



## **CARBON TAX IN LATIN AMERICA AND PROSPECTS FOR ITS IMPLEMENTATION IN BRAZIL**

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**Abstract:** This paper presents an analysis of carbon taxation, that is, the taxation of greenhouse gas emissions, in Latin American countries. This research aims to draw a parallel between foreign and Brazilian legislation, to promote the discussion on the use of economic mechanisms to control CO<sub>2</sub> emissions in the country. For its realization, bibliographical and documental research was carried out, as well as the study of the specific legislation of the countries that instituted such taxation in their legal systems. Mexico, some of its states, Chile, Colombia, and Argentina tax carbon in some way. Despite not being the only market mechanism or policy to control and reduce GHG emissions, carbon taxation is shown to be the most viable market mechanism for developing countries, given its low complexity and implementation costs.

**Keywords:** climate Change; carbon taxation; greenhouse gases; Latin America.

### **1 Introduction**

The National Climate Change Policy (PNMC in Portuguese), Law n° 12,187 of December 29th, 2009, in addition to establishing goals for reducing greenhouse gas emissions (GHG), aims to stimulate the development of a Brazilian Market for Emission Reductions (MBRE in Portuguese) and adopt fiscal and tax measures to stimulate the reduction and removal of GHG from the atmosphere (BRASIL, 2009).

Both measures depend on specific legislation for their full functioning. However, the MBRE has existed since the ratification of the Kyoto Protocol by Brazil in 2005, which initiated the international market for Certified Emission Reductions (CERs) in the country under the Clean Development Mechanism (CDM) of this treaty (SISTER, 2007). Additionally, the National Congress is processing Bill 528/2021, which aims to regulate the MBRE domestically (BRASIL, 2021a).

Other PLs presented in Congress with the purpose of taxation of GHG emissions were not approved, such as Bill 2.148/2015 (BRASIL, 2015a) or the Complementary Bill 73/2007 (BRASIL, 2007). The Selective Tax, proposed in the tax reform text, also presents the possibility of carbon taxation (BRASIL, 2021b).

Many countries and subnational and international entities adopt these economic mechanisms to stimulate the reduction of GHG emissions. Although most are concentrated in so-called developed countries, many developing countries have begun adopting such

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mechanisms, so in Latin America, Argentina, Chile, Colombia, and Mexico tax carbon (WORLD BANK, 2021).

Given the political-economic similarities between Brazil and these Latin American countries and that the Brazilian Amazon began to emit more GHGs than retain them in recent years (GATTI *et al.*, 2021), it is necessary to analyze the legislation, the impacts of these mechanisms in these neighboring countries, and other factors that may contribute to the debate and research on Taxation and climate in the country.

Thus, this paper aims to answer the question of how carbon taxes work in Latin American countries, their legal and economic aspects, and the possibility of collecting such a tax in the context of the current Brazilian legal system.

For this purpose, in addition to the literature review and documentary analysis of GHG emissions, we investigated data and legislation from Brazil and Latin American countries that tax carbon and the possible repercussion of such taxes in superior courts. Furthermore, this work did not aim to exhaust the theme but to propose the debate and deepen studies and research on legal and economic mechanisms that can contribute to reducing GHG emissions.

## **2 Carbon taxation theory and development**

The use of taxation for polluting agents to internalize possible environmental damage derives from the Pigouvian tax, theorized by Pigou in the work *the Economics of Welfare* (1920). The author argues that the State should institute taxes on activities that cause negative externalities to third parties so that the responsible economic agents begin to internalize the costs that would be borne by society (PIGOU, 1920).

In Environmental Law, the taxation of activities that pollute the environment to discourage them or for the polluter to internalize the costs of pollution has become one of the forms in which the Polluter-Pays Principle is manifested in public policies for the environment. Pigou's theories are very influential in the theoretical development of environmental taxation (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 1975).

Environmental legislation tends to reward the agents responsible for positive externalities or care for the environment, thus substantiating the Protector-Receiver Principle, an offshoot of the Polluter-Pays Principle (HUPFFER *et al.*, 2011), sometimes called the Pigouvian subsidy.

Thus, based on these principles, environmental taxation uses fiscal resources such as increased tax rates on more polluting products and services, tax incentives for less polluting ones, directing public revenues to finance public and private environmental projects, etc. (TÔRRES, 2005; TRENNEPOHL, 2007; TUPIASSU, 2006).

The activities that degrade the environment are subject to the induction of the State through taxation (SCHOUERI, 2005). Therefore, having no specific carbon tax, Brazil presents

a comprehensive set and possibilities for environmental tax standards for environmental protection (TUPIASSU, 2006).

The first country to institute a carbon tax, a proper environmental tax, was Finland in 1990, on the ton of CO<sub>2</sub> emitted by fossil fuels, excluding some important sectors of the Finnish economy from the payment of this new tax, such as natural gas and the timber industry (NACHMANY *et al.*, 2015).

The following year, in 1991, Sweden instituted a carbon tax with broad green tax reform, reducing the tax incidence on high incomes and offsetting them with other environmental taxes (TUPIASSU, 2006). The result of Sweden's commitment to reducing its GHG emissions is remarkable, reducing its emissions by 26% in 2019 compared to 1990 (ASEN, 2021).

Other countries have come to tax carbon as a form to reduce their GHG emissions so that, by May 2021, 25 countries taxed GHG at the national or regional level<sup>2</sup> (WORLD BANK, 2021). Most are European countries that have adopted emission reduction targets under the Kyoto Protocol (BRASIL, 2005).

The types of gases and economic sectors affected by these measures vary from country to country. Thus, the term carbon taxation (*carbon tax*) is representative. Spain, for example, taxes only fluorinated gases, representing only 3% of the total GHG emitted by the country (ASEN, 2021).

### 3 Carbon taxation in Mexico

In Latin America, the first country to tax carbon was Mexico. The *Ley General de Cambio Climático* (LGCC) of 2012 brought the foundations for taxation and climate policies in the country, establishing, among other things, the use of economic instruments by federal entities to reduce and control GHG emissions and the obligation of individuals and legal entities, which emit more than 25 thousand tons of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e) and perform certain activities, to register their GHG emissions (MÉXICO, 2020; MÉXICO, 2014).

In 2013, Mexico promoted a Tax Reform, approving carbon taxation, which came into force the following year (GUTIÉRREZ, 2015). With the changes in the *Ley del Impuesto Especial sobre Producción y Servicios* (IEPS), the Mexican State began to charge a value, updated every January first, on the liter or ton of certain fossil fuels (MÉXICO, 2019).

The carbon tax is levied on fossil fuels listed in article 2, fraction I, item h of the law, namely propane, butane, gasoline, kerosene, jet fuel, diesel, fuel oil, coke, petroleum coke, charcoal, and other fossil fuels, except mineral gas and crude oil, under article 8, I, i of the IEPS

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<sup>2</sup> These are the countries that tax carbon: Argentina, Canada, Chile, Colombia, Denmark, Estonia, Finland, France, Iceland, Ireland, Japan, Latvia, Lichtenstein, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Slovenia, South Africa, Spain, Sweden, Switzerland, Ukraine, United Kingdom.

Law (Mexico, 2019).

In addition to the tax on fossil fuels, article 2, fraction I, Item d establishes IEPS on fossil and non-fossil automotive fuels. Article 2-A provides for the application of a value, readjusted every year on the first of January, on the sale of gasoline and diesel, without prejudice to the IEPS applied (Mexico, 2019).

The reform in the legislation made possible the interaction between the carbon taxes instituted by the Mexican State with international treaty mechanisms since article 5 of this IEPS Law allows the use of carbon credits produced in Mexico in emission-reduction projects certified by the UN under the Kyoto Protocol for the payment of taxes levied on fossil fuels in article 2, fraction I, item h (MÉXICO, 2019).

However, the carbon tax had its constitutionality questioned by a distributor of petroleum products from Mexico who claimed, among other things, violation of the principles of proportionality, tax equality, and environmental responsibility, that the law does not comply with the extra-fiscal purpose it proposes to fulfill and that there are no alternatives to fossil fuels in Mexico (MÉXICO, 2018).

The Mexican Supreme Court, however, reaffirmed the compatibility of the IEPS Law with the Constitution, international treaties ratified by Mexico, and national legislation, which provide for the duty of the State and society as a whole to protect the environment and the health of its population (MÉXICO, 2018).

Mexico, as a federation that, like Brazil, distributes its tax jurisdictions and has the legal provision for the use of tax instruments for GHG reduction and control by all entities of the Federation, presents subnational carbon taxation initiatives in the state of Zacatecas, Baja California, and Tamaulipas (WORLD BANK, 2021).

It is essential to highlight that these measures to control and reduce GHG emissions have consistent results, given that, since the LGCC, the country has been observing a reduction in the level of CO<sub>2</sub> emissions from the use of fossil fuels (RITCHIE; ROSER, 2020).

### **3.1 Zacatecas**

Since January 2017, through a new *Ley de Hacienda*, the state of Zacatecas began to charge individuals and legal entities taxes for the emission per ton of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons, perfluorocarbon, and sulfur hexafluoride (SF<sub>6</sub>) (ZACATECAS, 2020).

The basic unit of the tax is the emission of tCO<sub>2</sub>e, taxed at MXN 250.00 (about BRL 65.98 in the September 2021 quote). Article 16 of the law establishes the equivalence factor so that, for example, the tax per ton of CH<sub>4</sub> issued is 22 times the value of the ton of CO<sub>2</sub> and that of SF<sub>6</sub> is 22,200 times such value (ZACATECAS, 2020). In addition, under article 35 of this law, those subject to this tax are entitled to a 20% reduction if they reduce their emissions by

20% compared to the previous fiscal year (ZACATECAS, 2020).

The *Suprema Corte de Justicia de la Nación* was asked to comment on the constitutionality of the New *Ley de Haciendas* of Zacatecas that had been questioned by a brewery that argued the invasion of federal jurisdiction and the violation of tax principles and legal security (MÉXICO, 2020a).

In the *Amparo en Revisión 888/2018*, the Court ruled that the law's constitutionality does not violate principles or invade federal jurisdiction when establishing carbon taxes. Thus, the LGCC provides for the jurisdiction of all entities of the Mexican federation to institute economic mechanisms to control and reduce GHG emissions (MÉXICO, 2020a).

### 3.2 Baja California

Decree n° 62 of April 30th, 2020, of Baja California amended the *Ley de Hacienda* of the state, allowing the taxation of gasoline, diesel, natural gas, and liquefied petroleum gas at MXN 0.17 per kilogram or liter of CO<sub>2</sub> emitted according to the emission factor provided for in article 136 of the *Ley de Hacienda*, already changed (BAJA CALIFORNIA, 2020).

Taxation is collected on the sale of fuel, and the municipalities of Baja California receive 20% of the collection made in their territories. While municipalities may choose to use the amount collected for the promotion and development of programs in favor of the environment, the state of Baja California uses its part of the collection for this purpose, according to article 136-7 of the *Ley de Hacienda* (BAJA CALIFORNIA, 2020).

The amendments to the decree entered into force the day after its publication. However, the Federal Government of Mexico filed a *Controversia Constitucional* alleging the amendment's unconstitutionality for invading the National Congress's jurisdiction to dispose of hydrocarbons, as established in article 73, X of the Mexican Constitution (MÉXICO, 2020b). To date (September 2021), the *Controversia Constitucional 119/2020* was not tried by the Mexican Supreme Court.

### 3.3 Tamaulipas

The state of Tamaulipas approved Decree n° LXIV-121 on July 29th, 2020, which amended the *Ley de Haciendas* and instituted the taxation for tCO<sub>2e</sub> equal to three times the daily value of the Measure Unit and update of Mexico (TAMAULIPAS, 2020), whose unit, in 2021, is worth MXN 89.62 (about BRL 23.30 in the September 2021 quote).

The carbon tax began to be collected monthly in January 2021 by all individuals and legal entities that perform activities in the territory of the state that emits more than 25 tCO<sub>2e</sub> per month, with the gases subject to taxation being the same as those of the *Ley de Haciendas* from the state of Zacatecas: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, hydrofluorocarbons, perfluorocarbon, and SF<sub>6</sub>, with the same equivalence factor, according to article 76 of the law (TAMAULIPAS, 2020).

According to article 76, this law establishes that the amount collected must be used for works and projects for Sustainable Development that protect the environment to mitigate the effects of climate change and for works and health projects in the state (TAMAULIPAS, 2020).

#### 4 Carbon taxation in Chile

On September 29th, 2014, Chile approved Law 20,780, which reformed the country's tax system and instituted taxes on GHG emissions in its articles 3 and 8. Article 3 establishes a tax levied only once on selling new, light and medium-sized cars. Article 8 establishes a tax on emissions from energy-generating sources by boilers or turbines that add up to a thermal power equal to or greater than 50MWt (CHILE, 2014b).

The vehicle tax began to be charged on December 29th, 2014, on the amount of nitrogen oxides (NOx) emitted by the vehicle according to a formula that the law establishes in its article 3: "*Impuesto en UTM = [(35 /rendimiento urbano (km/lt)) + (120 x g/km de NOx)] x (Precio de venta x 0,00000006)*" (CHILE, 2014b).

The tribute collection is made in *Unidad Tributaria Mensual* (UTM), which, on September 2021, amounted to CLP 52,631 (about BRL 350.00 in the September 2021 quote). The urban vehicle income and NOx emissions are determined by the Ministry of Transport and Telecommunications, which regulated the tax with decree 241 of November 29th, 2014 (CHILE, 2014a)<sup>3</sup>.

Trucks, pickup trucks, and vans with a functional capacity of more than 2 thousand Kg, tractors, forklifts, electric vehicles, *trailers*, *off-road* vehicles, ambulances, and taxis of all modalities, are exempt from this tax, among others, so that even after the payment of the tribute, vehicles that are used as taxis will be entitled to return of the tribute (CHILE, 2014b).

Article 8 of Law 20.780 established a tax on emissions of Particulate Matter (PM), NOx, sulfur dioxide (SO<sub>2</sub>), and CO<sub>2</sub> from energy-generating sources by boilers or turbines that add a thermal power equal to or greater than 50MWt. CO<sub>2</sub> is taxed at USD 5.00 per ton emitted, excluding emissions based on biomass (CHILE, 2014b).

This tribute is annual and must be paid in April of each year. It was charged from 2018, considering the GHG emissions of the previous year, as established in Article 14 of the transitional provisions of Law 20,780. Thus, the Ministry of the Environment of Chile will publish the entities subject to the tax, which must register their GHG emissions yearly (CHILE, 2014b).

The calculation of the tax for PM, SO<sub>2</sub>, and NOx emissions are made by the following formula:  $T_{ij} = CSC_{pci} \times P_{obj}$ , where  $T_{ij}$  is the amount to be paid in USD per ton of emissions,

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<sup>3</sup> The Chilean government, through the SII (*Servicios de Impuestos Internos*), maintains a list of information on urban income and nitrous oxide emissions of each taxable vehicle in the country, so that the calculation of the tax can be done on this website: <https://www4.sii.cl/calcImpVehiculoNuevoInternet/internet.html>.

CSCpci is the social cost of the contaminant, which is USD 0.9; USD 0.01, and USD 0.025 for the PM, SO<sub>2</sub>, and NO<sub>x</sub>, respectively, Pobj is the population of the commune in which the generator is installed, and the total will be multiplied by 0.1 for each ton of pollutant (CHILE, 2014b).

This value per ton emitted will be multiplied by 1.2 or 1.1 if the commune in which the generator is installed is declared as a saturated zone or latent zone, respectively, by the amount of contaminants in the air, according to the *Ley sobre Bases Generales del Medio Ambiente do Chile*, Law n° 19,300 (CHILE, 2014b).

## 5 Carbon taxation in Colombia

Colombia's tax reform, provided by Law 1819 of 2016, established the national carbon tax in its articles 221 to 223. The triggering event of the tax is the sale in the national territory, import for sale, and consumption, which will be charged only once to the first buyer or importer of fossil fuels (COLÔMBIA, 2016).

The tribute corresponded to COP 15,000.00 (COP 1.00 is equivalent to about BRL 0.0014 in the September 2021 quote), at the time of the enactment of the law, per ton of CO<sub>2</sub> emitted, so the cubic meter of natural gas was taxed at COP 29.00 and the gallons (3.7854 liters) of liquefied petroleum gas at COP 95.00, gasoline at COP 135.00, kerosene and aviation kerosene at COP 148.00, diesel at COP 152.00, and fuel oil at COP 177.00 (COLÔMBIA, 2016).

In the case of liquefied petroleum gas, the tax will be levied only if the buyer uses it for industrial purposes, while, in the case of natural gas, for the refining and petrochemical industries, according to the first and second paragraphs of article 221. The tax will not be charged if the taxable persons prove the carbon neutrality of their activities, as expressed in the third paragraph of that same article (COLÔMBIA, 2016).

Under the terms of the first paragraph of article 222, the tax is updated on the first of February by the inflation of the previous year plus one percentage point until the ton of CO<sub>2</sub> is equivalent to 1 unit of the tax value of Colombia (COLÔMBIA, 2016), corresponding to COP 36,308.00 in 2021.

In addition, the amounts collected will be used for managing coastal erosion, conserving water sources, and protecting ecosystems, as defined by the Ministry of the Environment and Sustainable Development of Colombia under article 223 of Law 1819 (COLÔMBIA, 2016).

Article 222 of this Law had its constitutionality questioned for allegedly violating the principles of equality, legality, legal certainty, and environmental standards since listing fossil fuels and the tribute to be paid for each of them does not mention mineral coal (COLOMBIA, 2020).

The Constitutional Court of Colombia judged that the arguments raised were not

enough to be analyzed, refraining from judging the constitutionality of the device in question, providing, among other things, that the Legislative Branch can choose the fuels on which the environmental taxation in question is levied, the tribute to mineral coal not being necessary to comply with the duties to the environment emanating from the Constitution of the country (COLÔMBIA, 2020).

## **6 Carbon taxation in Argentina**

As in Mexico, Chile, and Colombia, carbon taxation in Argentina was made possible thanks to tax reform in the country promoted by Law 27,430 of December 29th, 2017, which modified, among other laws, Law 23,966, of 1991, which now governs taxes on CO<sub>2</sub> (ARGENTINA, 2017). This tax only applies once and has companies that refine, produce, elaborate, manufacture, or import petroleum products as taxable persons (ARGENTINA, 2017).

The taxed products are gasoline, solvents, turpentine, diesel, kerosene, fuel oil, petroleum coke, and mineral coal, as indicated in the table of article 11 added to article 7 of Law 23.966, whose values are also indicated in Argentine Pesos (ARGENTINA, 2017). The values in the table must be updated every quarter, according to the Consumer Price Index (CPI) prepared by the National Institute of Statistics and Censuses of Argentina (ARGENTINA, 2017).

The tax was levied from the first of March 2018, except for fuel oil, petroleum coke, and mineral coal, which were levied from the first of January 2019. There is no legal obligation to allocate the collection of this tax for environmental purposes, according to article 19, added to Article 7 of Law 23.966. However, the law allows the Executive Branch to increase the value of taxes by up to 25% if guided by environmental and energy policies (ARGENTINA, 2017).

## **7 Prospects for Brazil**

Article 6, item VI, of the PNMC, provides fiscal and tax measures to reduce GHG emissions, which should be established in a specific law (BRASIL, 2009). Although the Union has not legislated on this device, municipalities, states, and even the Union present taxes that can indirectly mitigate GHG emissions, such as Green IPTU, adopted by many municipalities in the country (FEIO, 2018) and reduction of IPVA (RIO de JANEIRO, 2015) and IPI for cars that pollute less (BRASIL, 2012a).

The extra-fiscal use of these taxes characteristically fiscal is one of the possibilities given to the legislator to mitigate GHG emissions in the face of the impossibility of their direct taxation due to the lack of constitutional provision since the Federal Constitution is quite clear about the existing taxes in the country and its rules (TÔRRES, 2005; TUPIASSU, 2006).

Thus, the lack of a constitutional forecast of tax, of which the hypothesis of incidence is the GHG emissions of a particular establishment and the calculation base is the amount of



emissions in a certain period, as occurs with Law 20.780 of Chile or with the *Ley de Hacienda* of Zacatecas, for example, prevents the legislator of any of the entities of the federation from legislating on such a tribute (CARVALHO, 2019; ATALIBA, 2008).

The Contribuição de Intervenção no Domínio Econômico (CIDE) on fuels, established by Law nº 10,336 (BRASIL, 2001), despite the similarity with some of the taxes mentioned above, does not consider the CO<sub>2</sub>e emitted by each of the different fuels. Therefore, the rate for gasoline is currently BRL 100.00 per cubic meter, and zero reais for the others, most more polluting than gasoline (BRASIL, 2018).

However, the CIDE is appropriate for environmental taxation (TÔRRES, 2005) due to the purpose of these contributions and the social impact they cause by intervening in the economic domain (TRENNEPOLH, 2007). Thus, the CIDE on fuels could, if restructured, be a carbon tax along the lines of taxes on GHG emissions from fossil fuels in Mexico, Colombia, and Argentina.

In addition, the tax reform, under analysis in the National Congress, can also be a factor in changes in the country's tax environmental policy with the institution of the Selective Tax, a jurisdiction of the Union, and that would be used to discourage certain activities, such as those harmful to the environment (BRASIL, 2021b).

However, these indirect taxes should be cautiously analyzed by the legislator since they can directly affect the price of essential consumer goods, especially if such taxes are levied on fuel, directly affecting the general population as end consumers of these goods (NABAIS, 2010). As they do not consider the contributory capacity of the largest GHG emitters, they will undoubtedly be questioned by society if it is disproportionately affected by such a tax (NABAIS, 2012; SANCHES, 2016).

The negative impacts on the public budget and measures to compensate for these revenue waivers should be considered for tax incentives for less polluting products and services and those who pollute less or remove GHG from the atmosphere (CORREIA NETO, 2012). Thus, the introduction of such mechanisms in the legal system is often and preferably accompanied by green tax reform to obtain a balance between the financial activity of the State and the necessary care for the environment (MARKANDYA, 2012)

This is because carbon taxation is one of the many mechanisms that price GHGs and that can be used by the State to control and reduce emissions. In addition to taxation, emission markets are an essential climate policy tool with widespread use among developed countries (WORLD BANK, 2021).

It should be noted that GHG emissions in Brazil are primarily due to changes in land use, including deforestation and fires, responsible for 44% of the total GHG emissions in 2019, and agriculture, responsible for 28% of the total GHG emissions in the same period, together totaling more than 1.5 billion tCO<sub>2</sub>e emitted (ALBUQUERQUE *et al.*, 2020).

GHG emissions in Brazil in 2019 were 9.6% higher when compared to 2018. The estimate for 2020 is higher, with the consolidation of data on GHG emissions, an objective result of the current government's environmental management (AZEVEDO *et al.*, 2020), which calls into question the consolidated and praised Brazilian environmental diplomacy (CAMPOS; MUCHAGATA, 2017).

This increase in emissions takes place in a context where Brazil and several other countries have committed to reducing and controlling their emissions by ratifying the 2015 Paris Agreement, which created the Nationally Determined Contribution (NDC) (BRASIL, 2017b). In 2015, Brazil committed to maintaining GHG emission levels 37% lower in 2025 than in 2005 and 43% lower in 2030 than 2005 (RICUPERO *et al.*, 2021).

Even though it is considered an unambitious target, the Brazilian government changed the basis for calculating its NDC in 2020. Therefore, even without changing these percentages or the reference year, the total values of GHG emissions allowed will be higher than previously indicated by Brazil, which motivated the filing of a Popular Action against the State, having as the object of demand such a change in the calculation, which came to be called climatic “pedalada” (RICUPERO *et al.*, 2021).

In 2019, 413.7 million tCO<sub>2</sub>e were emitted for energy generation, representing 19% of total annual emissions and an increase of 1.1% compared to 2018 (ALBUQUERQUE *et al.*, 2020). The Brazilian energy matrix is considerably clean and does not depend on burning fossil fuels for residential electricity consumption when rain maintains the levels of hydroelectric reservoirs. Thus, a considerable part of these emissions come from the consumption of fuels for transport (ALBUQUERQUE *et al.*, 2020).

In 2019, 196.5 million tCO<sub>2</sub>e were emitted for energy generation in the transport sector, which is lower than in 2014, with records of around 220 million tCO<sub>2</sub>e of GHG emitted, despite having increased by 1% compared to 2018 (ALBUQUERQUE *et al.*, 2020).

There has also been an increase in the consumption of biofuels in the country. In contrast, the consumption of diesel and gasoline has fallen, demonstrating the effects of biofuel policies such as the obligation to mix a certain percentage of biofuel in fossil fuels (ALBUQUERQUE *et al.*, 2020) and the reduction in the rate of taxes levied on biofuels (TRENNEPOLH, 2007).

Law n° 13.576 of December 26th, 2017, which established the National Biofuels Policy (Renovabio in Portuguese), created the Decarbonization Credits (CBios in Portuguese), and directly mentioned the country's commitments signed in the Paris Agreement (BRASIL, 2017c).

CBios are units equivalent to 1 ton of CO<sub>2</sub> that is no longer emitted by biofuels compared to fossil fuels (BRASIL, 2017c). These credits are issued by biofuel producers and importers. Fossil fuel distributors must purchase them throughout the national territory according to the annual and mandatory goals established by the National Energy Policy Council

(CNPE in Portuguese) (BRASIL, 2019).

Although they are traded on the stock exchange and can be purchased by anyone, CBios do not constitute an emissions market as provided for in the MBRE or other systems since they are not assets arising from GHG emissions reduction. In addition, using CBios as an investment is unattractive for those not obliged to acquire it since it has a high price and uncertainties regarding its legal nature (GRILI, 2021).

CERs from CDM projects were traded under the Kyoto Protocol until the end of its term in 2020 (BRASIL, 2017a). The primary buyers were the Annex B countries<sup>4</sup> of that protocol, that is, countries that adopted goals of reduction of GHG emissions and bought CERs to offset their emissions to achieve these goals (SISTER, 2007).

These CERs were generated by companies that reduced their emissions or removed GHGs from the atmosphere, equivalent to 1 tCO<sub>2</sub>e, and proved to be an attractive business for Brazilian companies until 2013, when the European Union, one of the primary buyers of CERs in the world, began to allow the acquisition of CERs only from the so-called least developed countries, directly impacting the MBRE, reducing the registration of new CDM projects in the face of a substantial drop in demand (PROLO *et al.*, 2020).

With the end of the Kyoto Protocol and its flexibility mechanisms, such as the CDM, it is expected that an emissions market will be implemented to replace it, provided by article 6 of the Paris Agreement. However, it is still under negotiation by the signatory countries (BRASIL, 2017b).

The MBRE, through Bill 528/2021, will, in principle, be a voluntary market, that is, without the obligation for individuals and legal entities to acquire reduction certificates if they pollute more than a specific limit. However, the Ministry of Economy will later create a program offsetting GHG emissions (BRASIL, 2021a).

Another national and international mechanism is the payment for reducing or removing GHG emissions from the atmosphere. Brazil, for example, used this legal-economic mechanism, having a project approved by the Climate Green Fund in 2019, receiving USD 96.5 million for reducing deforestation in the Amazon Forest in 2014 and 2015 (CLIMATE GREEN FUND, 2019).

Part of this money will be used within the National Program for Payments for Environmental Services - Floresta+, created by Ordinance n° 41, item I of the Forest Code (Law n° 12,651 of May 25th, 2012) (BRASIL, 2012b).

It is essential to highlight that the National Policy for Payments for Environmental

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<sup>4</sup> The countries in Annex B of the Kyoto Protocol are Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, European Community, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Norway, New Zealand, Netherlands, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland, United States of America, and Ukraine.

Services (PNPSA in Portuguese), established by Law nº 14.119 of January 13th, 2021, established the offset linked to the certification of emissions for deforestation or degradation as a form of payment by the public power, provided that these individuals responsible for GHG emissions also preserve the environment according to the law (BRASIL, 2021c).

Thus, even without a tax on GHG emissions, Brazil can use other legal and economic mechanisms to implement its climate policies, noting, however, that investment in monitoring and combating illegal deforestation in Brazilian biomes is a measure of extreme importance for the climate and environment, but that has, unfortunately, been neglected.

## 8 Conclusion

The green fiscal reforms that instituted carbon taxes, which first took place in Europe in the early 1990s, became a reality for Latin American countries, especially Mexico, which was the first to promote a broad reform that included national taxation on carbon emitted by fossil fuels.

The adoption of this type of tax by developing countries shows the commitment and planning of these countries to reduce their GHG emissions by using fossil fuels and to develop and make cheaper technologies less polluting since this mechanism directly affects the national energy matrix.

Mexico's commitment to climate policies is significant given the country's history of being the largest GHG emitter in Latin America; a title passed to Brazil in the mid-2010s (RITCHIE; ROSER, 2020). In addition, Mexico is, to date, the only Latin American country to have submitted its long-term strategies for a low-GHG development to the UN, under the terms of article 4, paragraph 19, of the Paris Agreement (UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, 2021).

Furthermore, since January 2020, Mexico has had a pilot carbon market in operation, which is expected to be fully functional in 2023, which is the first carbon market implemented in a Latin American country (WORLD BANK, 2021), demonstrating a commitment to reducing its emissions and standing out as a climate leader among developing countries.

As for the possibility of carbon taxation in Brazil, the CIDE Combustível, of which specific rates can be modified by decree, could become a carbon tax if the rates reflect the GHG emission of each of the fuels, as with the IEPS Law in Mexico, Law 1819 in Colombia, and Law 27,430 in Argentina.

In addition, the Selective Tax, discussed within the scope of tax reform proposals processed in the National Congress, will, if approved, be similar to the laws mentioned above, especially the IEPS Law, since it may be levied on products and services that cause negative externalities and generate a burden to society, to discourage them.

However, the incidence of direct taxes on GHG emissions, as in Chile and some

Mexican states, depends on a change in the Constitution, being, perhaps, the most appropriate way of taxing carbon in Brazil, given the successive increases in the price of fuels, which have a direct impact on the income of the population, especially the poorest.

But it is necessary to indicate that the increase in GHG emissions in Brazil occurs in the context of fires and illegal deforestation, especially in the Amazon. The inertia of the government and the cut in public resources for studies and policies aimed at climate change show that, despite being important, taxation on GHG emissions in Brazil will not, *per se*, be enough for the country to fulfill its international commitments to reduce GHG emissions and be carbon neutral.

However, carbon taxation is a cheap and less complex market mechanism than carbon markets, for example, as can be seen when one observes that these markets take place predominantly in developed countries, such as the European Union Emissions Trading System (EU ETS), implemented in 2005 (WORLD BANK, 2021).

Only two developing countries, besides Mexico, have implemented markets of this nature: Kazakhstan, in 2013, and China, the world's largest GHG emitter, in 2021, after implementing several pilot emission markets in the country's most important cities (WORLD BANK, 2021). In Brazil, the regulation of such a market at the national level is being analyzed by the National Congress through Bill 528/2021 (BRASIL, 2021a).

Brazilian legislation provides for policies that depend on the wide use of GHG emission reduction certificates, which could be used to encourage the reduction of deforestation through an adequately regulated MBRE, similar to what happened with Brazil when it received money from the Climate Green Fund for reducing deforestation in the Amazon in 2014 and 2015.

The study of comparative legislation provides essential theoretical and empirical contributions to Brazil and other countries due to the expected proliferation of such markets and other legal-economic mechanisms in developing countries. Thus, this work aimed to investigate taxation on GHG emissions in Latin American countries, propose the debate, and deepen studies and research on carbon taxation and other mechanisms that can contribute to reducing GHG emissions.

## References

ALBUQUERQUE, I. et al.. **Análise das emissões brasileiras de gases de efeito estufa e suas implicações para as metas de clima do Brasil 1970-2019**. Sistema de estimativa de emissões de gases de efeito estufa. 2020. Disponível em: [https://seeg-br.s3.amazonaws.com/Documentos%20Analiticos/SEEG\\_8/SEEG8\\_DOC\\_ANALITICO\\_SINT ESE\\_1990-2019.pdf](https://seeg-br.s3.amazonaws.com/Documentos%20Analiticos/SEEG_8/SEEG8_DOC_ANALITICO_SINT ESE_1990-2019.pdf). Acesso em: 10 jun. 2021.

ARGENTINA. Ley 27430. Impuesto a las ganancias. **Boletín Oficial**, Buenos Aires, n. 33.781, p. 3-96, 29 dez. 2017, Primera Sección.

ASEN, Elke. **Carbon Taxes in Europe**. Tax Foundation. 2021. Disponível em:

<https://taxfoundation.org/carbon-taxes-in-europe-2021/>. Acesso em: 15 jun. 2021.

ATALIBA, Geraldo. **Hipótese de incidência tributária**. 6.ed. São Paulo: Malheiros, 2008. 216 p.

AZEVEDO, T. et al. **Impacto da pandemia de Covid-19 nas emissões de gases de efeito estufa no Brasil**. Sistema de estimativa de emissões de gases de efeito estufa. 2020. Disponível em: [https://seeg-br.s3.amazonaws.com/OC\\_nota\\_tecnica\\_FINAL.pdf](https://seeg-br.s3.amazonaws.com/OC_nota_tecnica_FINAL.pdf). Acesso em 10 set. 2021.

BAJA CALIFORNIA. Decreto nº 62. Se reforma el Título Segundo, Capítulo IX, artículos 133,134, 135 y 136, y se adicionan los artículos 136-1, 136-2, 136-3, 136-4, 136-5, 136-6 y 136-7, y se Reforma el Capítulo XIX, artículo 156-9, Capítulo XXII, artículo 156-48 de la Ley de Hacienda del Estado de Baja California, para quedar como sigue: **Periódico Oficial del Estado de Baja California**, Mexicali, Tomo CXXVII, n. 22, p. 35-45, 30 abr. 2020. Número Especial.

BRASIL. Câmara do Deputados. **Projeto de Lei Complementar nº 73 de 2007**. Propõe uma Reformulação Tributária Ecológica, a fim de regulamentar o artigo 146-A, da Constituição Federal, instituir os princípios da essencialidade e do diferencial tributário pela sustentabilidade ambiental e oneração das emissões de gases de efeito estufa, e criar a taxa sobre o carbono (“carbon tax”), na forma de Contribuição de Intervenção no Domínio Econômico, para a sustentabilidade ambiental e a mitigação do aquecimento global. Brasília: Câmara dos Deputados 2007. Disponível em: [https://www.camara.leg.br/proposicoesWeb/prop\\_mostrarintegra?codteor=468684](https://www.camara.leg.br/proposicoesWeb/prop_mostrarintegra?codteor=468684). Acesso em: 08 jun. 2021.

BRASIL. Câmara do Deputados. **Projeto de Lei nº 2148 de 2015**. Estabelece redução de tributos para produtos adequados à economia verde de baixo carbono. Brasília: Câmara dos Deputados, 2015a. Disponível em: [https://www.camara.leg.br/proposicoesWeb/prop\\_mostrarintegra?codteor=1355144](https://www.camara.leg.br/proposicoesWeb/prop_mostrarintegra?codteor=1355144). Acesso em: 08 jun. 2021.

BRASIL. Câmara do Deputados. **Projeto de Lei nº 528 de 2021**. Regulamenta o Mercado Brasileiro de Redução de Emissões (MBRE), determinado pela Política Nacional de Mudança do Clima – Lei nº 12.187, de 29 de dezembro de 2009. Brasília: Câmara dos Deputados, 2021a. Disponível em: [https://www.camara.leg.br/proposicoesWeb/prop\\_mostrarintegra?codteor=1965629](https://www.camara.leg.br/proposicoesWeb/prop_mostrarintegra?codteor=1965629). Acesso em: 08 jun. 2021.

BRASIL. **Comissão Mista Temporária da Reforma Tributária. Relatório Final da Reforma Tributária – PEC Nº 45/2019 e Nº 110/2019**. 2021b. Disponível em: <https://legis.senado.leg.br/sdleg-getter/documento/download/39670bbc-5cab-4e9a-adc5-ed34b80a7da0>. Acesso em: 8 set. 2021.

BRASIL. Decreto Legislativo nº 178, 12 de dezembro de 2017. Aprova o texto das Emendas ao Protocolo de Quioto à Convenção-Quadro das Nações Unidas sobre Mudança do Clima, adotadas por Sessão Ordinária da 8ª Conferência das Partes atuando como Reunião das Partes no Protocolo de Quioto, em Doha, Catar, em 8 de dezembro de 2012. **Diário Oficial da União**: Seção 1, Brasília, DF, n. 237, p. 1, 12 dez. 2017a.

BRASIL. Decreto nº 5.445, de 12 de maio de 2005. Promulga o Protocolo de Quioto à Convenção-Quadro das Nações Unidas sobre Mudança do Clima, aberto a assinaturas na cidade de Quioto, Japão, em 11 de dezembro de 1997, por ocasião da Terceira Conferência das Partes da Convenção-Quadro das Nações Unidas sobre Mudança do Clima. **Diário Oficial da União**: Seção 1, Brasília, DF, n. 91, p. 1-6, 13 maio 2005.

BRASIL. Decreto nº 7.819, de 3 de outubro de 2012. Regulamenta os arts. 40 a 44 da Lei nº 12.715, de 17 de setembro de 2012, que dispõe sobre o Programa de Incentivo à Inovação Tecnológica e Adensamento da Cadeia Produtiva de Veículos Automotores - INOVAR-AUTO, e os arts. 5º e 6º da Lei nº 12.546, de 14 de dezembro de 2011, que dispõe sobre redução do Imposto sobre Produtos Industrializados, na hipótese que especifica. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 192-A, p. 1-6, 03 out. 2012a. Edição Extra.

BRASIL. Decreto nº 9.391, de 30 de maio de 2018. Altera o Decreto nº 5.060, de 30 de abril de 2004, que reduz as alíquotas da Contribuição de Intervenção no Domínio Econômico incidente sobre a importação e a comercialização de petróleo e seus derivados, gás natural e seus derivados, e álcool etílico combustível, e o Decreto nº 5.059, de 30 de abril de 2004, que reduz as alíquotas da Contribuição para o PIS/Pasep e da Cofins incidentes sobre a importação e a comercialização de gasolina, óleo diesel, gás liquefeito de petróleo e querosene de aviação. **Diário Oficial da União:** Brasília, DF, n. 103-A, p. 46, 30 maio 2018. Edição Extra.

BRASIL. Decreto nº 9.073, de 5 de junho de 2017. Promulga o Acordo de Paris sob a Convenção-Quadro das Nações Unidas sobre Mudança do Clima, celebrado em Paris, em 12 de dezembro de 2015, e firmado em Nova Iorque, em 22 de abril de 2016. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 107, p. 3-7, 06 jun. 2017b.

BRASIL. Decreto nº 9.888, de 27 de junho de 2019. Dispõe sobre a definição das metas compulsórias anuais de redução de emissões de gases causadores do efeito estufa para a comercialização de combustíveis de que trata a Lei nº 13.576, de 26 de dezembro de 2017, e institui o Comitê da Política Nacional de Biocombustíveis - Comitê RenovaBio. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 123, p. 22-23, 28 jun. 2019.

BRASIL. Lei nº 10.336, de 19 de dezembro de 2001. Institui Contribuição de Intervenção no Domínio Econômico incidente sobre a importação e a comercialização de petróleo e seus derivados, gás natural e seus derivados, e álcool etílico combustível (Cide), e dá outras providências. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 242, p. 2-3, 20 dez. 2001.

BRASIL. Lei nº 12.187, de 29 de dezembro de 2009. Institui a Política Nacional sobre Mudança do Clima - PNMC e dá outras providências. **Diário Oficial da União:** Seção 2, Brasília, DF, n. 248, p. 109-110, 29 dez. 2009. Edição Extra.

BRASIL. Lei nº 12.651, de 25 de maio de 2012. Dispõe sobre a proteção da vegetação nativa; altera as Leis nºs 6.938, de 31 de agosto de 1981, 9.393, de 19 de dezembro de 1996, e 11.428, de 22 de dezembro de 2006; revoga as Leis nºs 4.771, de 15 de setembro de 1965, e 7.754, de 14 de abril de 1989, e a Medida Provisória nº 2.166-67, de 24 de agosto de 2001; e dá outras providências. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 102, p. 1-8, 28 maio 2012b.

BRASIL. Lei nº 13.576, de 26 de dezembro de 2017. Dispõe sobre a Política Nacional de Biocombustíveis (RenovaBio) e dá outras providências. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 247, p. 4-5, 27 dez. 2017c.

BRASIL. Lei nº 14.119, de 13 de janeiro de 2021. Institui a Política Nacional de Pagamento por Serviços Ambientais; e altera as Leis nºs 8.212, de 24 de julho de 1991, 8.629, de 25 de fevereiro de 1993, e 6.015, de 31 de dezembro de 1973, para adequá-las à nova política. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 9, p. 7-9, 13 jan. 2021c.

BRASIL. Ministério do Meio Ambiente. Gabinete do Ministro. Portaria nº 288, de 2 de julho de 2020. Institui o Programa Nacional de Pagamentos por Serviços Ambientais - Floresta+, no âmbito do Ministério do Meio Ambiente. **Diário Oficial da União:** Seção 1, Brasília, DF, n. 126, p. 87, 03 jul. 2020.

CAMPOS, Bárbara Pincowsca Cardoso; MUCHAGATA, Márcia. Direitos Humanos e Meio Ambiente: Avanços e Contradições do Modelo de Desenvolvimento Sustentável Brasileiro e a Agenda Internacional. In: TRINDADE, Antônio Augusto Cançado; LEAL, César Barros (Coord.). **Direitos Humanos e Meio Ambiente**. Fortaleza: Expressão Gráfica e Editora, 2017.

CARVALHO, Paulo de Barros. **Curso de direito tributário**. 30. ed. São Paulo: Saraiva Educação, 2019. 616 p. E-book.

CHILE. **Decreto 241**. Establece condiciones para determinar rendimiento urbano y emisiones de óxido de nitrógeno de vehículos motorizados y determina la forma y condiciones del cálculo del impuesto establecido en el artículo 3° de la ley n° 20.780. Santiago, 2014a. Disponível em: <https://www.bcn.cl/leychile/navegar?idNorma=1071073>. Acesso em: 10 set. 2021.

CHILE. **Ley N° 20.780**. Reforma tributaria que modifica el sistema de tributación de la renta e introduce diversos ajustes en el sistema tributário. Santiago, 2014b. Disponível em: <https://www.bcn.cl/leychile/navegar?idNorma=1067194&idVersion=2020-02-24>. Acesso em: 10 set. 2021.

CLIMATE GREEN FUND. GCF/B.22/10/Add.02. **Consideration of funding proposals - Addendum II Funding proposal package for FP100**. Incheon, 01 fev. 2019. Disponível em: <https://www.greenclimate.fund/sites/default/files/document/gcf-b22-10-add02.pdf>. Acesso em: 25 set. 2021.

COLÔMBIA. Ley 1819 de 2016 (diciembre 29). Por medio de la cual se adopta una reforma tributaria estructural, se fortalecen los mecanismos para la lucha contra la evasión y la elusión fiscal, y se dictan otras disposiciones. **Diario Oficial**, Bogotá, Año CLII, n. 50.101, p. 1-84. 29 dez. 2016.

COLÔMBIA. Corte Constitucional (Pleno). **Expediente D-13382, Sentencia C-046/20**. Demanda de inconstitucionalidad contra el artículo 222 (parcial) de la Ley 1819 de 2016, “Por medio de la cual se adopta una reforma tributaria estructural, se fortalecen los mecanismos para la lucha contra la evasión y la elusión fiscal, y se dictan otras disposiciones”. Magistrado Sustanciador: Luis Guillermo Guerrero Pérez. Sessão de 12/02/2020. Disponível em: <https://jurisprudenciaconstitucional.com/resolucion/84463-corte-constitucional-de-colombia-c-046-20>. Acesso em: 15 set. 2021.

CORREIA NETO, Celso de Barros. **O Averso do Tributo**: incentivos e renúncias fiscais no direito brasileiro. 2012. 271 f. Tese (Doutorado em Direito) – Faculdade de Direito do Largo São Francisco, Universidade de São Paulo, São Paulo, 2012.

FALKNER, Robert. The Paris Agreement and the new logic of international climate politics. **International Affairs**, Oxônia, v. 92, n. 5, p. 1107–1125, 2016.

FEIO, Luiza Gaspar. **O IPTU Verde e a Construção da Cidade Sustentável**. 2018. 121 f. Dissertação (Mestrado em Direito) – Instituto De Ciências Jurídicas, Universidade Federal do Pará, Pará, 2018. GATTI, Luciana V. et al. Amazonia as a carbon source linked to deforestation and climate change. **Nature**, [S. l.], n. 595, p. 388-408, 2021. Disponível em: <<https://doi.org/10.1038/s41586-021-03629-6>>.

GRILI, Mariana. Governo reformula área de biocombustíveis e promete nova coordenadoria. **Revista Globo Rural**. 2021. Disponível em: <https://revistagloborural.globo.com/Noticias/Agricultura/Cana/noticia/2021/02/governo-reformula-area-de-biocombustiveis-e-promete-nova-coordenadoria.html>. Acesso em: 27 set. 2021.



GUTIÉRREZ, Mónica Unda. La reforma tributaria de 2013: los problemas de la Hacienda pública y la desigualdad em México. **Espiral, Estudios sobre Estado y Sociedad**, México, v. 22, n. 64, p. 69-99, 2015.

HUPFFER, Haide M.; WEYERMÜLLER, André R.; WACLAWOVSKY, William G. Uma análise sistêmica do princípio do protetor-recebedor na institucionalização de programas de compensação por serviços ambientais. **Ambiente & Sociedade**, São Paulo, v. 14, n. 1, p. 95-114, 2011.

MARKANDYA, Anil. Environmental Taxation: What Have We Learnt in the Last 30 Years? In: CASTELLUCCI, Laura; MARKANDYA, Anil (Eds.). **Environmental Taxes and Fiscal Reform**, London, p. 9-56, 2012. Disponível em: [https://doi.org/10.1057/9780230392403\\_2](https://doi.org/10.1057/9780230392403_2).

MÉXICO. **Ley del Impuesto Especial sobre Producción y Servicios**. Nueva Ley publicada en el Diario Oficial de la Federación el 30 de diciembre de 1980. Cidade do México, 2019. Disponível em: [http://www.diputados.gob.mx/LeyesBiblio/pdf/78\\_241220.pdf](http://www.diputados.gob.mx/LeyesBiblio/pdf/78_241220.pdf). Acesso em: 9 set. 2021.

MÉXICO. **Ley General de Cambio Climático**. Nueva Ley publicada en el Diario Oficial de la Federación el 6 de junio de 2012. Cidade do México, 2020. Disponível em: [http://www.diputados.gob.mx/LeyesBiblio/pdf/LGCC\\_061120.pdf](http://www.diputados.gob.mx/LeyesBiblio/pdf/LGCC_061120.pdf). Acesso em: 9 set. 2021.

MÉXICO. **Reglamento de la Ley General de Cambio Climático en Materia del Registro Nacional de Emisiones**. Nuevo Reglamento publicado en el Diario Oficial de la Federación el 28 de octubre de 2014. Cidade do México, 2014. Disponível em: [http://www.diputados.gob.mx/LeyesBiblio/regley/Reg\\_LGCC\\_MRNE\\_281014.pdf](http://www.diputados.gob.mx/LeyesBiblio/regley/Reg_LGCC_MRNE_281014.pdf). Acesso em: 9 set. 2021.

MÉXICO. Suprema Corte de Justicia de la Nación (Segunda Sala). **Amparo en Revisión 827/2015**. Ponente: Min. Javier Laynez Potisek. Sessão de 10/01/2018. Disponível em: [https://www.scjn.gob.mx/sites/default/files/listas/documento\\_dos/2017-12/AR-827-2015.pdf](https://www.scjn.gob.mx/sites/default/files/listas/documento_dos/2017-12/AR-827-2015.pdf). Acesso em: 15 set. 2021.

MÉXICO. Suprema Corte de Justicia de la Nación (Segunda Sala). **Amparo en Revisión 888/2018**. Ponente: Min. Alberto Pérez Dayán. Sessão de 06/02/2020a. Disponível em: [https://www.scjn.gob.mx/sites/default/files/listas/documento\\_dos/2019-01/AR%20888-2018..pdf](https://www.scjn.gob.mx/sites/default/files/listas/documento_dos/2019-01/AR%20888-2018..pdf). Acesso em: 15 set. 2021.

MÉXICO. Suprema Corte de Justicia de la Nación. (Pleno). **Controversia Constitucional 119/2020**, Demandante: Poder Ejecutivo Federal, demandado: Poder Legislativo del Estado de Baja California, 2020b.

NABAIS, José Casalta. **Estudos de direito fiscal**: por um Estado fiscal suportável. Coimbra: Almedina, 2010. 362 p.

NABAIS, José Casalta. **O dever fundamental de pagar impostos**: contributo para a compreensão constitucional do estado fiscal contemporâneo. Coimbra: Almedina, 2012. 746 p.

NACHMANY, Michal. et al. **Climate Change Legislation In Finland**. 2015. Disponível em: [https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/Global\\_climate\\_legislation\\_study\\_20151.pdf](https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/Global_climate_legislation_study_20151.pdf). Acesso em: 10 set. 2021.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. **The Polluter Pays Principle**. Paris: ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 1975.

- PIGOU, A. C. **The Economics of Welfare**. Londres: Macmillan, 1920. 561 p.
- PROLO, C. D. et al. **A Política Nacional de Mudança do Clima em 2020: estado de metas, mercados e governança assumidos na Lei 12.187/2009**. Rio de Janeiro, 2020. 83 p.
- RICUPERO, R. et al. **Em defesa da ação popular contra a “pedalada” climática**. 2021. Disponível em: <https://www.oc.eco.br/wp-content/uploads/2021/04/Doc.-3-Carta-de-apoio.pdf>. Acesso em: 28 set. 2021.
- RIO DE JANEIRO. Lei nº 7.068, de 01 de outubro 2015. Altera a lei nº 2.877, de 22 de dezembro de 1997, que dispõe sobre o Imposto sobre a Propriedade de Veículos Automotores - IPVA. **Diário Oficial**, Parte 1, Rio de Janeiro, n. 181, p. 1-2, 02 out. 2015.
- RITCHIE, Hannah; ROSER, Max Roser. **CO<sub>2</sub> and Greenhouse Gas Emissions**. 2020. Disponível em: <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>. Acesso em: 12 set. 2021.
- SANCHES, José Luís Saldanha. **Justiça Fiscal**. Lisboa: Fundação Francisco Manuel dos Santos, 2016. 80 p. E-Book.
- SCHOUERI, Luís Eduardo. Normas Tributárias Indutoras em Matéria Ambiental. **Direito Tributário Ambiental**, São Paulo, v. 1, p. 235-256, 2005.
- SISTER, Gabriel. **Mercado de Carbono e Protocolo de Quioto: Aspectos Negociais e Tributação**. Rio de Janeiro: Elsevier, 2007. 178 p.
- TAMAULIPAS. **Decreto nº LIX-1090**. Mediante el cual se expide la Ley de Hacienda para el Estado de Tamaulipas. Ciudad Victoria, 2020. Disponível em: [http://po.tamaulipas.gob.mx/wp-content/uploads/2020/08/Ley\\_Hacienda.pdf](http://po.tamaulipas.gob.mx/wp-content/uploads/2020/08/Ley_Hacienda.pdf). Acesso em: 10 set. 2021.
- TÔRRES, Heleno Taveira. Da relação entre competências constitucionais tributária e ambiental: os limites dos chamados “tributos ambientais”. **Direito Tributário Ambiental**, São Paulo, n. 82, p. 115-158, 2005.
- TRENNEPOHL, Terence Dornelles. Incentivos tributários e meio ambiente: a sustentabilidade ambiental e o direito tributário. In: MARTINS, Ives Gandra da Silva; ELALI, André; PEIXOTO, Marcelo Magalhães (Coord.). **Incentivos Fiscais: Questões pontuais nas esferas federal, estadual e municipal**. São Paulo: MP Editora, 2007. p. 353-363.
- TUPIASSU, Lise Vieira da Costa. **Tributação Ambiental: A utilização de instrumentos econômicos e fiscais na implementação do direito ao meio ambiente saudável**. Rio de Janeiro: Renovar, 2006. 330 p.
- UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE. **Communication of long-term strategies**. 2021. Disponível em: <https://unfccc.int/process/the-paris-agreement/long-term-strategies>. Acesso em: 19 set. 2021.
- WORLD BANK. **State and Trends of Carbon Pricing 2021**. Washington: World Bank, 2021. 74 p.
- ZACATECAS. **Ley de Hacienda del Estado de Zacatecas**. Ley publicada en el Suplemento del Periódico Oficial del Estado de Zacatecas, el sábado 31 de diciembre de 2016. Zacatecas, 2020. Disponível em: <https://www.congresoac.gob.mx/63/ley&cual=57>. Acesso em: 9 set. 2021.