institutes. We also propose creating graduate programs focused on producing industry (rather than academic) leaders in cleantech, similar to the Engineering Doctorate programs in the United Kingdom.

7. Development of a specialized workforce for the cleantech industry. We recommend that curricula at technical academic programs related to cleantech (e.g. environmental engineering) be reformed and refocused to attend the needs of the

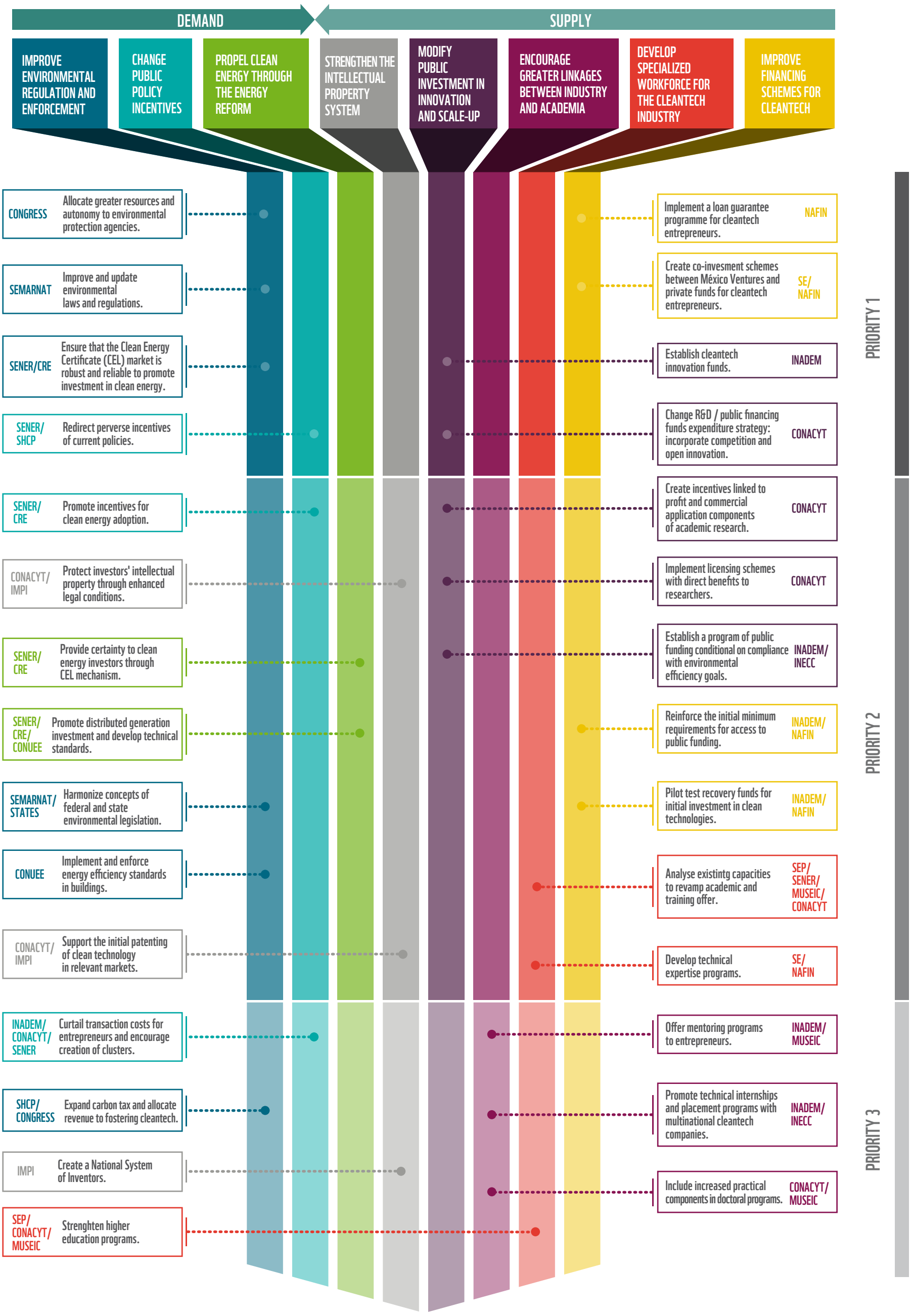
current and future cleantech industry in Mexico (e.g. wind or solar industries). We also recommend the addition of optional modules for college degrees that include entrepreneurship, business administration, marketing and finance.

8. Develop loan guarantee programs and encourage public-private investment in cleantech. Develop a Federal Loan-Guarantee Program for cleantech entrepreneurs (similar to that created for women entrepreneurs), including a stringent due-diligence process prior to the assignment of such guarantees (e.g. making sure the recipient is not listed in Mexico´s National Credit Bureau). We also recommend the promotion of late-stage co-investment opportunities in cleantech ventures between Mexico Ventures and venture capital firms. Moreover, we recommend that INADEM encourages the creation of specialist seed-capital funds focused on the following three areas: climate change, energy and sustainability.

These recommendations are part of an implicit larger recommendation to Federal and State governments, as well as academia, private sector, civil society, NGOs and financial institutions, to focus on cleantech innovation and commercialization. We believe it is crucial to improve the conditions surrounding technological innovation in order to boost cleantech growth in Mexico. . To achieve this, policy makers, investors and entrepreneurs need to actively participate in the development of a comprehensive nation-wide industrial policy.

# C.3 TOWARDS AN INDUSTRIAL CLEANTECH POLICY IN MEXICO

Supply and demand side policy measures are required for building an industrial cleantech policy. These measures, grouped into eight categories, are shown in order of priority in the roadmap below.




## INDUSTRIAL CLEANTECH POLICY IN MEXICO