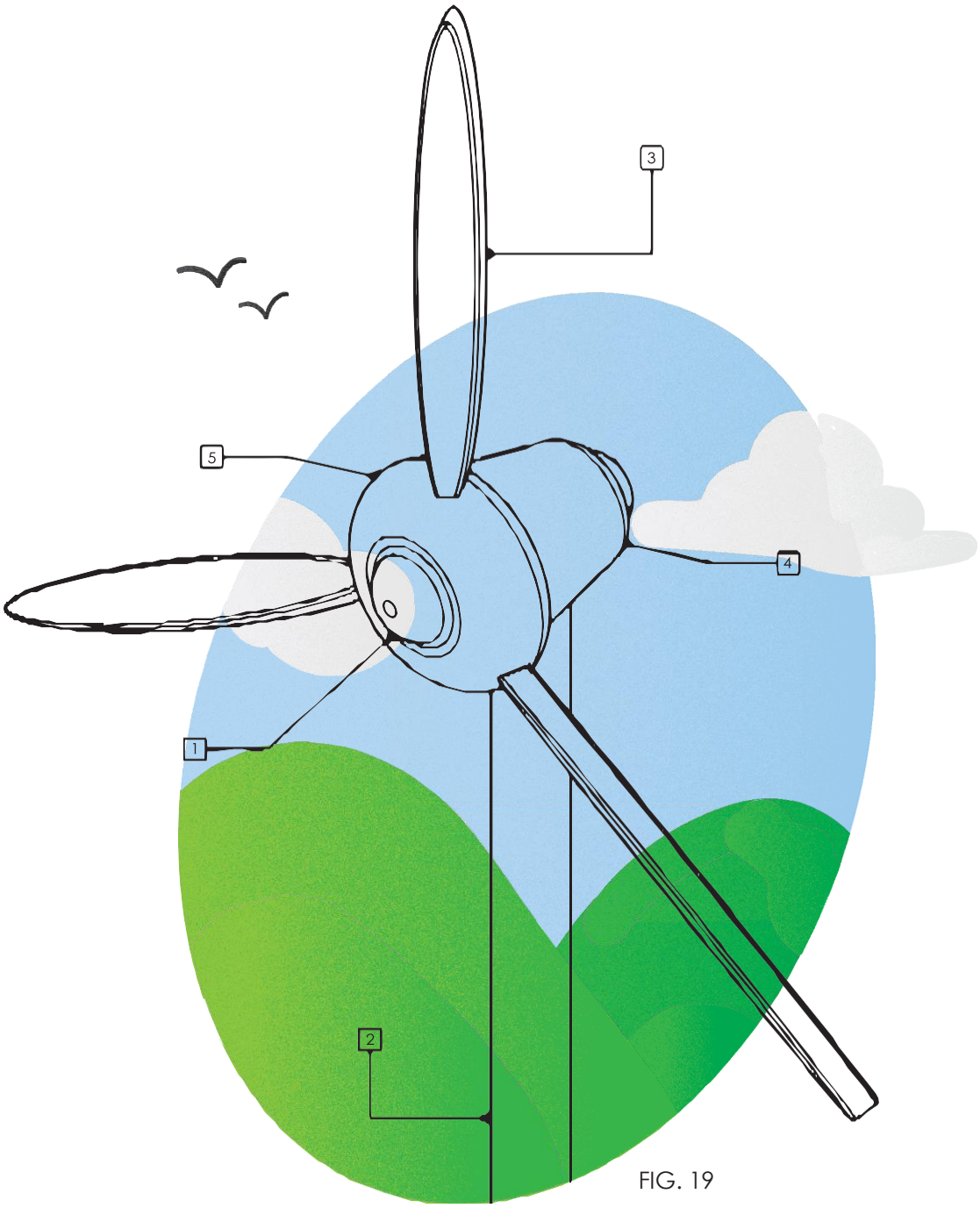

FIG. 19

GREEN PATENTS IN MEXICO

FROM 2017 TO 2022

& THEIR IDENTIFICATION BY GENDER

INTELLECTUAL PROPERTY, SUSTAINABLE DEVELOPMENT AND CIRCULAR ECONOMY

CAIINNO®
CENTRO DE ANÁLISIS PARA LA INVESTIGACIÓN EN INNOVACIÓN

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Key Words: green patents, green technologies, green innovations

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MOTIVATION

The primary motivation was the lack of statistical information in Mexico that identified the number of Mexican green patents applied within the country. This information is fundamental to promote and justify the changes that would allow Mexico to increase the amount of research and development activities relevant to combat climate change. Additionally, the presented data aid decision-makers to design better structured policies and interventions according to the current situation. Moreover, this investigation has the goal to give voice to the many women inventors who have overcome various paradigms and challenges that have appeared in their lives.

SCOPE & LIMITATIONS

As with any investigation, there are some limitations. Firstly, the presented information was gathered through inquiries, therefore largely depending on the unbiased responses of the collaborators. Secondly, considering that they can be edited without any prior notice, the publication addresses the validity constraints of the sources from which the codes were extracted. For that reason, CAIINNO cannot confirm whether or not such changes are made, and if the presented results will be affected.

IMPI SUPPORT

This is an effort to support the work of the Mexican Institute of Industrial Property (Instituto Mexicano de la Propiedad Industrial) (IMPI). Part of what makes a country better is the participation of civil society organizations. In this instance, CAIINNO seeks to contribute knowledge that supports the IMPI, the country, and other beneficiaries (e.g., academics, specialists, etc.).

POLITICAL NOTICE

CAIINNO's work, along with this research and its investigators, is not related with any political party in Mexico or abroad. This study was developed due to the investigators' personal interests, as well as the desire to help improve the conditions of the country. Though this publication aims to be of value for decision-makers and public officials, it was not designed to engage in attacks between political parties or candidates, hence, its usage for such reasons is prohibited.

DEFINITION OF GENDER & SEX

For the content of this investigation, we applied the terms created by the World Health Organization (2015). The term "gender" refers to the characteristics socially attributed to women and men, while "sex" solely refers to the biological differences.

PREFACE

It is a pleasure to present the research carried out by a group of authors represented by the Analysis Center for Innovation Research, (in Spanish, Centro de Análisis para la Investigación e Innovación, A.C. "CAIINNO"). Who sought to contribute, as an organized civil society, by highlighting the need to encourage discussion on subjects that affect us all, such as climate change, whose effects, we experience daily, and on all latitudes over the world. They also contributed by proposing mechanisms that encourage industrial property to help counter the negative effects of climate over the natural resources that, only 30 years ago, we believed to be inexhaustible.

The global climate crisis has uncovered the urgent need for the development and implementation of sustainable technologies that mitigate the negative effects of climate change. In this framework, Green patents have turned into a great indicator of technological advancement and the commitment of a country to environmental innovation. Nevertheless, there is a noticeable lack of statistical information in Mexico to identify and quantify the number of green patents registered by Mexicans within the country. This lack of data obstructs the promotion and justification of policies that encourage investigation and development activities aimed at generating relevant inventions in the fight against climate change.

The present investigation arises from the necessity of highlighting the number of green patents issued to Mexicans and the role of women in this sphere. After collecting and analyzing the data from the period 2017 – 2022, this study offers a first general overview of the current situation of green patents in Mexico. It classifies them into mixed, women-only, or men-only teams, according to the participation of men and women. This information will not only help us promote changes in the investigation sector but also emphasize the crucial role of women inventors, many of whom have overcome obstacles and paradigms to contribute to the fight against climate change.

This study, although limited by the reliability of the information provided by the authorities, aims to be the first step toward a deeper understanding of green innovation in Mexico and its potential growth. By providing specific data on a subnational level, the study offers a solid foundation for policymakers to design more targeted and efficient interventions that promote the investigation and technological development in Mexico.

Additionally, the study presents examples of strategies implemented in various regions that could not only be analyzed to bring them to the Mexican context but also to other latitudes in Latin America, who have begun to promote environmentally impactful strategies from their offices or Industrial Property Institutes.

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Master in Intellectual Property and Innovation, University of San Andres, the joint Master program of the WIPO, and former Director General of the National Registry of Costa Rica.

ABSTRACT

This effort made by organized civil society aimed to identify, on a subnational level, the number of green patents granted to Mexican residents from 2017 to 2022. Moreover, we identified the participation of women inventors in this patent sector- leading to the creation of the following three groups:

a) Mixed Teams — At least one woman and one man partake as inventors of the same invention.
b) Only Women — Only women have the role of inventors of an invention.
c) Only Men — Only men have the role of inventors of an invention.

The number of female and male inventors was also identified. The calculation did not check whether a person appears as inventor in more than one invention, so it is possible that the same inventor appears in more than one, and then be counted more than once.

We considered the data from 2017 to 2022, analyzing a total of 2,752 records. We were also able to obtain 100% of the required information-which helped with identifying the granted green patents. Furthermore, we used, separately, the proposed patent green codes of the World Intellectual Property Organization (1,220 codes) and the European Patent Office (193 codes). It was identified that they coincide in some codes. It was decided to integrate both because both are used in the literature and contribute to the present research.

The following table shows the results. The sum of the column "total green patents WIPO+EPO" contains the sum only of patents where the WIPO and EPO codes are not the same. This in order not to double count patents where the codes match. As an example, in 2017 although the sum of WIPO patents (78) and EPO patents (20) arithmetically would be 98, 83 are considered in the table because the WIPO and EPO codes coincided in 15 granted patents.

Table 1. Total of green patents used by Mexican residents (in accordance with the WIPO and EPO classifications).

Year	Total of green patents WIPO + EPO	Total of green patents WIPO	Total of green patents EPO	Total of green patents (solely women) WIPO	Total of green patents (solely women) EPO	Total of green patents (solely men) WIPO	Total of green patents (solely men) EPO	Total of green patents (mixed) WIPO	Total of green patents (mixed) EPO	Total of women in green patents WIPO	Total of women in green patents EPO	Total of men in green patents WIPO	Total of men in green patents EPO
2017	83	78	20	3	1	45	12	30	7	48	8	162	43
2018	77	76	9	7	0	34	5	35	4	73	5	162	24
2019	121	116	15	7	0	63	8	46	7	95	12	290	42
2020	95	93	8	6	0	44	6	43	2	81	2	249	26
2021	139	133	13	7	0	66	8	61	5	138	7	312	31
2022	104	98	12	3	0	43	5	52	7	107	12	251	26
Total	619	594	77	32	1	295	44	267	32	542	46	1426	192

Source: Own elaboration according to the data retrieved through the various enquires presented to the Mexican Institute of Industrial Property. The data was then applied to the filters designed by the programming language R, such which was developed for this investigation.

The previous table demonstrates that, according to the WIPO and EPO, there is a difference in the amount of used green patents and those created by women inventors. Although there isa higher number of green patents invented by men, there is also a large number of collaborations between women and men (mixed patents)- such which isa positive. The difference is most evident in the gap between the total number of women and men inventors.

GREEN PATENTS: GENERAL INTERNATIONAL PANORAMA

The CO2 emissions caused by urbanization, agriculture, animal husbandry, and deforestation have accelerated the loss of biodiversity to a point in which continued inaction will only lead to disastrous consequences. According to Román-Palacios & Wiens (2020), if nothing is done to mitigate climate change, it is estimated that by 2070, one out of three plant and animal species will face global extinction.

One of the first efforts made to prevent such was the United Nations Conference on Environment and Development (CNUMAD, 1992), which held the famous "Earth Summit" in 1992, with the goal of creating a new agenda on environmental and development issues in the 21st century. It now serves as a guideline for international cooperation and the development policy of the 21st century. This event later gave rise to the "Rio Declaration", which plays an essential part in invention patent-based activities.

The report of this Summit established the definition of "green technologies" as "environmentally sound technologies that protect the environment, are less polluting, use resources more sustainably, recycle a greater proportion of their waste, and manage residual wastes more effectively than the technologies they have come to replace" (UN, 1992). This definition is used as reference whenever "green technologies" is mentioned in this investigation.

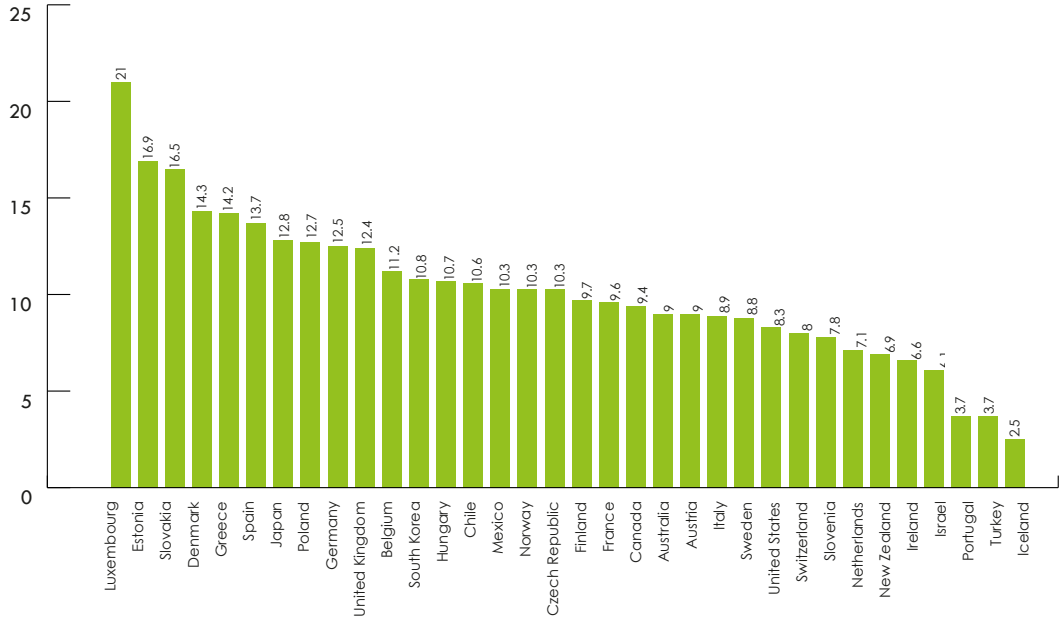
The impact of the "Earth Summit" can be identified in the works of the World Intellectual Property Organization (WIPO), which, since the beginning of the century, has motivated the generation of inventors aiming to combat the problems caused by climate change. For instance, it has been almost 10 years since the launch of WIPO GREEN, a program that aimed to create links between those who wish to share innovative and environmentally sound technologies, while also addressing climate change related problems (WIPO, 2013).

On a national level, Brazil is one of the countries that has conducted a significant number of studies related to green patents. Nunes Menezes, Menezes dos Santos, & de Bortoli (2016), utilized potentiometry to identify -based on the available data on green patents- the usage level of green technology. The data focuses on zones with a high assemblage of invention development, as well as providing an analysis of the economic contributions of such innovations.

On an international level, there are comparative studies about the growth rate of green patents- as demonstrated in the investigation titled "Measurements and Trends in Technological Eco-Innovation: Evidence from Environment-Related Patents" (Urbaniec, Tomala, & Martinez, 2021). In this paper, data from China, Korea, Japan, the United States and Germany are used to measure the level of "eco-innovation". These countries are considered to be the most important in terms of the number of green patents granted, serving as good indicators of the behavior of this type of technology.

According to the information provided by the Organization of Economic Cooperation and Development (OECD) in 2013 (CBS, n.d.), Luxembourg topped the list of countries with its high number of green patents, accounting for approximately 21% of green inventions. Respectively, Estonia and Slova- kia ranked 2nd and 3rd place with 16.9% and 16.5%. It is worth mentioning that Mexico held the 15th position with 10.3% of green patents, while Iceland ranked last place with 2.5%.

Graphic 1. Comparison of green patent request percentages with the total of patents in each country, 2013.



Source: Own elaboration according to the data provided by the OECD, CBS.

It is not a coincidence, but rather a causal relationship, that the previous graph shows European countries holding certain rankings. This is highlighted by Fabrizia, Guarini, & Meliciani (2018), who explain the significant impact made by the research and environmental development activities of the Europe 2020 strategy. The continued relevance is evident in how the European Com- mission's 2020-2024 research and innovation strategies continue to prioritize actions that prevent further environmental degradation and endangerment of life on Earth (European Commission, n.d.).

The consulted literature illustrates an expanding trend in the creation of green inventions and an increasing need for green programs. It is also suggested that to facilitate the growth of green patents, the government needs to adopt a more active role in this sector. For instance, Cohen, Gurun, & Nguyen (2022) analyzed the behavior of U.S. companies that participated in patenting activities for green inventions.

Nonetheless, to assure the growth of green innovation policies, they need to be appropriately designed and executed. Otherwise, especially in the case of Latin America, there is a risk of the efforts solely having a limited effect. In this regard, Grazzi, Sasso 6 Kemp (2019), have introduced a conceptual mark for measuring green innovations in Latin America and the Caribbean- such which can serve as a reference point in the development of green policies.

But the following question arises: Who are the ones producing the green patents? According to Fushimi, Bergquist, Rivera, Xu, & Wunsch-Vincent (2018), in a study realized by the WIPO, the upcoming four countries account for about 60% of all green patents: Japan, Germany, China, and the U.S. The impact of climate change is felt worldwide, which begs the following question: How is Mexico responding?

AD HOC POLICIES FOR GREEN PATENTS

After consulting literature, it can be identified that there is a noticeable international trend to promote invention patents as part of the solution to climate change. Nevertheless, as indicated by Ring (2021), there are skeptics among some academics regarding this approach. The author analyzed that, regardless of the stance, a strong legal framework linked with good public policies is essential to fully leverage the potential of green patents.

For that reason, within literature it is possible to identify the important role invention patents have in the international efforts to reach carbon neutrality in 2050 (European Parliament, 2019). The previous is corroborated by studies similar to the one written by authors Li, Wang, & Deng, (2022), who indicated that there is a current trend of applying green patents as primary solutions (active innovation) rather than alternatives. Moreover, there has been a growing diversity of these type of inventions.

In Europe, the topic of eco-innovation has become even more relevant in the business sector and in the agendas of political leaders. A clear example of this is the study titled "Green patents, regulatory policies and research network policies" (Fabrizi, Guarini, & Meliciani, 2018), which analyzes the influence of environmental regulations with the development of green technologies in the European continent. It was discovered that, although emission controls contribute to its development, market-based incentives may be more efficient in motivating inventors (independent or not) to create green technologies.

That said, this transition would not have been possible without the private sector. Companies such as General Electric have been actively involved in the creation and transfer of green technologies (Horton, 2012). This company has recognized the importance of investing in research and development activities (R&D), as well as the pivotal role of innovation in addressing climate change (General Electric, 2011). It also highlighted the special characteristics green technologies have in comparison with other types of invention patents-such as pharmaceuticals.

Furthermore, through an analysis of patent data, Johnstone, Haščič, & Popp (2009) discovered that, in the case of renewable energy, public policies play a decisive role in the amount of requests received for green patents. Additionally, according to Wang, Yeung, Li, & Wang (2022), cities actively engaged in the creation of green patents benefit from increased private investments, which lead to various positive externalities. Nevertheless, in line with Chen & Song (2017), it is important to examine the models of green patents to deter- mine if there are any restrictions that hinder its progress.

An important point for assuring that the spread and adoption of green technologies occurs as quickly as possible is the transfer of technology. Unlike the more commercial stances of this issue, the relevancy of the climate change crisis has transformed it into a global emergency (UN, 2021). According to Hall (2010), effective strategies and public policies are required to facilitate the rapid dissemination of knowledge, particularly in regard to the potential externalities associated with reducing negative impacts and enhancing positive ones.

But in the effort to combat climate change, the private sector emerged as a crucial player. For example, some companies launched the initiative "Eco-Patent Commons", which sought to be a means for other companies to freely share and utilize knowledge and patents with environmental benefits (Bowman, 2009). According to Contreras, Hall, & Helmers (2019), even though not all the objectives were reached, it was essential to share useful information. As well as sharing various lessons on how to better develop these kinds of initiatives.

SPECIAL GREEN PATENT SUPPORT PROGRAMS

One of the policies that have been implemented to encourage the creation of green patents is the fast-track patenting process, for which an overall implementation strategy has already been proposed (Lane, 2014). According to the WIPO (2012), the primary goal of this process is to focus on the requests for green technologies. This intervention is limited within the national borders where it is applied- hence, the particular conditions depend on the country. In the early years of such interventions, a diagnostic carried out by Patton (2012) discovered that there is no evidence that supports the statement that the application of these programs encouraged a growth of green patents.

Later, Dechezleprêtre (2013) led a comprehensive study to assess the results of different national green patent programs in seven countries with green patent policies in 2011. This perspective differs a bit from Patton's, perchance due to the timing of Dechezleprêtre analysis and his access to more information. Several of his findings emphasize that:

1. In general, there are few applications for admission in comparison with the total amount of patent requests.

2. Nonetheless, while some countries had a low percentage (Australia with 1%), others seemed to have had more success (U.K. with 20%).

3.It is inferred that the promotion campaign of the program was not intensive.

4. Overrepresentation of national applicants.

5. The goal of reducing the processing time was reached, with a 75% decrease in the time average of deciding whether to grant a patent.

6. Start-up companies were the most frequent users of the program. It is believed that it was to obtain funding or royalties faster.

7. Companies that wait to see how the market reacts to the technology they patent, tend to not join the program.

8. In the case of IP offices, a problem arises with not being able to completely ascertain the environmental benefits of certain technologies.

Among the few nations that have implemented this policy, Australia reviewed applications for benefit requests of environmentally sound technologies through its accelerated process (IP Australia, 2020). Another relevant case is that of the United States Patent and Trademark Office, which, in 2012, received a total of 5550 patent benefit requests with the accelerated process (USPTO, 2012). As shown in their official reports, they obtained the following results:

Table 2. Results of green patent benefit requests.

Petition Summary	Amount
Petitions awaiting decision	0
Petitions granted	3533
Petitions dismissed	1501
Petitions denied	516
Total petitions received	5550
Issued US Patents having granted Green Pet	1062

Source: Own elaboration based on the USPTO, Green Petition Report Summary, available in: https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.uspto.gov%2Fsites%2Fdefault%2Ffiles%-2Fpatents%2Finit_events%2Fgreen_report_summary20120426.pdf&data=05%7C01%7CCynthia.Henderson%40trade.gov%7C733c95404d7a4160a93208db31f3909c%7Ca1d183f26c7b4d9ab9945f2f31b3f780%7C1%7C0%7C638158694396058404%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6M-n0%3D%7C3000%7C%7C%7C&sdata=IMc9wIJALS8K8WO3d4CtVC6EHZCqZuCaePkVTkHSbR4%3D&reserved=0

Depending on the established perspective, the previous performance could be considered a success. For a country like Mexico, this can motivate them to implement a similar program. Of course, all in accordance with its characteristics and conditions during 2023. As mentioned by Jackman & Ball (2023), its suitability as a public policy is clearly demonstrated by the ten countries that have or have had an accelerated program for green patents: the U.K., the U.S., Australia, Brazil, Canada, China, Israel, Japan, and South Korea. There- fore, the following section explains, in general terms, the operation of the two green patent support programs in the U.S.

PILOT PROJECT FOR GREEN TECHNOLOGIES IN THE UNITED STATES

To this date, this program has concluded its validity period. Its definition of "green technologies" included those that were aimed at environmental protection, energy conservation, the development of renewable energy, and the reduction of greenhouse gases (Patton, 2012, pág. 32). In comparison with the existing policy, the concept of "green technologies" was more inclusive towards which projects could join the program.

It was first established in 2009 (Federal Register, 2009)[1] and discontinued in March 2012, or upon the arrival of 3,500 patent applications considered under status of the program (Federal Register, 2011). This consisted of each patent categorized as "green" automatically being given priority for examination. Moreover, it receives preferential treatment if it is treated by the Court of Patent Appeals. One of the benefits was that the maximum waiting period was 12 months- which represented a major incentive considering that the average time is 24 months. Such was based on previously published rules for the accelerated examination, which did not solely benefit green patents (Federal Register, 2006).

The results of this program were positive, showing an increase in 2010 with patents of greenhouse gas emissions and clean energies. As explained by Hurtado (2021), the program's proposed cusp was quickly surpassed. In 2012, there was a decrease of 44% of carbon capture and storage patents, as well as a 29% of those related to green technologies. The motive behind the drop remains unclear, but Hurtado infers that it could be due to certain regulations or policies, including technological limitations. For these reasons he concludes that the advanced process is the best possible policy.

Similarly, Kuhn & Teodorescu (2020), carried out an analysis to replicate and expand Dechezleprêtre's work on acceleration policies for USPTO patents. The analyzed were the "Green Technology Pilot Program" and the "Track One Pilot Program" policy.[2] They identified that some patents submitted into the fast-tracking process were the subject to litigations than those that were not submitted. It is important to mention that the study did not explicitly clarify whether the observed increased litigation applied specifically to green patents- it was discovered that the green technologies program generated positive externalities. Although this effort was not restricted to green patents, it does present useful evidence for policy makers in this area.

Here you can consult general information about the program's characteristics: https://www.federalregister.gov/documents/2009/12/08/E9-29207/pilot-program-for-green-technologies-including-greenhouse-gas-reduction

The latter offered acceleration opportunities for certain patent application procedures, not necessarily beneficial for the environment, but with the goal of avoiding backwardness.

THE UNITED STATES PILOT CLIMATE CHANGE MITIGATION PROGRAM

Issued on March 6th of 2023, this current "green patents" acceleration policy consists of the creation of the "award category" for patents that deal with matters relevant to climate change (USPTO, 2023). It is limited to inventions that focus on clean energies including wind, solar, hydrogen, hydroelectric, geothermal, and technologies involved in the development of plant-based fuels or biofuels. All patents that fall under this categorization are eligible to participate in the "Patents for Humanity" competition. Applications for this event are currently open.

The program is designed to have a positive impact on the climate by accelerating the processing of patent requests for environmental innovations. It includes those related to environmental quality, energy conservation, the development of renewable energy resources, and the reduction of greenhouse gases. The program aims to promote research, development, and innovation in climatology, as well as to encourage investment through the protection of intellectual property. As it can be seen, the USPTO created initiatives for inventors to propel growth in this industry. Moreover, the accepted applications are considered on an accelerated basis. The USPTO will review special petitions till June 5th of 2023 or when 1,000 requests have been granted special status- depending on whichever occurs first (USPTO, 2023).

Additionally, in July of 2022, the USPTO announced its union with "WIPO Green". Created by the WIPO in 2013, this organization consists of public and private bodies with the common goal of boosting the development of eco-friendly technology. The U.S. then created the new program of issuing patent acceleration certificates as an act of contribution to such association. As members of "WIPO Green", the USPTO joins the rank of IP authorities, alongside the national agencies of Brazil, Canada, Chile, Denmark, France, Japan, Lebanon, Morocco, Portugal, and Switzerland (USPTO, 2022)

A panel of experts independent from the USPTO are the ones who decide which patents can benefit from the program. The best-judged patents are then examined by an integrated review panel composed of employees from different departments of the U.S. government (USPTO, 2023). When one or several applications are selected, a certificate of "acceleration" will be issued. Such which will allow the winners to hasten their implementation procedure, ex parte reexamination, or ex parte appeal before the Patent Trial and Appeal Board. This certificate does not apply for disputes that arise after the grant of the patent nor private dispute settlements (USPTO, 2023).

This program was published by the U.S. government through the citation 77 FR 6544 (Federal Register, 2012). In regard to distribution of the Acceleration Certificates, the U.S. omitted the "Patents for Humanity Program Improvement Act" (116th Congress of the United States of America, 2021), which allowed for and made provisions of its issuance by the USPTO. Due to this, it can be inferred that the United States Pilot Climate Change Mitigation Program is part of, if not by extension, of the "Patents for Humanity" program. To participate in the "Patents for Humanity" contest, the inventor must be vigilant of the dates for the application period and awards (USPTO, 2023). It should be noted that the USPTO created a specific section in their web page for those who postulate an invention in the field of "Green Energy", they should create an account in order to track their status in the competition (USPTO, s.f.).

For more information, consult the following link: https://www.uspto.gov/about-us/news-updates/uspto-announces-new-patents-humanity-green-energy-category

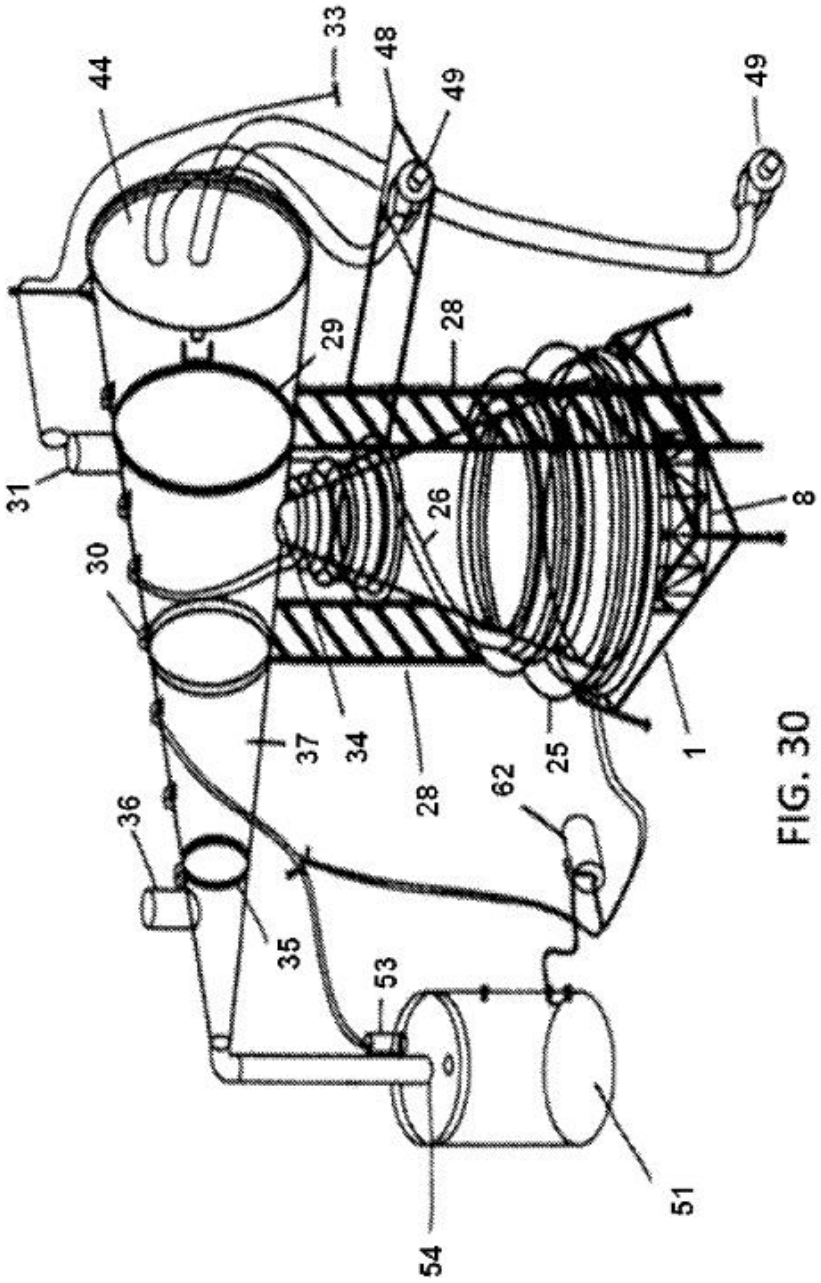
GREEN TECHNOLOGY: GENERAL OVERVIEW OF MEXICO

In the case of Mexico, there is very little literature on the problems with chronologies and patents. Among the studies is that of Vianna Bretas, Cordeiro Morais, Monteiro da Hora, & Azevedo Filho (2019), which identified that there are green patents in Mexico, in addition to being the main discretionary country of the countries compared to BRICS countries (Brazil, Russia, India, China and South Africa). On the other hand, Dochniak (2017) identified several patents related to global warming granted in the United States, among which some of Mexicans stand out who have worked on inventions against this phenome- non stand out. Among the invention patents that Dochniak identified stands out that of Miguel Ángel Caraveo-Martínez, who invented an "emissions purification system and a device to stop global warming that can eliminate polluting gases produced by combustion" (México Patente nº US 8454001 B2, 2010). This invention tries to combat one of the most severe issues in the country, particularly in urban areas.

For its part, the OECD has also carried studies on green patents that include Mexico, for example, it identified that from 2000 to 2011 patent applications for environmental technologies increased by 149.4 percent, while the total number of applications increased by 51.37 percent (OECD, n.d.).[4] According to the same source, other countries have grown even more than Mexico, for example, environmental patent applications grew 436 percent in Korea, 784 percent in India, and 1,040 percent in China.

Also, the OECD supported the Special Climate Change Program 2009-2012, which aimed to reduce greenhouse gases by 50 percent by 2050, compared to those emitted in the year 2000 (2011). In an evaluation carried out on said program, it was identified that most of the proposed goals were pending to be met, which is why in various cases the originally expected reduction of emissions had not been achieved (IMCO, 2012).

Figura 1. Ejemplo de patente verde.



Fuente: Imagen extraída de US 8,454,001, Emission purifying sustem and device for slowing global warming, (https://patentcenter.uspto.gov/applications/12876288).

USMCA

One of the obligations that Mexico has to take action against climate change is embodied in the Treaty between Mexico, the United States and Cana- da. Chapter twenty-four of the Environment promotes high levels of environ- mental protection, through an effective application of environmental laws and the obligations that have been acquired in multilateral environmental agreements. At the same time, it is recognized that increased cooperation, to protect and preserve the environment and sustainable development, fosters trade and investment. The Chapter seeks to strengthen the environmental governance of the countries, support the implementation of the international environmental agreements to which they are a party, and complement the objectives of this Treaty (Gobierno de México, 2019).

Now, the following USMCA articles are what have some kind relationship with actions to protect the environment through the use of technologies, which invention patents could be behind of:

> ***"Article 24.10: Protection of the Marine Environment from Pollution by Ships"***
>
> 3. Pursuant to Article 24.25 (Environmental Cooperation), the Parties shall cooperate to address matters of mutual interest with regard to pollution of the marine environment by ships. Areas of cooperation may include:
>
> (d) development of technologies to minimize waste generated by ships;
>
> ***Article 24.11: Air Quality***
>
> The Parties will cooperate to address matters of mutual interest with regard to air quality. Cooperation may include the exchange of information and experiences in areas related to:
>
> (d) reduction, control and prevention technologies and practices.

Article 24.24: Environmental Goods and Services

1. The Parties recognize the importance of trade and investment in environmental goods and services, including clean technologies, as a means of improving environmental and economic performance, contributing to green growth and jobs, and fostering sustainable development, while that address global environmental changes."

Regarding Chapter twenty, on Intellectual Property Rights, there is no specific precision indicating the use of invention patents to care for the environment. However, the vision of the Treaty regarding seeking the social and economic well-being of the member countries, as well as the provisions of chapter twenty-four, could be sufficient justification for the three countries to collaborate in this regard. Even so that Mexico can try to implement a policy similar to the Climate Change Mitigation Pilot Program, with the pertinent adjustments.

MEXICAN STATE LEGISLATION ON CLIMATE CHANGE

A first contribution of this publication is to identify whether the current state legislation on climate change at the state level considers the use of invention patents as a tool to combat or mitigate climate change. The second is to identify whether current local science, technology and innovation laws establish the use of invention patents as a tool to combat or mitigate climate change.

Regarding the former, it was found that all legislations have a definition of "climate change". Several do not have their own definition of climate change, but expressly refer to using the one established by the General Law on Climate Change. It was also identified that none of the local laws expressly considers inventions, particularly invention patents, as a solution against cli- mate change.

However, it was found that some laws consider promoting research and development activities. In Oaxaca, the law promotes changes in technology, as well as the transfer and innovation of clean technologies, although it does not link it to the fact that these changes must be generated locally, so it is inferred that foreign technology could be acquired. To review the articles where climate change is defined and its content, review Annex 1.

Table 3. State climate change legislation, 2017-2022.

State	Legislation	Includes concept of climate change.	Includes the use of inventions (patents) as a solution to climate change.
Aguascalientes	Climate Change Law for the State of Aguascalientes.	Yes.*	No
Campeche	Law of Ecological Balance and Environmental Protection of the State of Campeche.	Yes	No
Chiapas	Law for the Adaptation and Mitigation of Climate Change in the State of Chiapas.	Yes	No
Chihuahua	Climate Change Law of the State of Chihuahua.	Yes	No
Mexico city	Law on Mitigation and Adaptation to Climate Change and Sustainable Development of Mexico City.	Yes	No
Coahuila	Law of Science, Technological Development, and Innovation for the State of Coahuila de Zaragoza.	Yes	No
Colima	Law for the Mitigation and Adaptation to the Effects of Climate Change for the State of Colima.	Yes	No

Durango	Climate Change Law for the State of Durango.	Yes	No
Guanajuato	Climate Change Law for the State of Guanajuato and its Municipalities.	Yes	No
Guerrero	Law Number 845 on Climate Change for the State of Guerrero.	Yes	No
Hidalgo	Law on Mitigation and Adaptation to the Effects of Climate Change for the State of Hidalgo.	Yes	No
Jalisco	Law for Action on Climate Change of the State of Jalisco.	Yes.*	No
State of Mexico	Climate Change Law of the State of Mexico.	Yes.*	No
Michoacán	Climate Change Law of the State of Michoacán de Ocampo.	Yes.*	No
Morelos	Ecological Balance and Environmental Protection Law of the State of More-los.	Yes	No
Nayarit	State Law of Ecological Balance and Environmental Protection of the State of Nayarit.	Yes	No
Nuevo León	Law of Climate Change of the State of Nuevo León.	Yes	No
Oaxaca	Climate Change Law for the State of Oaxaca.	Yes	No
Puebla	Climate Change Law for the State of Puebla.	Yes	No
Querétaro	Climate Change Law for the State of Querétaro.	Yes	No

Quintana Roo	Climate Change Action Law for the State of Quintana Roo.	Yes	No
San Luis Potosí	Climate Change Law for the State of San Luis Potosí.	Yes	No
Sinaloa	State Law on Climate Change.	Yes	No
Sonora	Climate Change Law of the State of Sonora.	Yes.*	No
Tabasco	Climate Change and Sustainability Law of the State of Tabasco.	Yes	No
Tamaulipas	Climate Change Law for the State of Tamaulipas.	Yes	No
Tlaxcala	Environmental Protection and Sustainable Development Law of the State of Tlaxcala.	No	No
Veracruz	State Law on Mitigation and Adaptation to the Effects of Climate Change of the State of Vera- cruz.	Yes	No
Yucatán	Climate Change Law of the State of Yucatán.	Yes	No
Zacatecas	Climate Change Law for the State of Zacatecas and its Municipalities.	Yes	No

Source: Own elaboration based on information obtained from each of the laws, last revision date March 13, 2023.

* This state indicates that it takes as its definition that of article 2 of the Climate Change Law for the State of Aguascalientes.
* This state indicates that it takes as its definition that of article 7 of the Law for Action on Climate Change of the State of Jalisco.
* This state indicates that it takes as its definition that of article 4 of the Climate Change Law of the State of Mexico.
* This state indicates that it takes as its definition that of article 3 of the Climate Change Law of the State of Michoacán de Ocampo.
* This state indicates that it takes as its definition that of article 3 of the Climate Change Law of the State of Sonora

Likewise, state legislation on science, technology and innovation was reviewed in order to identify whether they consider these issues as tools against climate change. Moreover, it was sought if in their texts they address the use of invention patents as a solution or tool against climate change. In both cases, none of the state legislation contemplates the approach sought.

Table 4. State legislation on science, technology and innovation, and its relationship with climate change.

State	Legislation	Includes concept of climate change.	Includes the use of inventions (patents) as a solution to climate change.
Aguascalientes	Law of Science, Technology, Innovation, and Entrepreneurship for the Development of the Knowledge Society of the State of Aguascalientes.	No	No
Campeche	Law for the Promotion of Scientific and Technological Research of the State of Campeche.	No	No
Chiapas	Law of Science, Technology, and Innovation of the State of Chiapas.	No	No
Chihuahua	Law of Science, Technology, and Innovation of the State of Chihuahua.	No	No
Mexico City	Law of Science, Technology, and Innovation of Mexico City.	No	No
Coahuila	Law of Science, Technological Development, and Innovation for the State of Coahuila de Zaragoza.	No	No
Colima	Law for the Promotion and Development of Science and Technology of the State of Colima.	No	No
Durango	Science and Technology Law for the State of Durango.	No	No
Guanajuato	Education law for the state of Guanajuato.	No	No

Guerrero	Law Number 076 on Science, Technology, and Innovation of the State of Guerrero.	No	No
Hidalgo	Science, Technology, and Innovation Law of the State of Hidalgo.	No	No
Jalisco	Law of Science, Technological Development, and Innovation of the State of Jalisco.	No	No
State of Mexico	Science and Technology Law of Mexico State.	No	No
Michoacán	Law of Science, Technology, and Innovation of the State of Michoacán.	No	No
Morelos	Law of Innovation, Science, and Technology for the State of Morelos.	No	No
Nayarit	Science, Technology, and Innovation Law of the State of Nayarit.	No	No
Nuevo León	Law of Science, , Technology, and Innovation of the State of Nuevo León.	No	No
Oaxaca	Law of Science, , Technology, and Innovation for the State of Oaxaca.	No	Yes
Puebla	Law for the Promotion of Scientific, Technological, Humanistic, and Innovation Research for the State of Puebla.	No	No
Querétaro	Law for the Promotion of Scientific, Technological, Humanistic, and Innovation Research for the State of Querétaro.	No	No

Quintana Roo	Law of Science and , Technology of the State of Quintana Roo.	No	No
San Luis Potosí	Science and Technology Law of the State of San Luis Potosí.	No	Yes
Sinaloa	Science, Technology, and Innovation Law of the State of Sinaloa.	No	No
Sonora	Law for the Promotion of Innovation and Scientific and Technological Development of Sonora.	No	No
Tabasco	Law for the Promotion of Scientific Research and Technological Development for the State of Tabasco.	No	No
Tamaulipas	Law for the Promotion of Scientific and Technological Research in the State of Tamaulipas.	No	No
Tlaxcala	Law of Science and, Technology for the State of Tlaxcala.	No	No
Veracruz	Law for the Promotion of Scientific and Technological Research in the State of Veracruz de Ignacio de la Llave.	No	No
Yucatán	Law for the Promotion of Scientific, Technological Development, and Innovation of the State of Yucatán.	No	No
Zacatecas	Law of Science, , Technology, and Innovation of the State of Zacatecas.	No	No

Source: Own elaboration based on information obtained from each of the laws, las revision date March 13, 2023.

It is important to highlight that some of the legislations in the previous table state that inventions or innovations are expected to generate a social benefit, which could be translated into actions against climate change. Only in the case of Aguascalientes, it is specified that priority will be given to "projects that aim to achieve a rational, more efficient and ecologically sustainable use of natural resources" (Congreso de Aguascalientes, 2022). The complete list of information can be consulted in Annex 2.

FOREIGN LEGISLATION ON INTELLECTUAL AND INDUSTRIAL PROPERTY, AGAINST CLIMATE CHANGE

Finally, a review of national intellectual and industrial property legislation (as the case may be) of other countries was made, depending on the one that contemplates invention patents, in order to identify if any law contemplates the use of patents as a tool against climate change. The following table shows the countries considered, and it was found that none contemplates the use of patents for this purpose in their legislation. The complete list of information can be consulted in Annex 3.

Table 5. National legislation on industrial or intellectual property, contemplating invention patents, and their relationship with climate change.

Country	Name of the Law	Contemplates the use of invention patents as a tool against climate change.
Guatemala	Industrial Property Law.	No
Argentina	Law on Patents of Invention and Utility Models.	No
Bolivia	Law of December 2, 1916 on Industrial Privileges.	No
Chile	Law No. 19039 of March 6, 2006 on Industrial Property (consolidated law approved by Decree Law No. 4 of June 30, 2022, as amended by Law No. 21355 of July 5, 2021).	No
Colombia	Decision No. 486 of the Cartagena Agreement establishing the Common Regime on Industrial Property.	No

Costa Rica	Law No. 6867 of April 25, 1983, on Patents for Inventions, Industrial Designs, and Utility Models (as amended by Law No. 8686 of November 21, 2008).	No
Cuba	Decree No. 54, of the Country Trademark of the Republic of Cuba.	No
Ecuador	Decision No. 486 of the Cartagena Agreement establishing the Common Regime on Industrial Property.	No
El Salvador	Intellectual Property Law (as amended by Legislative Decree No. 611 of February 15, 2017).	No
Honduras	Industrial Property Law (approved by Decree No. 12-99-e and amended by Decree No. 16-2006).	No
Nicaragua	Law No. 354 on Patents for Inventions, Utility Models, and Industrial Designs.	No
Panama	Law No. 35 of May 10, 1996 which dictates provisions on Industrial Property.	No
Paraguay	Law No. 1630/2000 on Patents for Inventions (amended by Law No. 4046/2010).	No
Perú	Legislative Decree No. 1075 approving complementary provisions to Decision No. 486 of the Andean Community Commission establishing the Common Regime on Industrial Property (amended by Legislative Decree No. 1397).	No
Dominican Republic	Law No. 20-00 on Industrial Property.	No
Uruguay	Law No. 17164 of September 2, 1999, on Patents (as amended up to Law No. 19924 of December 18, 2020).	No
Venezuela	Industrial Property Law.	No

Belize	Patents Act (Chapter 253, Act No. 14 of 2000 revised edition 2000).	No
Brazil	Law No. 9279 of May 14, 1996 (Industrial Property Law, as amended by Law No. 14200 of September 2, 2021).	No
Haiti	Law of December 14, 1922, on Patents for Inventions, Industrial Designs and Models.	No

Source: Own elaboration based on information obtained from the WIPO Lex portal, available at: https://www.wipo.int/wipolex/en/main/home, last revision date March 13, 2023.

In conclusion, the evidence presented above raises the possibility of analyzing whether it is necessary to integrate into certain legislations, a precision to explicitly promote the use of invention patents as a tool against climate change. Although it is true despite the fact that there is no ad hoc legislation or precision in the laws, it is worth considering whether doing so would allow the generation of public policies in this regard. As seen in the case of the United States, an ad hoc legal framework was created linked to another, in order to promote green patents, without modifying the general legislation. Given the critical situation that exists today, it is an urgent debate to have.

HOW MANY GREEN PATENTS EXIST IN MEXICO?

In CAIINNO it is argued that green patents can be a useful tool against climate change. Therefore, a review was made in the literature, identifying that there are various types of methodologies focused on measuring green innovation, technologies or green patents, in different parameters, such as public and private investment, number of patents, etc. As a reference, the OECD designed a methodology to measure environmental innovation using patent data (Haščič & Migotto, 2015).

The green patents were determined in this study, based on the definition of green technologies established by Program 21, Chapter 32 of the United Nations Conference on Environment and Development, in Rio de Janeiro, which is also used by WIPO. Taking this definition for this publication, it is understood that green patents are those inventions that can be protected through an intervention patents, which are ecologically sound and whose objective is to protect "the environment, are less polluting, use all the resources in more sustainably, recycle a greater proportion of their waste and products, and treat residual waste in a more acceptable way than the technologies they have come to replace" (UN, 1992).

For the present investigation, two classifications of green patents were taken into consideration. First, the proposal by the World Intellectual Property Organization was used (WIPO, n.d.),[5] and then the one used by the European Patent Office (EPO, 2017).[6] Both start from the same promise, which is the identification and selection of codes from both the International Patent Classification (IPC) and the Cooperative Patent Classification (CPC), which are considered "green" under its criteria. It is important to mention that the WIPO considers both IPC and CPC, while the EPO only the IPC.

The exercise was carried out with the list of patents granted to Mexican residents, covering the period from 2017 to 2022. Based on the codes, the methodology implemented for the identification of green patents was the following:

[5] En este link se puede consultar la lista de códigos de patentes verdes de la WIPO: https://www.wipo.int/classifications/ipc/green-inventory/home

[6] En este link se puede consultar la lista de códigos de patentes verdes de la EPO: https://lp.espacenet.com/?locale=es_LP&view=patentesverdes1

1. Requests for information were submitted to the Mexican Institute of Industrial Property, in order to obtain data such as the names of inventors, file numbers, year of granting the invention patent, among others.

2. A list was generated concentrating all the WIPO IPC and CPC codes, and the EPO IPCs identified. In the case of the WIPO, with the help of the R programming language, both classifications were compared, and when it was identified that both shared the same codes, they were concentrated in a single list in order not to duplicate results (see Annex 3).[7]

3. Two ad hoc codes were designed in the R programming language (see Annex 4).

a. One that would allow the identification of the IPC and CPC codes were considered for green patents by the WIPO and the EPO. For this, the database of the previous point was used.

b. One that would allow women inventors to be identified. It is important to mention that the code and the name database of the "World Gender Name Dictionary" designed by WIPO was taken as a reference (WIPO, n.d.)[8], and from there the code was modified to make it useful in this exercise. Likewise, the list of names that WIPO has was expanded.

4. Patents in which women appear as inventors were identified, as well as the number of women per patent, per state and per year. In this regard, the following classification was made:

a. Only women – Patents where only women participate as inventors of an invention.

b. Mixed teams – Patent where at least one woman and one man participate as inventors of the same invention.

c. Only men – Patents where only men participate as inventors of an invention.

[7] La lista de códigos CIP de la OMPI y la EPO se hizo entre el 11 de diciembre del 2022, y el 5 de febrero del 2023, por lo que es posible haya habido algún cambio después de la última fecha.

[8] En este link se puede acceder al sitio a través del cual se accede al código y a la base de datos del diccionario: https://www.wipo.int/about-ip/en/ip_innovation_economics/gender_innovation_gap/gender_dictionary.html una vez dentro, se accede al repositorio de github desde donde se puede descargar todo en este link: https://github.com/IES-platform/r4r_gender para más detalle, ver el anexo.

5. The results of the green patents for the mentioned period were obtained based on the WIPO classification, by state and by year.

6. The results of the green patents for the aforementioned period were obtained based on the EPO classification, by state and by year.

It is important to mention that neither WIPO nor the EPO specify how regularly the sites where codes are updated, so there is a possibility that they may change.

GENERAL FINDINGS WIPO + EPO

The decision was made to identify green patents according to WIPO and EPO in order to exemplify two different and recurring classification criteria in the literature. This is because, like the EPO, other countries with ad hoc programs or policies to support green patents that consist of granting benefits based on the patent code, consider fewer codes than WIPO. While WIPO was found to have a list of 1,220 green codes, the EPO was found to have only 193 green codes (Annex 4).

However, it is important to specify that almost all the EPO codes were within the list of WIPO codes. Therefore, to obtain the total number of green patents and in order not to duplicate registrations, those whose codes were not repeated were added. This is why the total WIPO+EPO patents is 619. Otherwise, adding the WIPO total (594) and the EPO total (77) would have been a mistake because some patents would have been accounted for twice.

Table 6. Total green patents granted to Mexican residents in Mexico, 2017-2022.

Year	Total green patents WIPO + EPO	Total WIPO green patents	Total EPO green patents	Total patents granted to residents in Mexico (green + no greens)
2017	83	78	20	407
2018	77	76	9	457
2019	121	116	15	438
2020	95	93	8	397
2021	139	133	13	618
2022	104	98	12	507
Total	619	594	77	2,824

Source for columns with information on green patents: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.
Source for total patents granted to Mexicans in Mexico: Own elaboration based on IMPI in figures, available at: https://www.gob.mx/impi/documentos/instituto-mexicano-de-la-propiedad-industrial-en-cifras-impi-en-cifras

It was also possible to identify the total green patents at the subnational level for the aforementioned period, giving the following result.

Table 7. Total green patents granted to Mexican residents in Mexico at the state level 2017-2022.

State	Total green patents WIPO + EPO	Total WIPO green patents	Total EPO green patents
Aguascalientes	6	5	3
Baja California	15	14	0
Baja California Sur	1	1	0
Campeche	1	1	1
Chiapas	4	4	0
Chihuahua	3	3	0

Table 7. Total green patents granted to Mexican residents in Mexico at the state level 2017-2022.

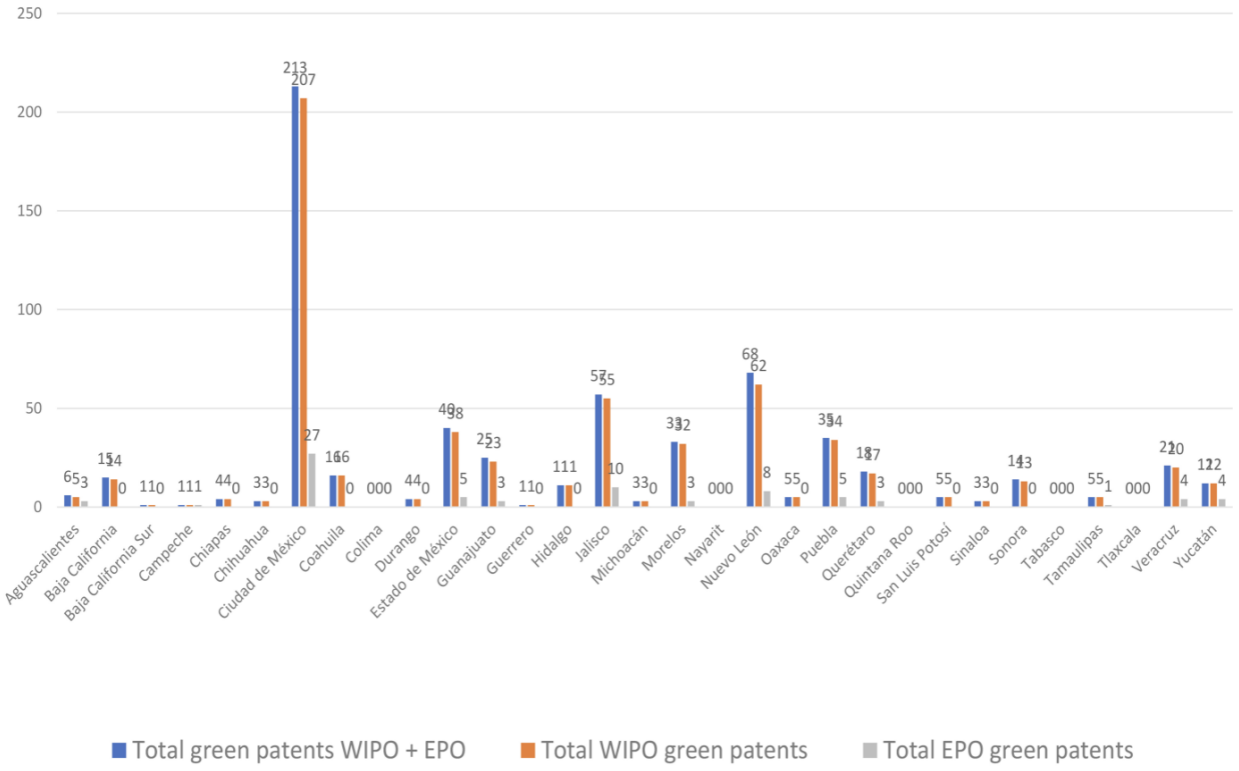
State	Total green patents WIPO + EPO	Total WIPO green patents	Total EPO green patents
Mexico City	213	207	27
Coahuila	16	16	0
Colima	0	0	0
Durango	4	4	0
State of Mexico	40	38	5
Guanajuato	25	23	3
Guerrero	1	1	0
Hidalgo	11	11	0
Jalisco	57	55	10
Michoacán	3	3	0
Morelos	33	32	3
Nayarit	0	0	0
Nuevo León	68	62	8
Oaxaca	5	5	0
Puebla	35	34	5
Querétaro	18	17	3
Quintana Roo	0	0	0
San Luis Potosí	5	5	0
Sinaloa	3	3	0
Sonora	14	13	0
Tabasco	0	0	0
Tamaulipas	5	5	1
Tlaxcala	0	0	0
Veracruz	21	20	4
Yucatán	12	12	4

Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property to which the filters have designed with the R programming language, designed for this research, were applied.

As it can be observed, it is clear that there are many more green patents when the WIPO code list is applied. This could be explained because the WIPO considers many more codes than the EPO. Additionally, when only using the EPO codes several states obtained zero green patents.

Another relevant finding that the following figure shows is the existing gap between Mexico City and the rest of the states, a phenomenon that coincides in both cases (WIPO-EPO). After Mexico City, there is a second group of six states (Mexico State, Guanajuato, Jalisco, Morelos, Nuevo León y Puebla), which had a total of more than twenty-five green patents each. Then a group of seven states (Baja California, Coahuila, Hidalgo, Querétaro, Sonora, Veracruz y Yucatán) that had a total between twenty-four and ten. Finally, a group of eighteen states with less than nine green patents, including five with zero.

Figure 2. Total of green patents granted to Mexican residents in Mexico at the state level, 2017-2022.



Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

GREEN PATENTS ACCORDING TO WIPO

WIPO created a "IPC Green Inventory" that aims to facilitate the search for patent information related to environmentally sound technologies, according to the list of the United Nations Framework Convention on Climate Change. This inventory contains the list of classes and codes that are considered "green", for example, the F03D that corresponds to wind energy. The topics and subtopics are as follows:

Table 8. Topics within which green patents are located, based on the IPC.

Topic	Subtopics
Alternative energy production	• Biofuels. • Integrated gasification combined cycle (IGCC). • Fuel cells. • Pyrolysis or gasification of biomass. • Harnessing energy from manmade waste. • Hydro energy. • Ocean thermal energy conversion (OTEC). • Wind energy. • Solar energy. • Geothermal energy. • Other production or use of heat, not derived from combustion; for example: natural heat. • Using waste heat. • Devices for producing mechanical power from muscle energy.
Transportation	• Vehicles in general (for example: hybrid or electric drive vehicles). • Vehicles other than rail vehicles. • Rail vehicles. • Marine vessel propulsion. • Cosmonautic vehicles using solar energy.

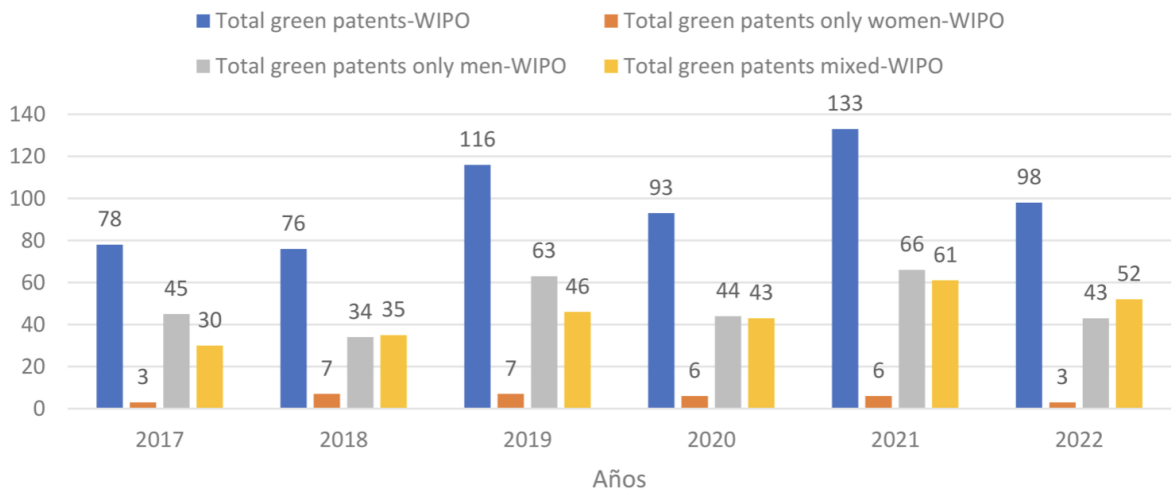
Waste management	• Waste disposal. • Treatment of waste. • Reuse of waste materials. • Pollution control.
Agriculture / Forestry	• Forestry techniques. • Alternative irrigation techniques. • Pesticide alternatives. • Soil improvement.
Energy conservation	• Storage of electrical power. • Power supply circuit. • Measurement of electricity consumption. • Storage of thermal energy. • Low energy lighting. • Thermal building insulation, in general. • Recovering mechanical energy.
Nuclear power generation	• Nuclear engineering (for example: fusion reactors, hybrid fission-fussion reactors, nuclear power plants). • Gas turbine power plants using heat sources of nuclear origin.
Administrative, regulatory or design aspects	• Commuting (for example: teleworking, etc.). • Carbon/emissions trading (for example: pollution credits). • Static structure design.

Source: Own elaboration based on the IPC Green inventory last visited March 11, 2023, available at: https://www.wipo.int/classifications/ipc/green-inventory/home

As identified in Table 6, a total of granted patents were identified that, according to the WIPO codes, are green. Now, speaking specifically of the participation of women inventors in this type of inventions, it was identified that the green patents of "only women" were below those of "only men" in all the years of study. However, it is important to highlight that the "mixed" ones

were almost on par with the "only men" ones, having a total of 266 and 301 respectively.

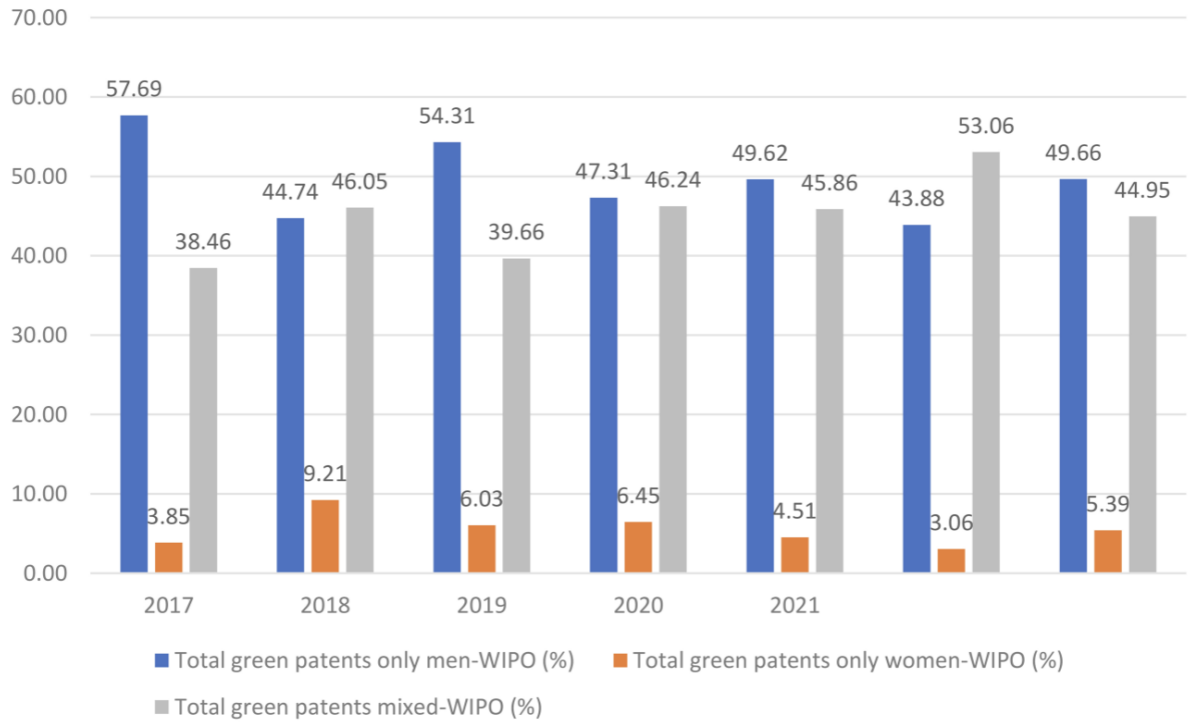
Graphic 3. Total green patents granted to Mexican residents in Mexico at the state level, according to their group, based on the WIPO classification, 2017-2022.



Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

In order to better exemplify the previous results, the percentage of each of the three group (only women, only men, mixed) was also calculated for each of the years. As it can be seen, the percentage of mixed patents is the one that has increased and by 2022, the collaboration between women and men was the most important.

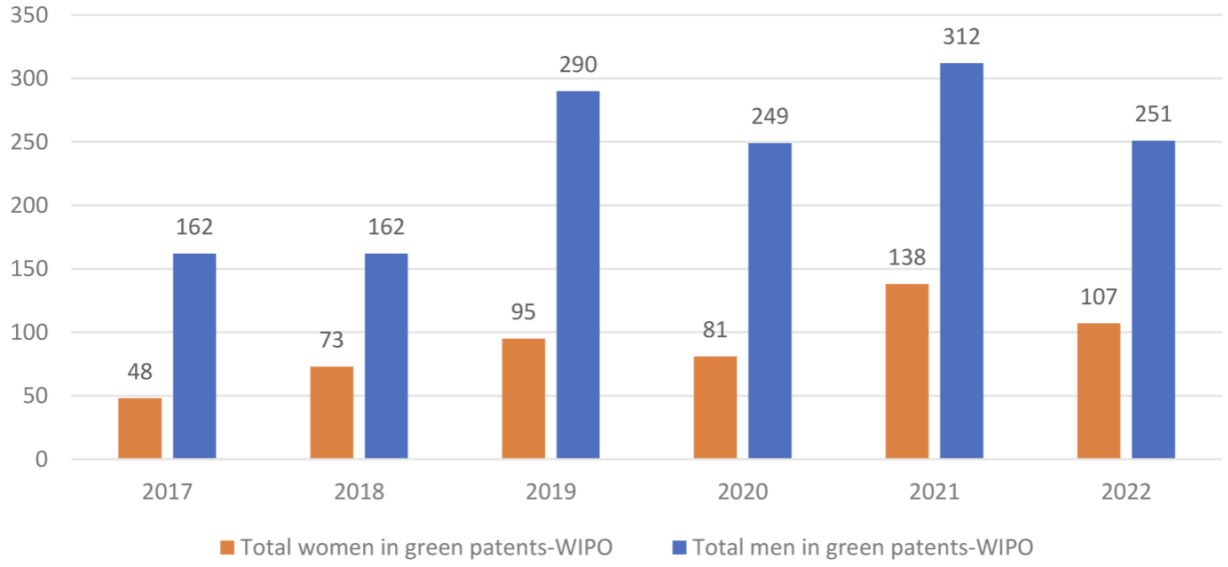
Graphic 4. Percentage of green patents granted to Mexican residents in Mexico at the state level, by group, based on WIPO classification, 2017 - 2022.



Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

The total number of women and men who appear as inventors in the green patents of the period analyzed was also identified. It is specified thot only men and women were added, so it is possible that people who appear in more than one invention have been counted more than once.

Graphic 5. Total number of women and men inventors in green patents granted to Mexican residents in Mexico at the state level, based on WIPO classification, 2017-2022.

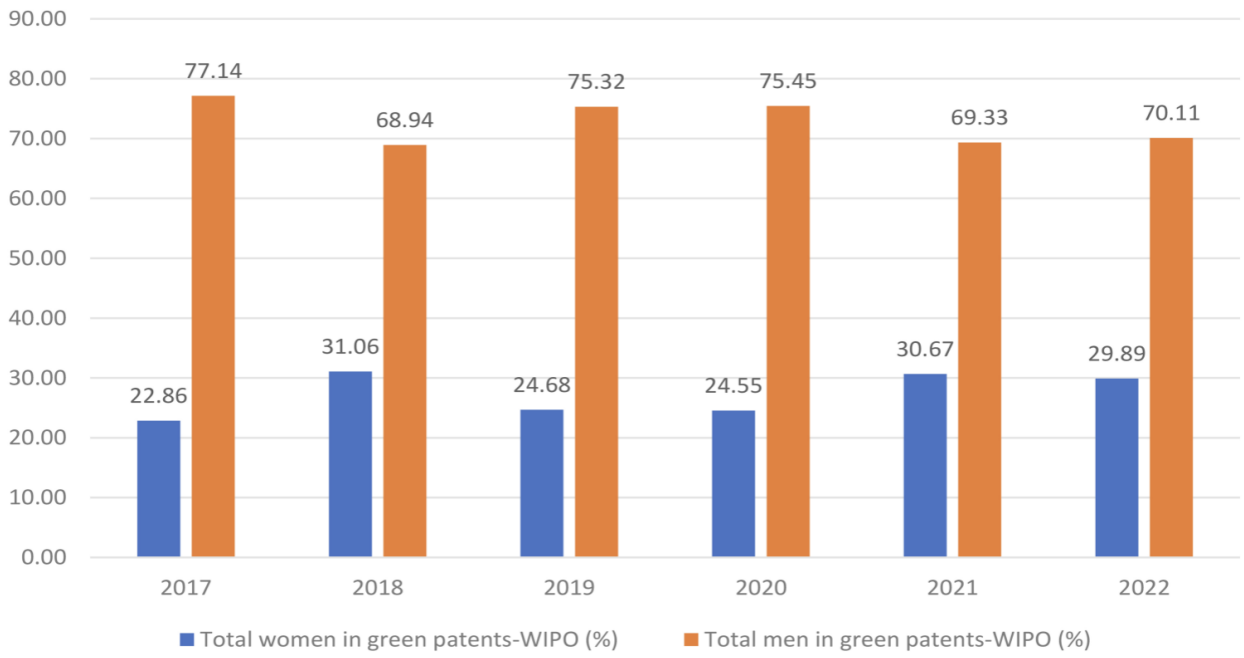


Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

As it can be seen in the figure above, many more men participated as inventors. This could explain why there were far fewer "women only" patents. Likewise, it is possible that women participated in more than one invention, but to confirm this, it is necessary to expand the study carried out here.

Finally, the percentage of women and men for each of the years of study was also extracted. As it can be seen, the gap between the two has remained between 70 and 80 percent throughout the analysis period.

Graphic 6. Percentage of women and men inventors in green patents granted to Mexican residents in Mexico at the state level, based on WIPO classification, 2017-2022.



Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

GREEN PATENTS ACCORDING TO THE EUROPEAN PATENT OFFICE

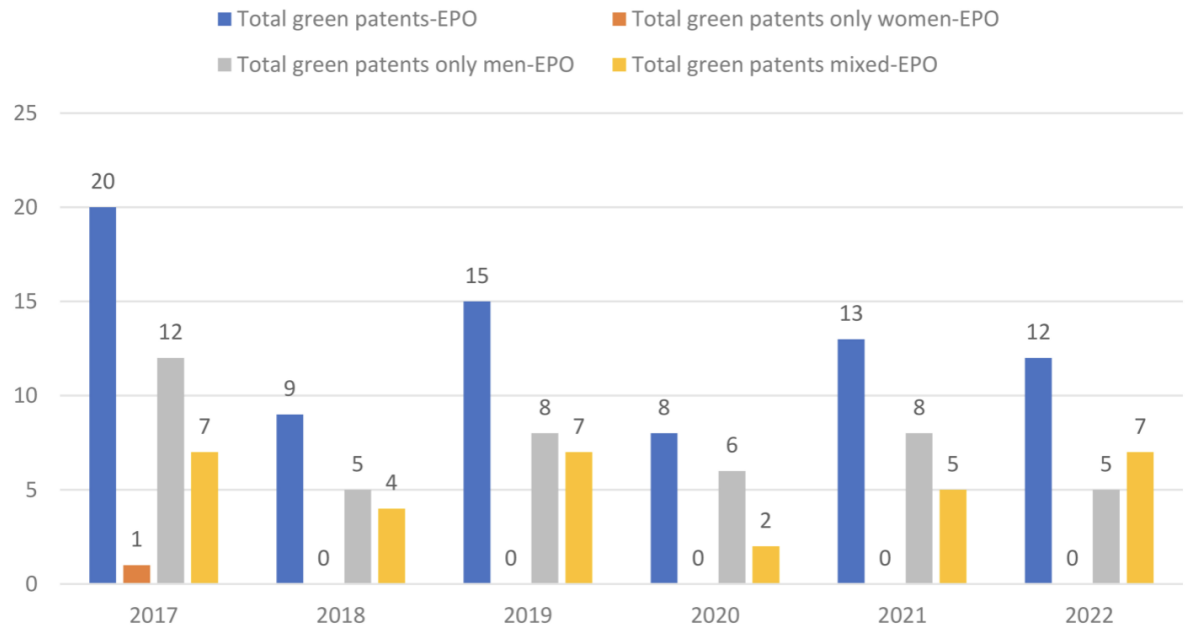
The European Patent Office (EPO) also identified the IPC codes corresponding to what they defined as green technologies. They delimit that list of "green patents" is provisional because it is difficult to define at least three key concepts: i. Clean technology; ii. Green technology, and; iii. Fight against climate change (EPO, 2017). The list of codes is much shorter than that of WIPO, and is made up of the following topics:

- Electric vehicle.
- Construction.
- Biomass and carbon capture and storage.
- Cement.
- Fuel injection.

- Geothermal energy and hydraulic energy.
- Lighting and methane industry.
- Ocean energy.
- Solar energy.
- Waste industry.
- Wind energy.

As it can be identified in Table 7, a total of 77 granted patents were identified that, according to the EPO codes are green. Now, speaking specifically of the participation of women inventors in this type of invention, it was identified that the green patens of "only women" were below those of "only men" in all the years of study, with only 2 patents. However, it is important to highlight that the "mixed" ones were almost on par with the "only men" ones in some years, having a total of 32 and 43 respectively.

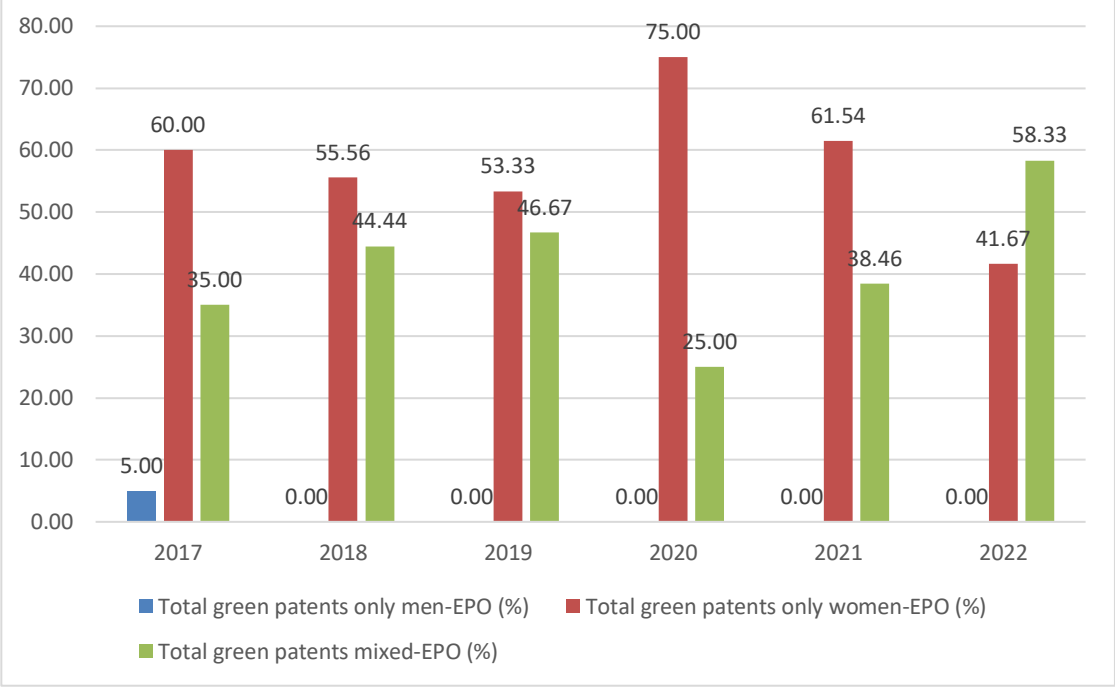
Graphic 7. Total green patents granted to Mexican residents in Mexico at the state level, according to their group, based on the EPO classification, 2017-2022.



Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

Seeking to better exemplify the previous results, we proceeded to calculate the percentage of each of the three groups (only women, only men, mixed), for each of the years. It can be seen that the percentage of mixed patents is the one that has increased and by 2022, collaboration between women and men was the most important.

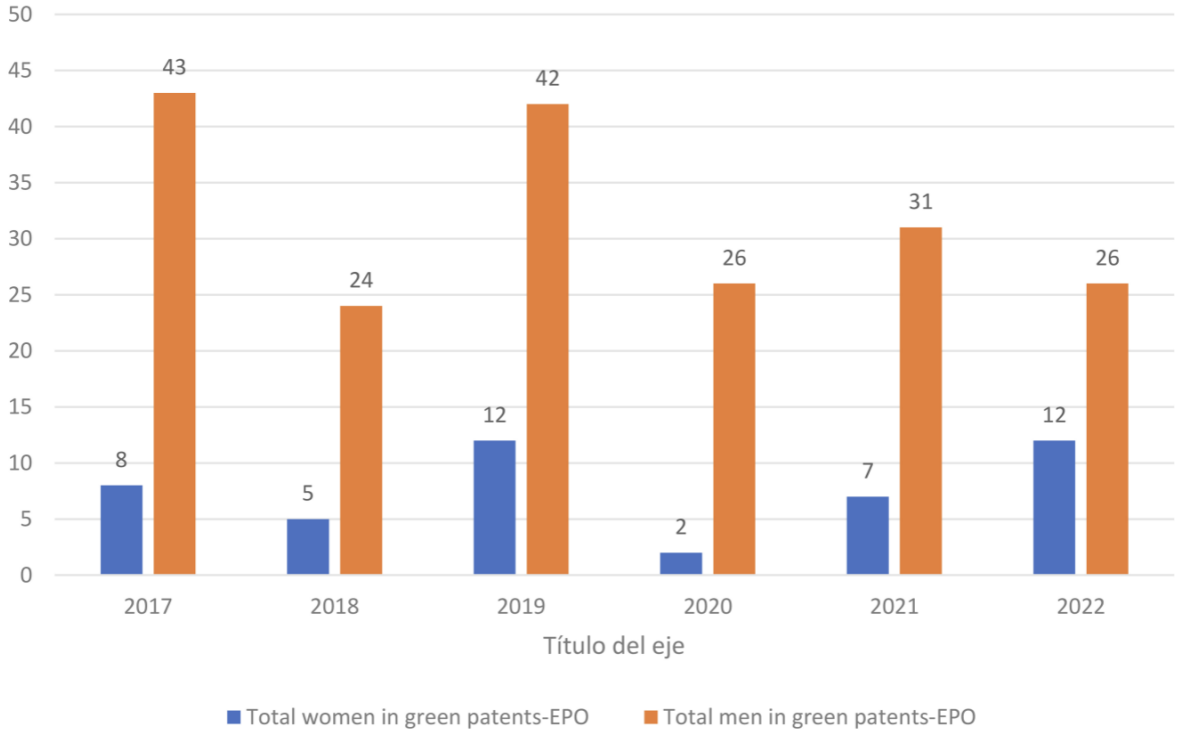
Graphic 8. Percentage of green licenses granted to Mexican residents in Mexico at the state level, by group, based on the EPO classification, 2017-2022.



Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

The total number of women and men who appear as inventors in the green patents of the period analyzed was also identified. It is specified that only men and women were added, so it is possible that people who appear in more than one invention have been counted more than once.

Graphic 9. Total number of women and men inventors in green patents granted to Mexican residents in Mexico at the state level, based on the EPO classification, 2017-2022.

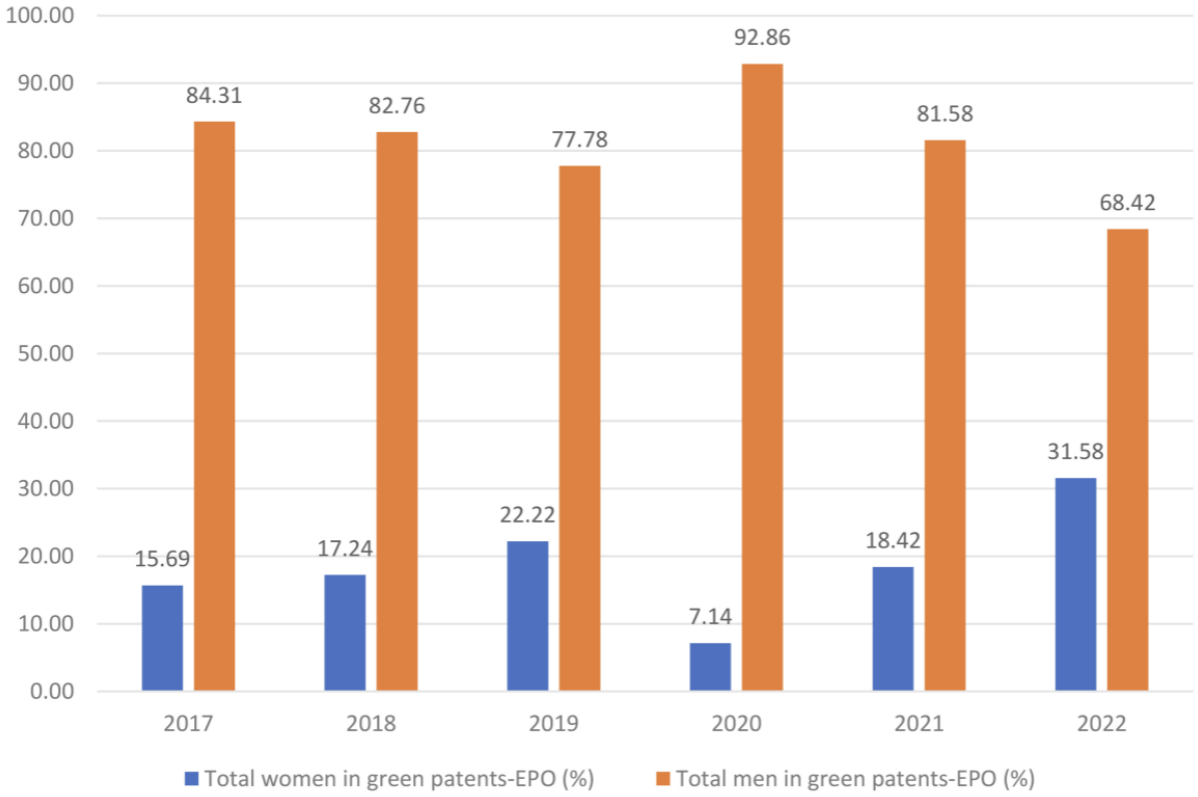


Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

It is possible to see in the figure above that many more men participated as inventors. This could explain why there were far fewer "women only" patents. Moreover, it is possible that women participated in more than one invention, but to confirm this, it is necessary to expand the study carried out here.

Finally, the percentage of women and men for each of the years of study was extracted. In the following figure it is possible to identify the gap between the two has remained between 70 and 80 percent throughout the analysis period. But it can also be noted that in 2022 that gap was substantially reduced compared to other years.

Graphic 10. Percentage of women and men inventors in green patents granted to Mexican residents in Mexico at the state level, based on the EPO classification, 20 7-2022.



Source: Own elaboration with data obtained through various information requests submitted to the Mexican Institute of Industrial Property, to which the filters designed with the R programming language, designed for this research, were applied.

As a conclusion of the point, on how many green patents exist in Mexico, it can be said that first, the difference between the results of the calculation using the codes proposed by WIPO, in contrast to those of the EPO, is clear. For this research, it cannot be asserted that this is positive or negative, but that it is simply a variation possibly explained by the difference in the number of codes that each one contemplates.

As it can be seen in Table 6, of the total 2,317 patents granted to Mexicans from 2017 to 2022 using the WIPO code list, 605 green patents were identified, and applying the EPO code, 77 were identified.

CONCLUSIONS

1. For several years there have been patents that could be considered green, for example, that of Miguel Ángel Caraveo-Martínez, identified by Dochniak.

2. The evidence suggests that ad hoc policies to encourage increased green patents work. However, they require proper design and implementation.

3. None of the Mexican state legislation on climate change expressly considers inventions, particularly invention patents, as a solution against climate change. However, it was found that some laws consider promoting research and development activities, as was the case in Oaxaca.

4. None of the state science, technology and innovation legislation explicitly considers using these three elements as tools against climate change. However, some of the laws in the table above state that inventions or innovations are expected to generate a social benefit, which could translate into actions against climate change. Only Aguascalientes specifies that priority will be given to ecologically sustainable projects.

5. None of the Latin American countries' intellectual and industrial property legislations cited in Annex 3, contemplates the use of the patents as a tool against climate change.

6. Depending on whether the criteria of WIPO or EPO codes is used, it can be concluded if there are few or not so few Mexican green patents.

7. The international trend is to follow a shorter list of green codes, just as the EPO does. However, this does not diminish the importance or feasibility of designing policies using all WIPO codes. In the end, each country is free to design its policy integrating the codes it considers viable.

8. At the subnational level, there is a big gap of green patents between Mexico City and the rest of the states, a phenomenon that coincides in both cases (WIPO-EPO). Then, three groups of states could be considered ranging from a maximum of 68 green patents in total, down to zero of these patents for the study years (2017-2022).

9. While overall there are more patents by men in both the WIPO and EPO results, mixed patents, where men and women collaborate, have gained ground, equaling or exceeding those of only men, it only happend in those of WIPO in 2022.

10. In the results of both the WIPO and EPO codes, women's green patents have remained well below those of men and mixed.

11. The gap between female inventors and male inventors has been maintained throughout all the years of study, both in the results of the WIPO and EPO codes.

RECOMMENDATIONS

1. Analyze green patent fast-track models implemented in other countries, with the goal of identifying the feasibility of reproducing them in Mexico.

2. Design *ad hoc* public policies taking into account as much information as possible. Ideally, circular economic strategies will be considered for the inclusion of green patents.

3. Assess the possibility of creating policies to replicate or create inventions with recyclable materials.

4. Assess the possibility of reforming-on both a state and federal level-climate change, science, technology, and innovation legislations, with the goal of stimulating government support for green patents.

5. Assess the viability of designing policies to encourage the participation of women inventors in the creation of green patents.

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APPENDIX

Annex 1. Comparison and analysis of state and federal environmental laws, concerning their usage of science, technology, innovation, and invention patents.

State	Legislation	Climate Change	Environment (protection of)	Use of CTI and invention patents as solutions
Federal	General Law on Climate Change.	**Article 3:** **IV. Climate change:** Weather variation that is directly or indirectly attributed to human activity that alters the composition of the global atmosphere, becoming a part of the natural climate variability observed over comparable periods.	**Article 2:** I. Guarantee the right to a healthy environment by establishing a concurrence of federative powers, entities, and municipalities in the production of public policies for the adaptation to climate change and the lessening of greenhouse gases and compounds.	Nonexistent.
Aguascalientes (Congreso del Estado de Aguascalientes., 2015)	Climate Change Law for the State of Aguascalientes.	There is no explicit definition of climate change. Nonetheless, it is mentioned in Article 2 that for the purposes of this Act, the definitions provided in Article 3 of the "General Law on Climate Change" will be applied.	II. Guarantee the right to a healthy environment by establishing bases for the production and application of gender-responsive public policies for the adaptation to climate change and the lessening of greenhouse gases and compounds.	Nonexistent.
Campeche (Congreso del Estado de Campeche, 1997)	Law of Ecological Balance and Environmental Protection of the State of Campeche.	Article 3 of state law replicates presented definition in the 3rd article of the "General Law on Climate Change".	ARTICLE 11. Corresponding to the Municipal governments: III. In accordance with their respective territorial districts, preserve and restore the ecological balance and protection of the environment, except in matters falling within the responsibility of the State or the Federation. IV. Adopt the necessary measures to prevent and control ecological emergencies and environmental contingencies. Especially when the scale of the ecological imbalances or damages do not exceed their territorial scope. When the action is exclusive, the Federation will provide the required support.	Nonexistent.

Chiapas (Congreso del Estado de Chiapas, 2015)	Law for the Adaptation and Mitigation of Climate Change in the State of Chiapas.	Article 4, Section V, of the state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Replicates Article 2 of the "Federal Law on Climate Change". Article 84. The objectives of the public mitigation policies are the following: I. Via the mitigation of emissions, protect the right to a healthy environment, and promote sustainable development and the protection of the environment.	Nonexistent.
Chihuahua (Congreso del Estado de , 2013)	Climate Change Law of the State of Chihuahua.	Article 3, Section II, of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 59. To accomplish the previously mentioned, the Secretariat must: II. Establish agreements with social and private organizations related to the environment, all while promoting adaptative and mitigative actions towards climate change; and the establishment, administration, and management of protected natural areas. As well as providing support with the sustainable management of natural resources and the development of investigative studies on the topic.	Nonexistent.
Mexico City (Congreso del Estado de Ciudad de México, 2011)	Law on Mitigation and Adaptation to Climate Change and Sustainable Development of Mexico City.	Article 4, Section V, of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 2. The objective of this Act is to: I. Guarantee the universal right to a healthy environment that assures the development and well-being of an individual. VIII. Promote an environmental civic culture through access to information and the encouragement of participation, that leads to a transformation of the patterns, habits, and norms of the production and consumer culture into ones based on sustainability.	Nonexistent.
Coahuila (Congreso del Estado de Coahuila de Zaragoza, 2013)	Law for the Adaptation and Mitigation to the Effects of Climate Change in the State of Coahuila de Zaragoza.	Article 7, Section II, of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 17. In correspondence with the agencies of the Public State Administration- according to their respective spheres of competence- the following functions must be performed:	Nonexistent.

			VI. Introduce new mechanisms to the offices that manage the care and safety of natural resources, in turn fostering an environmental caring culture among the public servants assigned to the department in charge- all while avoiding the use of unnecessary materials. Moreover, creating mechanisms for the periodic review of official vehicles, energy conservation, drinkable water, recycling, waste sorting, and other habits that are environmentally friendly.	
Colima (Congreso del Estado de Colima, 2016)	Law for the Mitigation and Adaptation to the Effects of Climate Change for the State of Colima.	Article 5, Section III, of state law replicates the definition provided in Article 3 of the "Federal Law on Climate Change".	**Article 12.-** Objectives of the mitigative public policies: **I.** Promote environmental conservation, sustainable development, and the right to a healthy environment. **X.** Develop public and economic incentives to propel the estableishment of industries and companies that are environmentally friendly.	Nonexistent.
Durango (Congreso del Estado de Durango, 2013)	*Climate Change Law of the State of Durango*	Article 3, Section III, of state law replicates the definition provided in Article 3 of the "Federal Law on Climate Change".	***ARTICLE 31.*** *To accomplish the points mentioned in the previous article, the Comission must:* ***II.*** *Establish agreements with social and private organizations related to the environment, all while promoting adaptive and mitigative actions towards climate change; and the establishment, administration, and management of protected natural areas. As well as providing support with the sustainable management of natural resources and the development of investigative studies on the topic.*	*Nonexistent*

Guanajuato (Congreso del Estado de Guanajuato, 2013)	Climate Change Law for the State of Guanajuato and its Municipalities.	Article 2, Section II of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	**Article 42.** During the execution and evaluation of the local policy on climate change, the State executive and the municipalities will reflect the following principles: **IV.** Prevention: The most effective method to preserve the ecological balance in the face of the effects of climate change, avoiding any damage towards the environment. **VIII.** Environmental responsibility: The obligation of whomever performs activities that affect or may affect the environment to prevent, minimize, repair, restore, and ultimately, compensate for the damage caused. **Article 49.** Objectives of the mitigative public policies: **I.** Promote environmental conservation, sustainable development, and the right to a healthy environment through the mitigation, reduction, or compensation of emissions.	Nonexistent.
Guerrero (Congreso del Estado de Guerrero, 2015)	Law Number 845 on Climate Change for the State of Guerrero.	*Article 2, Section II of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".*	**Article 2.** This Act includes the following: **III.** Prevent and control anthropogenic greenhouse gas and compound emissions that do not meet federal standards. These include pollutants and those that change their composition when airborne. In turn causing climate change and negatively impacting the environment (e.g., weather and biodiversity), food safety, human health, and economic development. **Article 35.** For the construction and usage of the local policy on climate change adaptation and mitigation, as well as in the issuance of technical standards and other regulatory provisions, the state, municipal, and private authorities of Guerrero will reflect the following principles.	Nonexistent

			I. Every individual has the right to live in a healthy environment for their development, health, and well-being. Under the terms of this and other similar laws, the authorities must take the necessary steps to assure this right. *Further articles were added.*	
Hidalgo (Congreso del Estado de Hidalgo, 2013)	Law on Mitigation and Adaptation to the Effects of Climate Change for the State of Hidalgo.	Article 4, Section IV of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 3. The objective of this Act is to: I. Preserve the right for all individuals to have access to a healthy environment for their development and well-being. Article 11. The following principles will be observed during the formulation of the "State Policy on Climate Change": IV.- Prevention: The most effective method to preserve the ecological balance in the face of the effects of climate change, avoiding any damage to the environment.	Nonexistent.
Jalisco (Congreso del Estado de Jalisco, 2013)	Law for Action on Climate Change of the State of Jalisco.	Although there is no established definition, it does mention that the definitions provided in the state and federal regulations will be considered (art. 7).	Article 3. The objectives of this Act are to: I. Guarantee for all individuals and communities the right to a healthy environment for their development and well-being.	Nonexistent.

State of Mexico (Congreso del Estado de Mexico, 2013)	Climate Change Law of the State of Mexico.	Although there is no established definition, it does mention that the definitions provided in the state and federal regulations will be considered (art. 7).	Article 10.- The Institute is a decentralized public entity with its own legal personality and assets. Such are sectorized by the Ministry, who has the goal to promote institutional and sectorial abilities to confront climate change. This will be accomplished through the development of scientific and technological research on climate change, energy efficiency and renewable energies within the scope of state jurisdiction. It will have the following duties: XVII. Elaborate and disseminate among agencies and entities of the "State Public Administration and City Municipalities" a catalog of clean technologies that could aid in lessening the effects of climate change.	Nonexistent.
Michoacán (Congreso del Estado de Michoacán de Ocampo. , 2014)	Climate Change Law of the State	Although there is no established definition, it does mention that the definitions provided in the "General Law on Climate Change" will be considered (art. 3).	ARTICLE 15. The objectives of the local policy of the mitigation of climate change are: I. Promote environmental conservation, sustainable development, and the right to a healthy environment through the mitigation of emissions; ARTICLE 82. To comply with the previous article, the "Inter-secretarial Commission" must: II. Establish agreements with social and private organizations related to the environment, all while promoting adaptive and mitigative actions towards climate change; and the establishment, administration, and management of protected natural areas.	Nonexistent.
Morelos (Congreso del Estado de Morelos, 1999)	Law of Ecological Balance and Environmental Protection of the State of Morelos.	Article 4, Section XI of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 3.- Actions of public order and interest are considered: IX. Integrate previous analysis and study of the traditional knowledge and	Nonexistent.

		However, it adds the following: […] as well as climate change directly or indirectly attributed to global warming caused by the emissions of greenhouse gases brought upon by human activity that alters the composition of the global atmosphere and joins the natural climate variability observed during comparable periods.	practices of rural women, especially during the creation of environmental management and outreach programs- in relation with the sustainable use and management of resources. Article 43.- To contribute to the achievement of the objectives of the environmental policy- on the subject of human settlements- besides fulfilling the mentioned in Article 27 of the Constitution, the "State Executive and Municipalities" will consider the following criteria: VI. State and municipal authorities, within the sphere of their jurisdiction, will promote the use of economic, fiscal, and financial instruments of urban and environmental policy. With the goal to induce behaviors compatible with the protection and restoration of the environment- as well as with sustainable urban development.	
Nayarit (Congreso del Estado De Nayarit. , 2001)	State Law of Ecological Balance and Environmental Protection of the State of Nayarit.	Article 3, Section IX of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 12. For the formulation and conduction of the state environmental policy, as well as the application of the measures and instruments provided in this Act, the following principles will be observed: XVII.- Considering that the preservation of the ecological balance and the protection of the environment is the responsibility of society as a whole, the state will study and determine the contributions in material, cultural, human, and financial resources to be made by the direct and indirect	Nonexistent.

			users of a given ecosystem. XVIII.- Whomever makes use of natural resources or performs activities that directly or indirectly affect the environment has the obligation to prevent and repair any damages caused to the environment. Moreover, incentives should be given to people who protect the environment and sustainable use natural resources. XX.- Private benefit shall not be placed before society's right to a healthy environment nor the equilibrium of ecosystems- in part or in its entirety.	
Nuevo León (Congreso del Estado De Nuevo León. , 2019)	Law of Climate Change of the State of Nuevo León.	Article 3, Section VI of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 2.- The present Act has the purpose of: VII. Promote a culture of citizen participation that leads to the reduction of greenhouse gases and compounds, including the protection of the environment. All on the basis of education, investigation, and development of topics that inform the public of adaptive and mitigative actions of the effects climate change has on the population. Article 7.- The following attributions correspond to the Secretariat: XXXII. Promote the certification of transformation processes of material and operating mechanisms that contribute to environmental care and energy savings through the corresponding instances;	Nonexistent.

Oaxaca (Congreso del Estado de Oaxaca, 2008)	Climate Change Law for the State of Oaxaca..	Article 3, Section III.- Climate change: Weather changes directly or indirectly attributed to human activity, resulting in alterations in the composition of the global atmosphere, and inappropriate land use. Ultimately represented through the variability of climate observed over comparable periods of time.	Article 10. Attributions of the CICC. Section XXIII.- Design and promote public policies for environmental conservation in the provision of public services and housing planning; Article 43. In formulating state population on climate change, the following principles will be reflected in part: IV.- Prevention: The most effective method to preserve the ecological balance in the face of the effects of climate change, avoiding any damage to the environment.	Article 10. Attributions of the CICC. Section XI.- Propose the integration of incentives that promote changes in technology, behavior, or energy efficiency in industrial, commercial, and service activities that generate carbon gas emissions. As well as to grant incentives to those that carry out actions for the protection, preservation or restoration of ecosystems, the environment and local development; Article 53. For the mitigation of the harmful effects of climate change- such as the reduction and control of atmospheric GEI contamination and other similar particles-, plans, programs, actions, and regulatory instruments will be established. Additionally, the following features will be observed: Section IV.- Energy efficiency practices, the substitution of fossil fuels with renewable energy sources, and the transfer of clean technologies will be promoted;

Puebla (Congreso del Estado de Puebla, 2013)	Climate Change Law for the State of Puebla.	Article 3, Section III of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	ARTICLE 13. In the formulation and management of the state's climate change policy, in both the adaptation and mitigation policies, as well as in the issuance of technical standards and other regulatory provisions in this area, the state and municipal authorities will observe the following principles: I. Unrestricted respect for the universal right to enjoy a healthy environment that permits an individual's development and well-being. IV. Prevention: The most effective method to preserve the ecological balance in the face of the effects of climate change, avoiding any damage to the environment.	Nonexistent.
Querétaro (Congreso del Estado de Querétaro, 2017)	Climate Change Law for the State of Querétaro.	Article 3, Section IV of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 2. The present Act has the following objectives: V. Guarantee the human right to a healthy environment for their development and well-being, quality of life, and human health through the transition to clean energies, the protection of ecosystems, the reduction of heat, greenhouse gas and compound emissions, and the establishment of conservation measures. X. Boosting the transition of energy, as well as preserving the environment and improving quality of life of the State's population- in accordance with the relevant federal provisions.	Nonexistent.

Quintana Roo (Congreso del Estado de Quintana Roo, 2013)	Climate Change Action Law for the State of Quintana Roo.	Article 2, Section V of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 1. The present Act is of public order and interest; thus, its provision is of mandatory observance throughout the state of Quintana Roo. Its purpose is to: I. Guarantee the human right to a healthy environment through the formulation, management, and evaluation of the "State Policy" on climate change. Article 4 Bis. The policies, plans, programs, norms, actions, and other instruments that are executed within the framework of this Act will follow the following principles: a) Sustainable development: Implement adaptation measures in accordance with the national policies adopted by the Federation, in turn increasing the capacity to adapt to the adverse effects of climate change. The goal is to achieve a development that guarantees a balance between economic growth, environmental protection and social well-being with low GHG emissions.	Nonexistent.
San Luis Potosí (Congreso del Estado De San Luis Potosí., 2015)	Climate Change Law for the State of San Luis Potosí.	Article 3, Section V of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	ARTICLE 4. These are the guiding principles of the state's climate change policy: IV. Prevention: The most effective method to preserve the ecological balance in the face of the effects of climate change, avoiding any damage to the environment. V. Environmental responsibility: The obligation of whomever performs activities that affect or may affect the environment to prevent, minimize, repair, restore, and ultimately, compensate for the damage caused.; ARTICLE 8. The objectives of the public mitigation policies are the following: I. Via the mitigation of emissions, protect the right to a healthy environment, and promote sustainable development and the protection of the environment.	Nonexistent.

Sinaloa (Congreso del Estado de Sinaloa, 2020)	*State Law on Climate Change.*	*Article 4, Section III of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".*	**Article 7.** The Secretariat is responsible for the following duties: **XXIV.** Elaborate and disseminate among the agencies of the "State Public Administration and Municipalities" a catalog of clean technologies that can help mitigate the effects of climate change. **Article 65.** The "Inter-secretarial Commission" will be able to propose adjustments or modifications to the scenarios, trajectories, objectives, actions, or goals induced in the State Strategy in the following cases: It is required by environmental, renewable energy, sustainable transport, health, housing, agri-food safety, civil protection, and social development policies.	*Nonexistent.*
Sonora (Congreso del Estado de Sonora, 2016)	Climate Change Law for the State of Sonora.	There is no explicitly defined definition, nonetheless, the provision of the "General Law of Ecological Balance and Environmental Protection" and other applicable legislation of the State of Sonora shall be applied. (art. 3).	**Article 2.-** The present act has the purpose of: I.- Guarantee the universal right to a healthy environment for an individual's development, health, and well-being. In accordance with the mentioned in the Political Constitution of Mexico and the Political Constitution of the State of Sonora. **Article 10.-** In the topic of climate change, the Secretariat is the authority in charge of proposing policies and programs related to ecology and environment. This is one of their duties established by the "Ley Orgánica del Poder Ejecutivo del Estado de Sonora" and other provisions related to it.	Nonexistent.
Tabasco (Congreso del Estado de Tabasco, 2020)	Climate Change and Sustainability Law of the State of Tabasco.	Article 3, Section IV of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	**Article 2.** The present act has the purpose of: II. Guarantee the right to a healthy environment by establishing bases for the production and application of gender-responsive public policies for the adaptation to climate change and the lessening of greenhouse gases and compounds. **Article 24.** The objectives of the public mitigation policies are the following: I. Via the mitigation of emissions, protect the right to a healthy environment, and promote sustainable development and the protection of the environment.	Nonexistent.

Tamaulipas (Congreso del Estado de Tamaulipas, 2017)	Climate Change Law for the State of Tamaulipas.	Article 2, Section IV of state law replicates the definition provided in Article 3 of the "General Law on Climate Change	ARTICLE 1. The present law is of public order and interest, having the purpose to establish norms, principles, and bases for the following: I. Guarantee the right to an environment appropriate for an individual's deve- lopment and well-being. ARTICLE 16. During the formulation, management, and evaluation of the "Política Estatal de Cambio Climático", the state executive and the municipalities will reflect the following principles: VIII. Environmental responsibility: The obligation of whomever performs activities that affect or may affect the environment to prevent, minimize, repair, restore, and ultimately, compensate for the damage caused.	Nonexistent.
Tlaxcala (Congreso Del Estado De Tlaxcala , 2022)	Environmental Protection and Sustainable Development Law of the State of Tlaxcala.	Does not have an established definition of "climate change".	ARTICLE 2. The purpose of this Act is the preservation of the environment, restoration of the ecological balance, regulation and distribution of competencies favoring sustainable development. In addition, guaranteeing the universal right to live in a healthy environment and establishing the basis for: V. In regard to the conservation of the environment, implement the protection mechanisms of the State and Municipalities' ecological management- all in the sphere of duties not reserved to the Federation.	Nonexistent.
Veracruz (Congreso del Estado de Veracruz, 2010)	State Law of Mitigation and Adaptation to the Effects of Climate Change of the State of Veracruz.	Article 2, Section III of state law replicates the definition provided in Article 3 of the "General Law on Climate Change".	Article 2. For the purposes of this Act, the following definitions shall apply: VI. Adverse climate change effects: Abrupt environ- mental variations caused by climate change that have significant harmful effects on the composition, resilience, productivity of ecosystems, state of human health, and functioning of socioeconomic systems.	Nonexistent.

Yucatán (Congreso del Estado de Yucatán, 2021)	Climate Change Law of the State of Yucatán..	There is no established definition, however in Article 3 it is explained that this law will follow the definitions set forth in ",General Law on Climate Change", general, "Law of Ecological Balance and Environmental Protection", and "Environmental Protection Law of the State of Yucatán".	Article 1. The present Act is of public order and interest; thus, its provision is of mandatory observance throughout the state of Yucatán. Its purpose is to: IX. Guarantee the human right to a safe, clean, healthy, and sustainable environment. Article 83. The following actions are to promote joint participation. II. Establish agreements with social and private organizations related to the environment, all while promoting adaptative and mitigative actions towards climate change; and the establishment, administration, and management of protected natural areas. As well as providing support with the sustainable management of natural resources and the development of investigative studies on the topic.	Nonexistent.
Zacatecas (Congreso del Estado de Zacatecas, 2015)	Climate Change Law for the State of Zacatecas and its Municipalities.	Article 2, Section IV of state law replicates the definition provided in Article 3, Section IV of the "General Law on Climate Change"	Article 1. The present Act is of public order and interest; thus, its provision is of mandatory observance throughout the state of Zacatecas. Its purpose is to: II. Guarantee the right to enjoy an adequate and healthy environment that contributes to sustainable integral development. Article 20. During the formulation and management of the State Policies, as well as in the adaptation and mitigation, issuance of technical standards and other regulatory provisions, the state and municipal authorities will observe the following principles: I. Guarantee the universal right to a healthy environment that assures the development and well-being of an individual.	Nonexistent.

Annex 2. Analysis and comparison of state science and technology laws in relation to climate change.

State	Legislation	Climate change	Environment (protection of	Use of CTI and invention patents as a solution
Federal	Law of Science and Technology	Nonexistent.	Article 12. XIII. The research, technological development and innovation activities carried out directly by public sector agencies and entities will be oriented preferably towards identifying and solving problems and challenges of general interest, contributing significantly to advancing the frontier of knowledge, improving the competitiveness and productivity of the country's economic sectors, increasing the quality of life of the population and the environment and supporting the training of specialized personnel in science and technology;	Article 65. Open Access shall mean access through a digital platform and without subscription, registration or payment requirements, to research, educational, academic, scientific, technological and innovation materials, financed with public resources or that have used public infras-tructure in their realization, without prejudice to the provisions on patents, protection of intellectual or industrial property, national security and copyright, among others, as well as that information which, by reason of its nature or decision of the author is confidential or reserved. Article 66. Access to Quality Scientific and Technological Information Resources shall be understood as the set of techniques used to search, categorize and access in an unequivocal manner, the full text of publications recognized by the science, technology and innovation sectors, and which are the result of peer review. The

				access referred to also includes databases containing citation records and bibliographic information of scientific and technological journal articles, theses and dissertations, protocols, conference proceedings and patents, among others.
Aguascalientes (Congreso de Aguascalientes, 2022)	Law of Science, Technology, Innovation, and Entrepreneurship for the Development of the Knowledge Society of the State of Aguascalientes.	No information related to climate change was found.	No information related to the environment was found.	Article 5°, section. XII of the state law replicates the definition of Research contained in article 4°, section III of the Law of Science and Technology. **Article 5°**. For the purposes of this Law, the following definitions shall apply: **IV. Technological development:** To the process of applying knowledge for the adaptation to the change of **technology** in the production of goods or services and the transformation of state-of-the-art **technology** increasing the export in excellence of the products, in order to comply with the objectives and with the highest standards of quality, such as the certification of a competitive advantage before competitors, utility and cost of the good or service produced or generated. **Article 70.** For the creation and operation of the development instruments referred to in this Law, **priority will be given to projects** that seek to achieve a rational, more **efficient** and **ecologically sustainable** use of natural resources.

Campeche (Congreso de Campeche, 2021)	Law for the Promotion of Scientific and Technological Research of the State of Campeche.	No information related to climate change was found.	No information related to the environment was found.	Article 42. The State Fund for the Promotion of Science and Technology shall be constituted with the contributions of: VI. The benefits generated by the patents that are registered in the name of the State Government or COESICYDET and the corresponding intellectual rights, as well as the income received from the sale of goods and rendering of scientific and technological services;
Chiapas (Congreso de Chiapas, 2021)	Law of Science, Technology, and Innovation of the State of Chiapas.	No information related to climate change was found.	Article 19. The principles that shall govern the support that the Executive Branch of the State grants to strengthen scientific research, technological development and innovation in general, as well as science, technology and innovation projects in particular, shall be the following: XII. The research, development and innovation activities directly carried out by the agencies and entities of the State Public Administration shall seek the identification and solution problems and challenges of general interest, contribute to the advancement of knowledge, allow improving the quality of life of the population and environment and support the training of human resources specialized in science and technology, without prejudice to the freedom of research of individuals or the autonomy of the institutions.	Article 3°, section VI of the state law replicates the definition of Technological Development contained in article 4°, section III of the Science and Technology Law. **XIII. Innovation:** The transformation of an idea into a product, manufacturing process or approach to a specific social service, into a new or improved one, as well as the transformation of a **technology** into another greater utility. **XV. Scientific Research:** The systematic process of planning, generation, improvement, dissemination, diffusion, teaching and application of knowledge in the different areas related to **science, technology and innovation**, oriented to the satisfaction of social demands and expectations, to the prevention and attention of the development needs of the Entity, as well as to the advancement of knowledge.

Chihuahua (Congreso de Chihuahua, 2018)	Law of Science, Technology, and Innovation of the State of Chihuaha.	No information related to climate change was found.	Article 4. Public Policies. The public, scientific academic, technological, social and productive sectors shall participate in the integration and implementation of public policies on knowledge and technological innovation, in accordance with the following principles: XI. The use and generation of knowledge must consider diverse ethical aspects, among them those related to human health, the environment, social benefit, respect for cultural diversity, adherence to the legal framework, as well as the advantages and risks represented by both the use and the absence of the application of new technologies.	**Article 2. - XII. Technological development:** Consists of systematic work based on existing knowledge, obtained through **research or practical experience**, aimed at manufacturing new materials, products or devices; establishing new processes, systems and services; or substantially improving existing ones. **XX. Innovation:** Is the introduction of a new, or significantly improved, product, process, new marketing method or new organizational method, in the company's internal practices, workplace organization or external relations. **XXII. Applied research:** Consists of original work involving the use of results and previous work, directed fundamentally toward a specific practical objective or the solution of problems of public interest. **XXIII. Basic research:** Consists of original, experimental or theoretical work, which is undertaken mainly to obtain new knowledge about the foundations of phenomena and observable facts, without being directed toward a specific application or use. **Article 6. XV. Intellectual Property:** The necessary support shall be promoted and provided so that the entities responsible for the application of this Law contribute so that the scientific, technological and innovation activities that generate patents are protected in accordance with the Federal Copyright Law, the Industrial Property Law and other provisions and laws in the matter and with this the intellectual property sock in the State is increased.

Mexico City	Law of Science, Technology, and Innovation of Mexico City.	No information related to climate change was found.	Article 4. For the purposes of this Law, the following definitions shall apply: I. Scientific, Technological and Innovation Activities: Those that comply with the applicable technical and legal regulations, particularly in matters of environment, social development, civil protection and urban development, as well as the programs, agreements and covenants that shall specify the corresponding characteristics and that comply with any of the following requirements: to promote through science and technology the economic development of the City, to generate jobs; or to apply in their productive processes national or imported technology that allows the efficient use of water and energy; also considering the advice, training and provision of services that favor the intensive use of knowledge and technology in the productive processes, promotion of metrology and the establishment of quality standards and certification in terms of the provisions of the legislation of the matter.	XIX. To promote scientific and technological collaboration between academic institutions and companies, as well as to promote and assist in the registration of intellectual property and patents generated from scientific and technological knowledge and innovation arising in the institutions and companies of Mexico City.
Coahuila (Congreso de Coahuila, 2017)	Law of Science, Technological Development, and Innovation for the State of Coahuila de Zaragoza.	No information related to climate change was found.	**Article 8.** The principles that shall govern the support that the State is obliged to grant to promote, develop and strengthen scientific research, technological development and innovation in general, as well as in particular the research activities carried out by the agencies and entities of the State Public Administration shall be the following: **VI.** The science, technology and innovation projects must be oriented by a sustainable development criterion,	Article 2°, section VI of the state law replicates the definition of Technological Development contained in article 4°, section III of the Science and Technology Law. Article 2. I**V. Science,** the coherent set of knowledge related to certain categories of facts, objects or phenomena; **XI. Copyright,** the right that the law recognizes to the author of an intellectual or artistic work to authorize its reproduction and to share in benefits generated by it;

			considering at all times, the respect for ecosystems, **the care of the environment** and in general the observance of ecological norms and criteria in order to contribute to the advancement of knowledge and in this way allow improving the quality of life in the State.	XXII. **Innovation,** the introduction of a new or significantly improved product, good or service, of a process, of a marketing method or of a new organizational method, in the internal practices of the company, the organization of the workplace or external rela- tions; XXIII. **Invention,** any human creation that allows the transformation of matter or energy existing in nature, for its use by man to satisfy his specific needs. XXIV. **Scientific and Technological Research,** to the systematic activities that are closely related to the generation, improvement, diffusion and application of scientific and technological knowledge in all its fields; XXX. **Patent,** to the new inventions resulting from an inventive activity and susceptible of industrial application, under the terms of the Industrial Property Law.

Colima (Congreso de Colima, 2016)	Law for the Promotion and Development of Science and Technology of the State of Colima.	No information related to climate change was found.	No information related to the environment was found.	**Article 24.** The State Science and Technology Fund shall be established: **VI.** The benefits generated by the **patents** registered in the name of the State Government and the intellectual rights that correspond to it, as well as the income it receives from the sale of goods and provision of scientific and technological services;
Durango (Congreso de Durango, 2006)	Science and Technology Law for the State of Durango.	No information related to climate change was found.	No information related to the environment was found.	**Article 5.** For the purposes of this Law, the following definitions shall apply: **V. Innovation:** The transformation of an idea into a product, manufacturing process or approach to a specific social service, into a new or improved one, as well as the transformation of a technology into another of greater utility; **Article 19.** In order to conform the State Registry of Science and Technology, the following items shall be included: institutions; teams of **researchers; individual researchers; infrastructure** and equipment; projects in process and completed; patents; projects in process and completed; patents; sources of scientific information; publications and events, and financing. The COCYTED will be in charge of operating the State Science and Technology Registry and overseeing its operation.

Guanajuato (Congreso de Guanajuato)	Law for the Promotion of Scientific, Technological Research, and Innovation for the State of Guanajuato.	No information related to climate change was found.	XII. The research, development and innovation activities carried out directly by the agencies and entities of the Public Administration should seek to identify and solve problems and challenges of general interest, contribute to the advancement of knowledge, improve the quality of life of the population and the environment, and support the training of specialized human resources in science and technology, without prejudice to the freedom of research of individuals or the autonomy of institutions.	Article 33, paragraph D) The governing bodies of the institutions, centers and entities shall be empowered to establish support, criteria and determinations related to intellectual property and the benefits that correspond to the institutions; being able to grant, in terms of rights, to researchers, academics and specialized personnel, who have generated them up to70% of the royalties generated.
Guerrero (Congreso de Guerrero , 2009)	Law Number 076 on Science, Technology, and Innovation of the State of Guerrero.	No information related to climate change was found.	Article 7. The principles that shall govern the support provided by the State Government through COCYTIEG to promote and develop scientific and technological research and innovation in general shall be the following: XI. The research and technological development activity carried out directly by the agencies and entities of the public sector will be oriented, preferably, to seek the identification and solution of problems and challenges of general interest, to contribute significantly to the advancement of knowledge, allow for the improvement of the quality of life of the population while respecting and protecting the environment and supporting the training of specialized personnel in science and technology;	**Article 4:** **IV. Technological Development:** The process of transformation (by creation, adoption, adaptation and/or innovation) of a technology, so that it meets the objectives for which it was designed or prosed, such as quantity, quality and cost of the good or service produced; **VII. Innovation:** The transformation of an idea into a product, manufacturing process or approach to a given service, into a new or improved one, and to the transformation of a technology and innovation into another of greater utility; **VIII. Research:** The systematic and creative work carried out with the purpose of expanding the frontier of knowledge above nature, culture and society;

Hidalgo (Congreso de Hidalgo, 2007)	Science, Technology, and Innovation Law of the State of Hidalgo.	No information related to climate change was found.	Article 5. The local policy on science, technology and innovation shall be governed in accordance with the following: I. Knowledge and innovation are strategic factors to contribute to sustainable social development, care for the environment, improve competitiveness and raise the quality of life.	**Article 2:** **VIII. Research:** The systematic study directed toward more complete scientific knowledge or better understanding of the subject matter studied in any area of knowledge. It is usually classified as basic or applied: in basic research the objective is to gain knowledge or understanding of phenomena without specific applications in mind; in applied research the objective is to gain knowledge or understanding necessary for a specific need; **XV. Innovation:** The introduction of a new, or significantly improved, product, good or service, process, new marketing method or new organizational method in the company's internal practices, workplace organization or external relations; **XVI. Technological development:** The systematic use of knowledge or understanding gained from research directed toward the production of materials, devices, systems or methods, including the design, development and improvement of prototypes and new processes;

Jalisco (Congreso de Jalisco, 2014)	Law of Science, Technological Development, and Innovation of the State of Jalisco.	No information related to climate change was found.	Article 4. The specific objectives of the law are the following: VI. To propitiate the elevation of the competitiveness of the companies by means of the incorporation of developments and techchnical innovations to the productive processes, for the generation of new and better goods and services with high added values and competitive at world level, it will promote the utilization of the productive resources, taking care of its conservation and the environment and implementing a national policy for the sustainable industrial development; Article 6. The public scientific, academic, technological, social and productive sectors will participate in the integration and realization of public policies in the matter of knowledge according to the following principles: VII. The policies, instruments and criteria with which the State Government promotes knowledge shall seek the greatest beneficial effect in the teaching and learning of science, tech- nology and innovation, in the quality of education at all levels, and shall encourage the participation and development of new generations of researchers and technologists, seeking to include robotics preferably through alternatives of the use of recycled material or material that does not affect the environment as raw material of the projects; XI. The use and generation of knowledge must consider various ethical aspects related to human dignity and health, the environment, social benefit, respect for cultural	**Article 2:** **I. Scientific and Technological Activities:** Those of a systematic and permanent nature oriented to the generation, improvement and application of knowledge in all fields of science and technology; **II. Innovation Activities:** Those scientific, technological, organizational, financial, commercial and social activities that lead to innovation; **XI. Information and Communication Technologies:** Is the set of resources, procedures and techniques used in the processing, storage and transmission of information and knowledge. Article 55. 1. The State Fund shall be constituted, without exception, with the contributions of: VI. The benefits generated by **patents** that are registered in the name of the State Government and the intellectual rights that correspond to it, as well as the income it receives from the sale of goods and the rendering of scientific and technological services;

State of Mexico (Congreso del Estado de México, 2004)	Law of Science and Technology of the State of Mexico.	Article 6. The principles shall govern the support that the State Government shall grant in order to promote, develop and strengthen scientific research and technological development in the entity, shall be the following: XIV. The scientific research and technological development carried out by the agencies and auxiliary organisms of the state public administration shall be oriented preferably to seek the identification and solution of problems and challenges of general interest; contribute significantly to the generation of knowledge; support the training of human resources specialized in science and technology; and specialized human resources in science and technology; and to improve the quality of life of the population in terms of education, heal, food, environment, climate change, energy efficiency, renewable energies and civil protection;	Article 6. The principles shall govern the support that the State Government shall grant in order to promote, develop and strengthen scientific research and technological development in the entity, shall be the following: XIV. The scientific research and technological development carried out by the agencies and auxiliary organisms of the state public administration shall be oriented preferably to seek the identification and solution of problems and challenges of general interest; contribute significantly to the generation of knowledge; support the training of human resources specialized in science and technology; and specialized human resources in science and technology; and to improve the quality of life of the population in terms of education, heal, food, environment, climate change, energy efficiency, renewable energies and civil protection;	**Article 2:** **VII. Scientific Research and Technological Development,** to the activities of generation, application, diffusion and dissemination of knowledge in the diverse areas related to science and technology, oriented to the social demands, to the attention of the entity's problems, to its sectors, as well as to the advancement of knowledge; **Article 2.** For the purposes of interpretation of the present ordinance, the following shall be understood as: **IX.** Open Access. Access through a digital platform and without subscription, registration or payment requirements, to research, educational, academic, scientific, technological and innovation materials, financed with state public resources or that have used public infrastructure in their realization, without prejudice to the provisions on **patents, protection of public protection of intellectual or industrial property, national security and copyrights,** among others, as well as information that, due to its nature or the author's decision, is confidential or reserved.

Michoacán (Congreso de Michoacán , 2012)	Law of Science, Technology, and Innovation of the State of Michoacán.	No information related to climate change was found.	**Article 80.** Scientific or technological research carried out in Michoacán will seek to contribute significantly to solve relevant scientific or technological problems or to solve the State's problems in health, housing, education, sports, recreation, culture, **environment** and all those that have an impact on the living conditions of the population.	**Article 2:** **III. Science:** Set of objective and systematically structured knowledge obtained through and observation of regular patterns, reasoning and experimentation in specific fields, from which new questions are generated, new hypotheses are constructed, principles are deduced and general laws with validity in their specific fields are elaborated; **VIII. Technological development:** The use of knowledge to generate a process that culminates in its practical application; **XIX. Innovation:** The transformation of an idea into a marketable product, or of a manufacturing process, or an approach to a given social service, into a new or improved one with possibilities of introducing it into a market, as well as to the transformation of a technology into another of greater utility or greater sustainability; **XXI. Scientific research:** The activity whose purpose is the systematic mobilization and evaluation of results of applied research to create new materials, products or new processes, carrying out intellectual and experimental activities with the purpose of increasing or creating knowledge on a subject; **XXIX. Technology:** Set of knowledge pertaining to a technique; **Article 71.** The following items shall be included in the State Registry of Science, Technology and Innovation: **VII. Patents;**

Morelos (Congreso de Morelos, 2021)	Law of Innovation, Science, and Technology for the State of Morelos.	No information related to climate change was found.	**Article 30.** The principles that shall govern the support granted by the State Executive Branch to strengthen scientific research, technological development and innovation in general, as well as Science and Technology projects in particular, shall be the following: **XIII.** The research, development and innovation activities directly carried out by the Secretariats, Departments and Entities of the State Public Administration shall seek the identification and solution of problems and challenges of general interest, contribute to the advancement of knowledge, allow **improving the quality of life of the population and the environment** and support the formation of specialized human resources in Science and Technology, without prejudice to the freedom of research of individuals or the autonomy of the institutions.	**Article 12.** The CCYTEM shall have the following attributions: **III.** Support through the granting of scholarships, support and other means, the formation of human resources of high academic level for **scientific research and technological development,** contributing to strengthening of postgraduate programs in the entity, and in general all those actions, courses, continuing education and academic exchange programs that tend to promote the reproduction of new generations of researchers and update the highest level of knowledge; **Article 3:** **III. Technological development:** The process of applying knowledge for the production of goods or services; **IV. Innovation:** The transformation of an idea into a product, manufacturing process or approach to a given social service, into a new or improved one, as well as the transformation of a technology into another of greater utility;

Nayarit (Congreso de Nayarit, 2010)	Law of Science, Technology, and Innovation of the State of Nayarit.	No information related to climate change was found.	Article 15. In order to encourage and promote science, technology and innovation, COCYTEN shall be subject to the following criteria: XVIII. The projects for the development of science, technology and innovation promoted by COCYTEN shall be oriented under a sustainable development criterion, considering at all times respect for ecosystems, care for the environment and in general compliance with ecological norms and criteria.	The article 3°, sections IX and X of the state law replicates the definition of Research (IX) and Innovation (X) contained in article 4°, sections III and IX, respectively, of the Science and Technological Law. Article 3. II. Open Access: access through a digital platform and without subscription, registration or payment requirements, to research, educational, academic, scientific, technological and innovation materials, financed with public resources or that have used public infrastructure in their realization, without prejudice to the provisions on patents, protection of intellectual or industrial property, national security and copyright, among others, as well as that information that by reason of its nature or decision of the author, is confidential or reserved; III. Access to Qualify Scientific and Technological Information Resources: set of techniques used to search, categorize and access in an unequivocal manner, the full text of publications recognized by the science, technology and articles, theses and dissertations, protocols, conference, proceedings and patents, among others;

Nuevo León (Congreso de Nuevo Léon , 2020)	Law of Science, Technology, and Innovation of the State of Nuevo León.	No information related to climate change was found. Nor with the terms patent, inventions, author, climate change, industrial property.	**Article 17.** The CYROCTEINL shall contain, among others, the following aspects: **II.** The priority areas of science, technology and innovation which shall be primarily the following: **d) Environment** and sustainability;	**Article 2.** The objectives of this Law are: **XXIV.** To promote access to the regulation and granting of **invention patents,** utility model registrations, industrial designs, layout designs of integrated circuits, trademarks and commercial notices, publication of trade names, declaration of protection of appellations of origin and geographical indications. **Article 3:** **VIII. Technological development:** the systematic use of knowledge or understanding obtained from research directed towards the production of materials, devices, systems or methods, including the design, development and improvement of prototypes, new processes or products; **XII. Innovation:** the introduction of a new or significantly improved product, good, service, or process, derived both from the application of scientific research and technological development, as a response to social and market needs. **XIII. Scientific research:** the systematic study directed towards a more complete scientific knowledge or towards a better understanding of the matter studied. It is classified as basic or applied: in basic research, the objective is to gain knowledge or understanding of phenomena without specific applications; in applied research, the objective is to gain knowledge or understanding necessary to apply them to practically satisfy social or market needs;

Oaxaca (Congreso de Oaxaca , 2008)	Law of Science, Technology, and Innovation for the State of Oaxaca.	**Article 55.** For the creation and operation of the instruments of promotion referred to in this Law, priority shall be given to programs and projects whose purposes are the development and technological innovation, linked to companies or entities that use technology. Likewise, priority will be given to projects that seek to achieve a rational, more efficient and ecologically sustainable use of natural resources, and those whose is the mitigation and adaptation to the effects of **climate change,** and those whose objective is to generate and apply renewable energies in the state's economic sectors and in the everyday life to the population, as well as associations whose purpose is to create and operate scientific and technological networks.	**Article 5.** The fulfillment of the specific objectives of the present Law by the public and private sectors in the State shall be subject to the following guiding principles: **IV.** The instruments of support to science and technology shall seek the systemic development of the scientific and technological potentiality of the State, seeking the growth and consolidation of the scientific and academic communities for the benefit of the **environment**, the economic and social development of the State; he environment **XIII.** The activities of scientific research, development and technological innovation carried out by individuals and companies of the public and private sector shall be oriented, preferably, to identify and solve the problems of general interest, in order to contribute significantly to the advancement of knowledge, in order to improve the quality of life of the population, the recue and **protection of the environment;**	**Article 5.** The fulfillment of the specific objectives of the present Law in charge of the public and private sectors in the State, shall be subject to the following guiding principles: I. The planning activities of scientific research, development and technological innovation, shall adhere to the general planning processes established by the present Law, the Planning Law for the State of Oaxaca, the State Development Plan and other applicable laws; I. The results of the activities of scientific research, development and technological innovation, which are the object of support in terms of this Law, shall invariably be evaluated and taken into account for the granting of subsequent support; **Article 30.** The following items shall be included in the RECyT: **VI. Patents;**

Puebla (Congreso de Puebla, 2004)	Law for the Promotion of Scientific, Technological, Humanistic, and Innovation Research for the State of Puebla.	No information related to climate change was found.	Article 11. The research, development and innovation activities directly carried out by the agencies and entities of the State or Municipal Public Administration shall seek the identification and solution of problems and challenges of general interest, contribute to the advancement of knowledge, allow the improvement of the quality of life of the population, the environment and sustainable development general, and support the training of human resources specialized in science, technology and humanities without prejudice to the freedom of research of individuals or the autonomy of the institutions.	**Article 9.** The principles that shall govern the support that the Government of the State and the Municipalities grant to strengthen and promote scientific, technological and humanistic research, as well as innovation and technology transfer shall be the following: **XIII.-** The development of **research leading to the granting of national and international patents** shall be specifically promoted, for which purpose there shall be a specific fund with the participation of the industrialists who may be the beneficiaries of these patents; **Article 12.** In order to develop, strengthen and consolidate a scientific culture in society, the State Government and the City Councils, as the case may be, shall promote the participation of the public, social and private sectors in the disclosure and dissemination of **scientific and technological activities.** **Article 13.** Within the scope of their respective competencies and in accordance with the needs of the State and Municipalities, the social demand and the available resources, the public, social and private sectors, as well as the institutions of higher and higher secondary education, shall endeavor to: **II.** Encourage the organization and realization of **academic and scientific activities,** which propitiate the exchange of information in science, technology and humanities, the contact between specialists and the development of knowledge (Article 13). **Article 14.** For the formation of human resources oriented to research and development CONCYTEP shall: **III.-** Promote support programs and scholarships for postgraduate studies, aimed at the formation of human resources of high academic level that satisfy the needs of knowledge, **research, innovation and technology transfer** in the priority areas of the State and the Municipalities; **V.-** Promote exchange programs at the state, national and international level of academics, **researchers and technicians.** **Article 2:** **IV.- Technological Development.** Process of generation and application of knowledge for the production of goods or services; **VI.- Innovation.** The transformation of an idea into a product, manufacturing process or approach of a determined social service into a new or improved one, as well as the transformation of a technology into another of greater utility; **VII.- Scientific, technological and humanistic research.** The systematic activities of knowledge generation in the different areas related to science, technology and human and social sciences;

Querétaro (Congreso de Querétaro, 2010)	Law for the Promotion of Scientific, Technological, Humanistic, and Innovation Research for the State of Querétaro.	No information related to climate change was found.	No information related to the environment was found.	**Article 3.** The activities in the area of scientific and technological research, as well as technological development and innovation and their promotion, shall be subject to the following criteria: **II.** The concurrence of public and private resources shall be sought for the **generation, execution and dissemination of research projects,** as well as for the formation, promotion and training of human resources of high academic level. **Article 7.** The Council, in addition to the attributions indicated in its Decree of creation, shall be responsible for the following: **IV.** To support and promote the contribution of resources to academic institutions, **scientific research centers, individuals and legal entities, for the promotion and realization of research and technological developments, based on specific programs and projects, under the** terms provided in this Law and other applicable provisions; Article 23. Within the scope of their respective competencies and in accordance with the needs of the State, the social demand and the available resources, the governmental, academic, business and social sectors shall be endeavor to: Promote the conservation, consolidation, updating and development of the infrastructure destined to the divulgation and diffusion of science, technology and innovation, with the purpose of making available to the academic, scientific and technological communities and the public, private, productive and social sectors, updated and quality information on science and technology in the State of Querétaro. Article 2°, section IV and VI of the state law replicates the definition of Technological Development (IV) and Innovation (VI) contained in Article 46°, section X and IX, respectively, of the Law of Science and Technology. Article 2: **VII. Scientific and technological research:** the systematic activities of generation, improvement, dissemination, diffusion and application of knowledge in the various areas related to science and technology, both in the productive sector of goods and services in the social sector, oriented to the attention of the problems of the Entity, of its sectors, as well as the advancement of knowledge.

Quintana Roo (Congreso de Quintana Roo, 2006)	Science and Technology Law of the State of San Luis Potosi.	**Article 51.** In the allocation of the support referred to in this Law, priority will be given to projects that promote innovation and technological development in small and medium-sized enterprises. Moreover, priority will be given to projects that propose to achieve a rational, efficient and environmentally sustainable use of natural resources, as well as those that contribute to the **fight against the effects of climate change,** and those related to the generation of renewable energies.	**Article 7°.** The principles that shall govern the support that COPOCYT and the municipalities grant to strengthen and promote scientific research, technological development and innovation in general and, in particular, the actions, projects and programs of scientific and technological research, shall be the following: **XIII.** The research, technological development and innovation activities carried out by public sector agencies and entities shall be focused on the identification and solution of problems of general interest, to contribute to the advancement of knowledge, to improve the quality of life of the population, to promote respect for the **environment**, and to support the training of human resources specialized in science, technology and innovation, without prejudice to the autonomy of the institutions;	**Article 49.** Public institutions and scientific and technological research centers, in their respective areas of competence, shall promote **innovation and technological development,** and shall establish efficient mechanisms to link them to the productive and service sectors. Article 3°, section VII of the state law replicates the definition of Research contained in article 4°, sections X and IX, respectively, of the Law of Science and Technology. Article 3: **V. Technological development:** the process of transformation (by adoption, adaptation and/or innovation) of a technology, so that it complies with greater efficiency and effectiveness with the objectives of quantity, quality and cost of the good or service produced; **VI. Innovation:** The transformation of an idea into a product; the manufacturing process or the approach of a given service into a new or improved one; and the transformation of a technology into a more useful one; **VII. Research:** To the set of activities that include scientific, basic and applied research, in all areas of knowledge. **Article 51. Paragraph 5** When it is the case, the form and conditions in which the agency or entity that supports a technological project shall recover, totally or partially, the resources invested in it shall be determined; furthermore, the modality according to which the agency or entity shall participate in the benefits resulting from the exploitation of the technology or **patent** that is generated shall be determined, in accordance with the provisions of the laws of the matter.

San Luis Potosí (Congreso de San Luis Potosí, 2003)	Law for the Promotion of Scientific, Technological, Humanistic, and Innovation Research for the State of Querétaro.	No information related to climate change was found.	No information related to the environment was found.	**Article 3.** The activities in the area of scientific and technological research, as well as technological development and innovation and their promotion, shall be subject to the following criteria: **II.** The concurrence of public and private resources shall be sought for the **generation, execution and dissemination of research projects,** as well as for the formation, promotion and training of human resources of high academic level. **Article 7.** The Council, in addition to the attributions indicated in its Decree of creation, shall be responsible for the following: **IV.** To support and promote the contribution of resources to academic institutions, **scientific research centers, individuals and legal entities, for the promotion and realization of research and technological developments, based on specific programs and projects, under the** terms provided in this Law and other applicable provisions; Article 23. Within the scope of their respective competencies and in accordance with the needs of the State, the social demand and the available resources, the governmental, academic, business and social sectors shall be endeavor to: Promote the conservation, consolidation, updating and development of the infrastructure destined to the divulgation and diffusion of science, technology and innovation, with the purpose of making available to the academic, scientific and technological communities and the public, private, productive and social sectors, updated and quality information on science and technology in the State of Querétaro. Article 2°, section IV and VI of the state law replicates the definition of Technological Development (IV) and Innovation (VI) contained in Article 46°, section X and IX, respectively, of the Law of Science and Technology. Article 2: **VII. Scientific and technological research:** the systematic activities of generation, improvement, dissemination, diffusion and application of knowledge in the various areas related to science and technology, both in the productive sector of goods and services in the social sector, oriented to the attention of the problems of the Entity, of its sectors, as well as the advancement of knowledge.

Sinaloa (Congreso de Sinaloa, 2012)	Science, Technology, and Innovation Law of the State of Sinaloa.	No information related to climate change was found.	Article 6: XVI. Research: The support described in this Law will be oriented to provide resources for basic and applied research and technological development, according to the available budgets and based on the quality and impact of the proposals. Research proposals oriented to solve problems and needs of public interest in the areas of education, health, housing and sustainable development, environment, security, civil protection, social development, among others, will be attended;	**Article 6:** **XV. Industrial Property:** Support will be promoted to help ensure that scientific, technological and innovation activities that generate patents are protected in accordance with the provisions and laws on the subject; **XVII. Innovation:** the creation of incubators, economic support, venture capital funds, investor networks and other support the entrepreneurship shall be promoted, so that scientific and technological development give rise to new companies of products and services of high added value; **Article 29.** The State Fund for Science Technology and Innovation shall be constituted with the contributions of: **VI.** The benefits generated by **patents** that are registered in the name of the State Government and **the intellectual rights** that correspond to it, as well as the income it receives from the sale of patents. **Article 44.** The Coordination shall establish strategies and mechanisms of linkage between the agencies and auxiliary organisms of the federal, state or municipal public administration; the academic, scientific and technological communities and the public and private research centers. Article 3°, section XX of the state law replicates the definition of Research contained in article 4°, section III, respectively, of the Law of Science and Technology. **Article 3:** **XIX. Innovation:** Activity aimed at the commercial application of an invention, whether it is the product of research or the combination thereof with existing knowledge to generate new products, services, processes, technologies, business models or new businesses, with evident differentiators and competitive advantages among the existing ones; **XI. Technological development:** Consists of systematic work based on existing knowledge, obtained through research or practical experience, aimed at the manufacture of new materials, products or devices; the establishment of new processes, systems and services; or the substantial improvement of existing ones;

Sonora (Congreso de Sonora, 2020)	Law for the Promotion of Innovation and Scientific and Technological Development of Sonora.	No information related to climate change was found.	Article 64. The following technological projects with the following approaches will have preference in obtaining the public support indicated in the present law: V. Promote the rational use of natural resources and the protection of the environment.	**Article 3:** **X.- Scientific, technologic, and innovative development:** The process of improving the welfare of the population and other social processes through scientific and technological studies. As a result, having a positive impact on the quality of life, development and economic growth. **XI. Technological entrepreneurship:** Individual or legal entities that apply cutting-edge technologies (or of Industry 4.0) in the fabrication of products, implementation or improvement of production processes, provision of services, IT automation systems, interactive or collaborative economy platforms. **XXII.- Industry 4.0 technologies:** Referring to the technologies related to the union of the physical and digital world to make the industry more adaptable and flexible with production needs and processes- as well as to achieve a more efficient allocation of resources. These technologies include, but are not limited to, the following: Big data and data analysis, cloud computing and storage, cybersecurity, additive manufacturing, simulation systems, augmented reality, collaborative robotics and management platforms. **Article 46.-** For the purposes of disseminating the scientific, technological, and innovative development of the state of Sonora, the Council will operate and maintain a permanently updated IT platform accessible to any citizen via the web. It must, at least, contain the following: **IX.-** Technological products (e.g., patents), packages and services distributed by the research centers and higher education institutions; **Article 50.-** The purpose of State funding will be to finance projects and programs focused on the following: scientific, social, humanistic and technological research, innovation and technological development, technological and postgraduate infrastructure, scholarships for postgraduate studies, academic exchange at a postgraduate level, popularization of science and technology, patenting, industrial designs, lay-out designs of integrated circuits and industrial secrets, as well as other activities that contribute with this law.

Tabasco (Congreso de Tabasco, 2019)	Law for the Promotion of Scientific Research and Technological Development for the State of Tabasco.	No information related to climate change was found.	**Article 5.-** The State Government will provide support to promote and develop scientific and technological research based on the following principles: **XIII.** The research and technological development directly carried out by entities of the public sector will seek the identification and solution of challenges that will contribute significantly to the advancement of knowledge and the quality of life improvement of the population while respecting the environment- as well as supporting the training of science and technology personnel.	**Article 4:** **II. Investigation.-** The systematic and creative work carried out with the goal of expanding the knowledge of nature, humanity, culture, and society. The usage of these understandings will lead to the ability to develop new applications. **V. Technological Development.-** The transformation process (either by adoption, adaptation, and/or innovation) of a technology so that it may fulfill its proposed objectives- such as quantity, quality, cost of the good and service produced.

Tamaulipas (Congreso de Tamaulipas, 2020)	Law for the Promotion of Scientific and Technological Research in the State of Tamaulipas.	No information related to climate change was found.	**Article 4.** The State Government will provide support to promote and develop scientific and technological research- including the research activities carried out by the agencies of the Public State Administration- based on the following principles: **XIII.-** The research and technological development directly carried out by entities of the public sector will seek the identification and solution of challenges that will contribute significantly to the advancement of knowledge and the quality of life improvement of the population while respecting the environment- as well as supporting the training of science and technology personnel.	**Article 2.** In order to fulfill the purpose of this law, the following actions shall be promoted: **III.-** Establish and guarantee the association and participation of the scientific and academic communities of higher education institutions, of the public, social and private sectors, and research centers. The goal is to generate policies for the promotion, dissemination, development, and application of science and technology- as well as the training of science and technology professionals. Article 3, Section IV of state law replicates the definition provided in the investigation shown in Article 4, Section III of the "Law on Science and Technology". **VII.- Technological Development.-** The transformation process (either by adoption, adaptation, and/or innovation) of a technology so that it may fulfill its proposed objectives- such as quantity, quality, cost of the good and service produced. **IX.- Innovation.-** The transformation of a product idea, fabrication process, or approach to a specific social service, into a better version. Such as the transformation of technology into a more useful one.
Tlaxcala (Congreso de Tlaxcala, 2003)	Law of Science and Technology for the State of Tlaxcala.	No information related to climate change was found.	**Article 41.** Criteria to boost science and technology. **V.** Promote the care of the ecosystem and the environment.	**Article 3:** **VI. Innovation:** The transformation of an idea or technology of a product into something new, in turn making it more useful. **VII. Scientific Research and Technological Development:** Systemic activities of the generation, improvement, dissemination, and application of knowledge in the various areas related to science and technology.

Veracruz (Congreso de Veracruz, 2004)	Law for the Promotion of Scientific and Technological Research in the State of Veracruz De Ignacio De La Llave.	No information related to climate change was found.	Article 30. The principles and criteria that will determine the support the COVEICYDET grants- to promote scientific research, technological development and innovation - will be the following: XVI. Research, development, and innovative activities directly developed by the Public Administration must identify and resolve conflicts of interest, in order to contribute to the advancement of knowledge and the training of human resources (in science and technology). This must be done without any violation to the freedom of research by individuals and institutions. XX. Science and technology-based projects supported by the COVEICYDET will be governed by a sustainable development criterion, constantly respecting the ecosystems, protecting the environment, and other ecological standards.	Article 5. II. Scientific and Technological Research: Systemic activities of the generation, improvement, dissemination, and application of knowledge in the various areas related to science and technology. III. Technological Development: The transformation process (either by adoption, adaptation, and/ or innovation) of a technology so that it may fulfill its proposed objectives- such as quantity, quality, cost of the good and service produced. IV. Innovation: The transformation of a product idea, fabrication process, or approach to a specific social service, into a better version. Such as the transformation of technology into a more useful one. Article 2. Scientific and Technological Research, technological development, as well as the transfer and usage of knowledge are priority duties of the State Government and Municipal Governments. Also corresponding to the centers of higher education institutions, non-governmental research and technological organizations, and the academic, social, and private

Yucatán (Congreso de Yucatán , 2011)	Law for the Promotion of Scientific, Technological Development and Innovation of the State of Yucatán.	No information related to climate change was found.	**Article 29.-** SIIDETEY joins the public and private institutions of superior education, centers of investigation, and technology-based companies that- without losing its legal status and framework- contributes to the following aims: **VII.-** Contribute to the State's industrialized and economic momentum through the development and usage of modern technologies respectful to the environment. .	Article 3, Section VI of state law replicates the definition of "innovation" provided in Article 4, Section IX of the "Law on Science and Technology". **Article 3.-** **V.- Technological Development:** The transformation process (either by adoption, adaptation, and/or innovation) of a technology so that it may foster social welfare. **IX.- Innovation:** The transformation of a product idea, fabrication process, or approach to a specific social service, into a better version. Such as the transformation of technology into a more useful one. **X.- Research:** Activities that generate, improve, innovate, and disseminate knowledge of various areas related to science and technology. They have the aim of responding to social demands and address State and sectoral problems. **Article 66.-** The State System of Researchers, Technologists, Inventors, and Associates will have the following objectives: **II.-** Help ensure that researchers, technologists, inventors, and associates are provided with suitable conditions to incorporate the national and international outlines- for the recognition of scientific research, technological development, innovation, and connection, as well as the gain of patents and proprietary rights.

Zacatecas (Congreso de Zacatecas , 2006)	Law of Science, Technology and Innovation of the State of Zacatecas.	No information related to climate change was found.	**Article 32.** The State will provide support to promote scientific research, technological development, and innovation- with emphasis on science and technology projects- based on the following principles: **XII.** Research, development, and innovative activities directly developed by the Public Administration must identify and resolve conflicts of interest, in order to contribute to the advancement of knowledge and the training of human resources (in science and technology). This must be done without any violation of the freedom of research by individuals and institutions. .	Article 3, Section VI of state law replicates the definition of "innovation" provided in Article 4, Section IX of the "Law on Science and Technology". **Article 3:** **IV. Scientific and technological investigation:** The systematic process of generating, transmitting, improving, disseminating, teaching, and applying knowledge in various areas related to science and technology. The aim is to meet social demands and expectations, the development needs of the entity, and promote the advancement of knowledge. **V. Technology:** The systematic usage of knowledge and research towards the production of materials, devices, systems or methods (including the design), development and improvement of prototypes, processes, products, services or organizational models **XXVII. Open Access**: Access to investigations and educational, academic, scientific, technological and innovative materials, through a digital platform without any previous subscription or payment required. The mentioned are supported by public funds and respect the layouts related to patents and the protection of intellectual or industrial property, national security, and copyright. This includes information which, due to its nature or to the author's decision, is confidential or reserved.

Country	Law	Contemplates the use of invention patents as a tool against climate change.	Contemplates support or ad hoc policies to encourage the increase of women inventors.
Guatemala (Congreso de Guatemala, 2000)	Industrial Property Law.	No	No
Argentina (Congreso de Argentina, 2018)	Law on Patents of Invention and Utility Models.	No	No
Bolivia (Congreso de la República Boliviana, 1916)	Law of December 2, 1916 on Industrial Privileges.	No	No
Chile (Ministerio de Economía, Fomento y Turismo; Subsecretaria de Economía y Empresas de Menor Tamaño, 2022)	LAW NO.19039 OF MARCH 6, 2006 ON INDUSTRIAL PROPERTY (CONSOLIDATED LAW APPROVED BY DECREE LAW NO.4 OF JUNE 30, 2022, AS AMENDED BY LAW NO.21355 OF JULY 5, 2021	No	No
Colombia (Congreso de la República de Colombia, 1994)	Decision No. 486 of the Cartagena Agreement establishshing the Common Regime on Industrial Property.	No	No
Costa rica (Asamblea Legislativa de la república de República de Costa Rica, 2008)	Law No. 6867 of April 25, 1983, on Patents for Inventions, Industrial Designs, and Utility Models (as amended by Law No. 8686 of November 21, 2008).	No	No
Cuba (Ministerio de Justicia de Cuba , 2021)	Decree No. 54, of the Country Trademark of the Republic of Cuba.	No	No
Ecuador (Comisión de la Comunidad Andina, 2001)	Decision No. 486 of the Cartagena Agreement establishing the Common Regime on Industrial Property.	No	No
El Salvador (La Asamblea Legislativa de la República del Salvador, 2017), 2017)	Intellectual Property Law (as amended by Legislative Decree No. 611 of February 15, 2017).		No
Honduras (Corte Suprema de Justicia de Honduras, 2006)	Industrial Property Law (approved by Decree No. 12-99-e and amended by Decree No. 16-2006).	No	No

Nicaragua (La Asamblea Nacional de la República de Nicaragua, 2000)	Law No. 354 on Patents for Inventions, Utility Models, and Industrial Designs.	No	No
Panama (La Asamblea Legislativa de Panamá, 1996)	Law No. 35 of May 10, 1996 which dictates provisions on Industrial Property.	No	No
Paraguay (Congreso de la Nación Paraguaya, 2010)	Law No. 1630/2000 on Patents for Inventions (amended by Law No. 4046/2010).	No	No
Peru (Presidente Constitucional de la república de Perú, 2008)	Legislative Decree No. 1075 approving complementary provisions to Decision No. 486 of the Andean Community Commission establishing the Common Regime on Industrial Property (amended by Legislative Decree No. 1397).	No	No
República Dominicana Congreso de la Unión de la República Dominicana, 2000)	Law No. 20-00 on Industrial Property.	No	No
Uruguay (Representantes de la República Oriental del Uruguay, 2020)	Law No. 17164 of September 2, 1999, on Patents (as amended up to Law No. 19924 of December 18, 2020).	No	No
Venezuela (Congreso de la República de Venezuela, 1956)	Industrial Property Law.	No	No
Belize (Goverment of Belize, 2000)	Patents act (chapter 253, act no. 14 of 2000, revised edition 2000)	No	No
Brazil (Congreso Nacional de Brasil, 1996)	Law No. 9279 of May 14, 1996 (Industrial Property Law, as amended by Law No. 14200 of September 2, 2021).	No	No
Haiti (Presidente de la República de Haití, 1992)1992)	Law of December 14, 1922, on Patents for Inventions, Industrial Designs, and Models.	No	No

Annex 4. Green codes.

A list was generated concentrating all the WIPO IPC and CPC codes, and the EPO IPCs identified. In the case of WIPO, with the help of the R programming language, both classifications were compared, and upon identifying that both shared the same codes, they concentrated on a single list in order not to duplicate results.

In this link it can be downloaded the Excel file that contains two tabs.

1. OMPI Greens – With all the IPC and CPC codes concentrated in the same list.
2. Green EPO – With all the IPC codes considered by the EPO.

However, in the case of the "WIPO Greens" tab, those codes that there are also considered by the database contained in the "EPO Greens" tab are highlighted in yellow. Finally, it is important to specify that neither of the two portals specifies how often the information is updated.

Annex 5. Green patent classification and gender classification codes.

Gender classification code.

The code is written in the R programming language. The objective of the code is to be able to count whether the patens are made only by men, only by women or mixed (that is, men and women appearing as inventors) and then count the total number of men and women.

For this, the database of names with genera version 1.1 of the WIPO (World Intellectual Property Organization) cloned from its Github repository was used. Subsequently, that same database was cleaned for use, separating only the names in a new database to work better.

In order to classify inventors from the database, the steps described below were followed:

- First, a cleaning of the names of the inventors was carried out since these acme in the form of list-type records separated by semicolons (;). The objective was to separate them according to the number of inventors that exists and leave the first name of each of them to be evaluated. The names were also transformed to capital letters. It was cleaned up enough to be useable with WIPO database and gender function.

- Once the names are clean, the code is in charge of comparing the names with the WIPO database to find out the gender of the names previously obtained. In addition to checking and seeing if the gender is masculine or feminine, a conditional is also performed for those neutral nouns, that is, it can be both masculine and feminine; these names were included manually. Once the comparison is made with the WIPO database, the gender of the names is obtained with the gender function.

- The genders obtained with both methods are stored in different columns so that later they can be compared and then only one option is left, since some names did not have a gender with both methods or the results were ambiguous. The code gives priority to the results obtained with the WIPO database. In case of being neutral, it stays with the danger assigned by the WIPO database.

- After obtaining a single gender result for each name, the code creates a conditional to know if there are only men, only women or if it is mixed (it should be noted that these labels were used to maintain the same order that was specified in the database). Once this evaluation is made, a count is made of the total number of men and the total number of women.

- Finally, the columns of this new database are pasted to the original one to later export said database. To access the full code, please go to this link.

Green patent classification code

Este código es un programa escrito en lenguaje R que clasifica las patentes verdes de una base de datos según su This code is a program written in R language that classifies green patents in a database according to their similarity to the green patent classification list drawn from the WIPO (World Intellectual Property Organization) and the EU (European Union).

The way in which the lists of green patents were obtained according to each institution was through a repository, made by hand within Excel, where the IPC codes of patents considered as green for each one were registered. This Excel can be downloaded here. Having these lists, they were standardized to match the format that was used on the basis that would be diagnosed.

In order to classify the green patents in the database, the steps described below were followed:

- After going through a data cleaning process, the code first selects two subsets of the original patent database to be used for each classification: a query that selects all columns, except for the "IPC" and "IPC classes", and that will be used to make the IPC classification; and another with all the columns except "CPC" and "CPC classes" as it will be used for the CPC classification.

- Then, it defines two functions (ipcWIPO and cpcWIPO) that are in charge of finding the patents that match in terms of IPC or CPC between the patent databases and the WIPO classification databases. If matches are found in the lists, the patents are tagged with a value of 1 and the matching value in another column is extracted.

- Consecutively, the two resulting tables are joined into one and a column indicating whether a patent is classified as a green invention (true or false) is added according to the WIPO criteria. Then, the same process is repeated to sort according to the EU list with the functions (ipcEU and cpcEU).

- Finally, both final resulting tables are reordered and downloaded separately.

To access the full code, please go to this lin


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