Europe's experience with Carbon-Energy Taxation to protect the environment

تجربة أوروبا في فرض الضرائب على الطاقة الكربونية من أجل حماية البيئة

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ملخص:

تهدف هذه الدراسة إلى التعرف على ضريبة الطاقة الكربونية التي أصبح لها تأثير عالمي كبير من خلال توجه معظم الدول نحو تسعير الكربون وفرض ضرائب على الانبعاثات الغازية الدفيئة خاصة ثاني أكسيد الكربون الذي يعد من أخطر أنواع التلوث وأكثرها انتشارا. و ذلك من خلال إشكالية تتمثل في واقع تطبيق ضرائب الكربون للدول الرائدة في الاتحاد الأوروبي.

كما خلصت هذه الدراسة إلى بعض النتائج أهمها، أنه يمكن لهذا النوع من الضرائب تحقيق إيرادات كبيرة للحكومات والتي يمكن استخدامها في التصدي للأضرار الاقتصادية، بالإضافة إلى تحقيق منافع بيئية وصحية و ذلك بتقليص انبعاث الغازات المسببة للاحتباس الحراري، والاستثمار في مستقبل منخفض الكربون وانتقال معظم الدول إلى تطبيق الاقتصاد الأخضر.

الكلمات المفتاحية: تلوث الهواء، الضرائب البيئية، ضرائب الكربون، الإيرادات، أوروبا.

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Abstract:

This study aims to identify the carbon energy tax that has become a major global impact due to the orientation of most countries towards carbon pricing and the imposition of taxes on greenhouse gas emissions, in particular carbon dioxide, which is one of the most dangerous and widespread types of pollution. Through the problematic of reality of the application of the carbon taxes in the European Union. The study also found some results, the most important is: this type of tax can generate significant revenues for governments that can be used to address economic damage, in addition to achieving environmental and health benefits by reducing greenhouse gas emissions, investing in a low-carbon future and moving most countries To implement the green economy.

Key Words*: Air pollution, Environmental taxation, Carbon taxes, Energy, Revenue, Europe.*

Introduction:

Air pollution is considered as one of the most dangerous environmental problems because of its impact on human health or on the economic and social aspects of many countries, Whatever of the degree of their economic progress and growth, which has led them to design and implement strategies and develop economic policies to achieve economic and environmental development objectives in order to reduce greenhouse gas emissions. These policies include an emission trading or carbon pricing system, imposing a set of taxes that are part of the mechanisms put in place to reduce individual and business dependence on fuel and encourage a shift to cleaner fuels.

The objective of this mechanism is to reduce harmful levels of carbon dioxide emissions, thereby mitigating the negative impacts of climate change on the environment. It also plays a major role in meeting international commitments under the 2015 Paris Agreement, which laid the foundation for international action to combat global warming.

A carbon tax is a tax aimed at reducing the use of fossil fuels and replacing them with green energy sources as an effective means of mitigating the effects of greenhouse gas emissions on the environment. It can also generate revenues that can be used to address economic damage.

The European Union has set a set of major objectives in the climate and energy framework for the 2030s for the period between 2021 and 2030, on which the countries of the Union are working, so that we will find at the forefront of these objectives a reduction of at least 40% in greenhouse gas emissions to lower levels.

The research problematic: it is as follows:

What are the applications of energy- carbon tax in the European Union leading countries?

- The sub-questions: through the main problematic, we ask these sub-questions:

- What are the effects of air pollution on the environment and the economy?
-What are the environmental taxes? What are their classifications?
-How would a carbon tax affects the environment?
-When will carbon taxes be imposed in the European Union?
-Do carbon taxes generate revenue that can be reused to preserve the environment?
- Where are carbon taxes revenue allocated in European countries?

- Research objectives: the purpose of the research is:

-To identify air pollution and its impact on the environment and the economy;
- Identify the different types of environmental taxes;
- To identify carbon energy taxes and their applications in EU countries and the price imposed for environmental protection;
-Allocation of energy tax revenues to the European Union

- part of research:

I-Air pollution and Environment.
II-Carbon-Energy Taxes.
III -International experiences
IV- Analysis of financial revenues for energy taxes

I –Air pollution and Environment.

I- 1-definition of air pollution:

Air pollution is one of the most serious environmental problems in societies at all levels of economic development. (Mengesha & Mamo, August 2006, pp. 05-06) In addition to that is a complex mixture of gases and particles whose sources and composition vary spatially and temporally. While hundreds of different chemical compounds can be measured in air, governments typically measure only a small subset of gases and particles as indicators of the different types of air pollution and the different types of major sources contributing to the pollution. (IHME, 2018, p. 02).

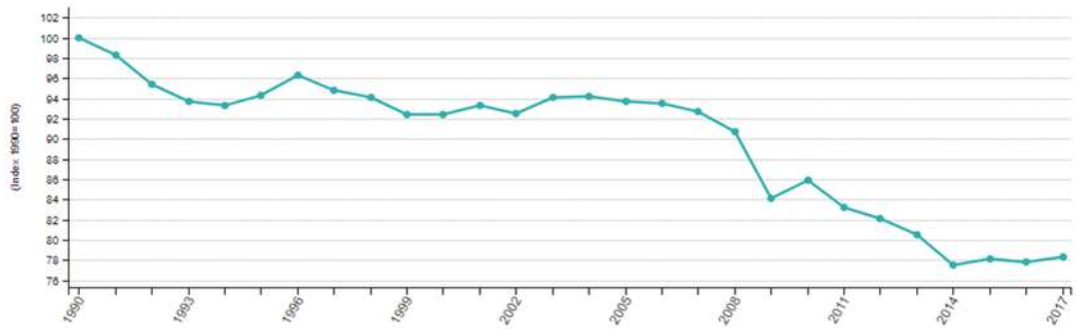
Air pollution may be defined also as any atmospheric condition in which certain substances are present in such concentrations that can produce undesirable effects on man and his environment. These substances include gases (SOx, NOx, CO, HCs, etc) particulate matter (smoke, dust, fumes, aerosols) radioactive materials and many others. Most of these substances are naturally present in the atmosphere in low concentrations and are usually considered to be harmless. (Mengesha & Mamo, August 2006, p. 05).

I- 2-Effects of air pollution:

Air pollution is not just a health risk; it is also an economic burden. By causing illness and premature death, pollution reduces quality of life. By causing a loss of productive labor, pollution also reduces output and incomes in these countries. the annual quality of life or welfare costs of air pollution in low- and middle-income countries are in the trillions of dollars, and lost income is in the hundreds of billions of dollars. The enormity of the costs stems from the widespread nature of exposure to air pollution. Around 87 percent of the world's population is living in areas where PM2.5 concentrations exceed the WHO guideline value, and so every day billions of people are breathing polluted air and raising their risk of succumbing to a pollution-caused illness. The economic costs associated with this elevated risk are a real drag on development. (IHME, 2016, p. 02).

Air pollution is a global environmental problem that influences mostly the health of urban population, and repeated exposures to ambient air pollutants over a prolonged period of time increases the risk of being susceptible to airborne diseases such as cardiovascular and respiratory diseases and lung cancer. (Monteiro, Vieira, & and , september 2016, p. 02) Air, land, and water pollution caused 9 million premature deaths in 2015, accounting for 16 percent of all deaths worldwide. About 92 percent of all pollution-related mortality is seen in low-income and middle-income countries, with the poor, marginalized, and young hardest hit by the health effects of the contamination. The economic burden is immense: in 2016, ambient air pollution alone cost the global economy $5.7 trillion—4.4 percent of global gross domestic product (GDP). The World Bank is committed to supporting countries most severely affected by pollution, by providing technical assistance on pollution management, facilitating knowledge generation and sharing, and raising awareness about the detrimental impact on global health. World Bank lending commitments that address pollution management and environmental health issues grew to $4.28 billion in FY2016 from $1.81 billion in FY2008; the results of this increase included air pollution reduction in Mongolia and China and an easing of contamination on land and in rivers in a number of developing countries. This work is in part supported by the Pollution Management and Environmental Health Multi-Donor Trust Fund (PMEH) within the World Bank's Environment and Natural Resources Global Practice. (World Bank, 2018, p. 04) Based on the above, the following figure shows the total greenhouse gas emissions for European Union countries for the period from 1990 to 2017:

Figure n°1: Total greenhouse gas emissions (including international aviation and indirect CO2, excluding LULUCF) trend, EU-28, 1990–2017



Source: (Eurostat Statistics, June 2019)

Figure 1 shows that there was a general downward trend to emissions during the 1990–1999 period (aside from a relative peak in 1996, when a cold winter led to an increase in heating

requirements). From 1999 to 2006 the evolution of greenhouse gas emissions within the EU-28 remained relatively unchanged, although it started falling at a modest pace through to 2008. The year 2009 saw a sharp drop in emissions as a consequence of the global financial and economic crisis and the resulting reduced industrial activity. Emissions increased in 2010 and decreased again from 2011 onward. In 2015, GHG emissions slightly increased compared to 2014. In 2016 the decreasing tendency returned. Emissions increased by 0.7 % (30 million tonne of CO2-equivalents) between 2016 and 2017. Across EU Member States in 2017, greenhouse gas emissions were the highest in Germany (21 % of the EU-28 total or 936 million tonne of CO2-equivalents), followed by the United Kingdom and France. The biggest decreases compared to 1990 were reported for Lithuania, Latvia, Romania and Estonia (– 57 %, – 56 %, – 54 % and – 48 % respectively). On the other side of the spectrum, the biggest increases compared to 1990 were reported for Cyprus (+ 56 %), Portugal (+ 23 %) and Spain (+ 22 %). (Statistics , June 2019, p. 02) According to the Environmental Protection Agency, energy-related carbon emissions accounted for 76.1 percent of all greenhouse gases emitted in 2017. Carbon emissions from industrial processes (other than fossil fuel combustion) made up 5.6 percent; methane emissions from energy production, agriculture, and landfills 10.2 percent; nitrous oxide from agriculture 5.6 percent; and fluorinated gases (HFCs, PFCs, SF6, and NF3, man-made industrial gases mainly used as refrigerants) the remaining 2.6 percent. From now on, our analysis will focus on energy-related carbon emissions. (Kyle & Elke , 2019, p. 04).

I-3-Environmental performance Index:

Different definitions of environmental performance have been offered in relation to the business sphere. In this regard, considers environmental performance as the commitment of organizations to preserve and protect their natural environment with its multi-dimensional characteristics, such as maintaining the quality of water, air, soil, etc. (Gallego-Alvarez, Vicente-Galindo, & and, p. 7809) The main aim of the research (Environmental performance Index) was to identify key determining factors of Environmental Performance in Europe. Research was provided by nine competitiveness categories of Environmental Performance: (A1) Health Impacts, (A2) Air Quality, (A3) Water and Sanitation, (B1) Water Resources, (B2) Agriculture, (B3) Forests, (B4) Fisheries, (B5) Bio-diversity and Habitat and (B6) Climate & Energy. The Environmental Performance Index builds on measures relevant to two core arguments:

- (a) reducing environmental stress to human health (the environmental health statement).
- (b) protecting ecosystems and natural resources (the ecosystem vitality statement). (Slamovir, 2016, p. 48)

European union countries are classified according to their environmental performance achieves for the year 2018, the following table shows that:

Table n°1: environmental performance index rankings for some countries

Rank	Country	Score
1	Switzerland	87.42
2	France	83.95
3	Denmark	81.60
5	Sweden	80.51
6	United kingdom	79.89
7	Luxembourg	79.12
10	Finland	78.64
13	Germany	78.37
16	Italy	76.96
17	New Zeeland	75.96

Source: (World Economic , Yale , & Colombia, 2018, p. 04)

The environmental performance index is based on the assessment of the situation of different countries according to two groups: Environmental health and the vitality of ecosystems, so that air pollution is the most serious problem on the global level.

Switzerland topped the countries of the world in the list of environmental performance index for the year 2018, due to its distinction in most environmental indicators, especially in the fields of air and climate protection, then followed by France, Denmark, Malta, Sweden, and what is noticed through this report, (World Economic , Yale , & Colombia, 2018, p. 04) that the countries that occupied the first positions are the countries Developed that pays attention to making an effective environmental policy to conserve climate, energy, and natural resources in addition to greenhouse gas emissions. The 2016 country ranking puts Finland in first place, with other Nordic countries scoring highly and New Zealand the best non-European country in 11th position. (Matters, 2016).

II -Carbon-Energy Taxes

II-1-Environmental taxation

The united nations system of Environmental-Economic Accounting, a global statistical standard, provides a definition of environmental tax as: a tax whose base is a physical unit(or a proxy of it) of something that has a proven, specific, negative impact on the environment. This definition now constitutes a component of the EU's statistical framework as stated in the regulation (EU) N° 691/2011 on European environmental economic accounts. (Speck & Susanna, 2016, pp. 13-14). The concept of using taxation to correct negative externalities such as pollution is generally credited to pigou (1920), and such corrective taxes are sometimes referred as Pigouvian Taxation. The basic idea is simple. A negative externality- a case in which production or consumption of some good harms someone other than the buyer or seller of that good- represents a market failure because the buyer ′s and seller′s decisions fail to take into account that external cost. Consequently, an unregulated free market will generally result in an inefficiently high quantity of good with an associated negative externality. Imposing a tax on the externality-generating good can correct the externality. (Roberton & Williams , 2015, pp. 02-03)

Eurostat (2001) has categorized environmental taxes into four main groups: energy taxes, transport taxes, pollution taxes and resources taxes. Table 1 illustrates the tax bases included in the environmental tax statistics framework. (Marlene, Milini, & Gorpeichaud, July 2014, pp. 14-15). The following table shows the various taxes to the environment:

Table n°2: Tax Bases Included in Environmental Tax Statistics Framework:

Tax Base	Description/ Examples
Measured or estimated emissions to air	Measured or estimated NOx emissions
	SO2 content of fossil fuels
	Other measured or estimated emissions to air
Ozone-depleting substances	
Measured or estimated effluents to water	Measured or estimated effluents of oxidizable matters (BOD, COD)
	Other measured or estimated effluents to Water
	Effluent collection and treatment, fixed annual taxes
Certain non-point sources of water pollution	Pesticides (based on , e.g., chemical content, price or volume)
	Artificial fertilizers (based on, e.g. phosphorous or nitrogen content or price)
	Manure

Waste management	Waste management in general(e.g. collection or treatment taxes)
	Waste management , individual product (e.g., packaging, beverage containers)
Noise	e.g., aircraft take –off and landings
Energy products	Energy products used for transport purpose: Unleaded petrol, leaded petrol, Diesel, other energy products for transport purposes(e.g., LPG or natural gas)
	Energy products used for stationary purposes: light and heavy fuel oil, Natural Gas, Coal, Coke, Biofuels, other Fuels for stationary purpose, electricity consumption, electricity production, district heat consumption, district heat production.
Transport	Motor Vehicles, one-off import or sales taxes.
	Registration or use of motor vehicles, recurrent (e.g., yearly) taxes
Resources	Water abstraction
	Extraction of raw materials (except oil and gas)
	Other resources (e.g., forests)

Source: (Marlene, Milini, & Gorpeichaud, July 2014, p. 15)

II -2-Carbon- Energy taxes:

II -2-1 Energy taxes:

This category included taxes on energy production and on energy products used for both transport and stationary purpose. The most important energy products for transport purpose are petrol and diesel.

Energy products for stationary use include fuel oils, natural gas, coal and electricity. Taxes on Biofuels and on any other form of energy from renewable sources are included. Taxes on stocks of energy products are also included.

Carbon dioxide (CO2) taxes are included under energy taxes rather than under pollution taxes. There are several reasons for this. First of all, it is often not possible to identify CO2 taxes separately in tax statistics, because they are integrated with energy taxes, e.g., via differentiation of mineral oil tax rates according to the carbon content of the fuel. In addition, they are partly introduced as a substitute for other energy taxes and the revenue from these taxes can be very large compared to the revenue from pollution taxes. This means that including CO2 taxes with pollution taxes rather than energy taxes would distort both the time series at national level and international comparisons. If CO2 taxes are identifiable, these taxes should be reported as a separate category next to the total energy taxes. Taxes on greenhouse gas emissions other than CO2 should also be included here. (Eurostat, 2013, pp. 13-14)**.**

II -2-2 Carbon taxes:

carbon taxes place a fixed price on a given unit of GHG emissions. This is typically done by levying a tax on fossil fuels in accordance with their carbon content, or on other goods in accordance with the emissions produced in production processes. Though several different definitions of carbon taxes have been formulated to date, for the purposes of this Guide we adopt the following guiding definition, based on the one used in the World Bank's State and Trends of Carbon Pricing.

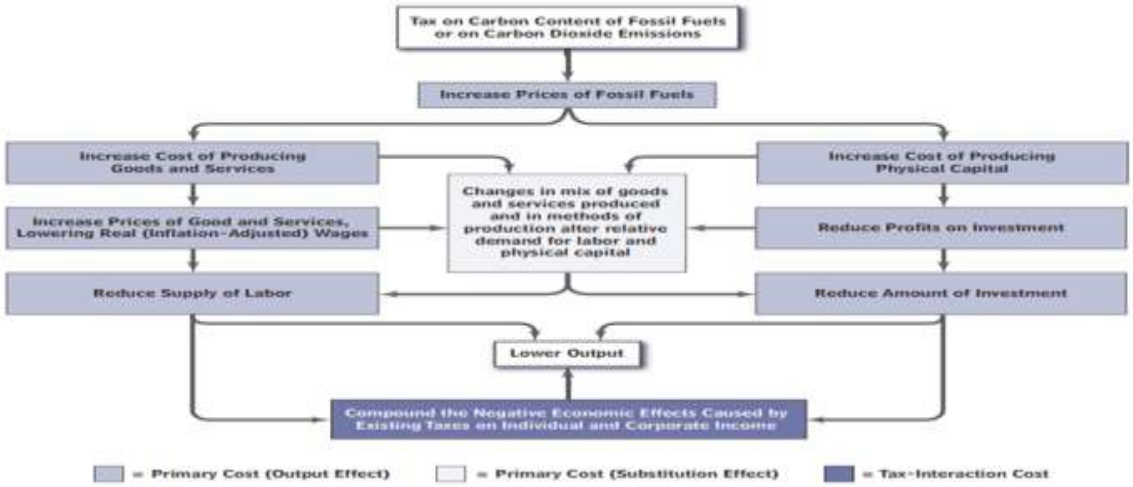
"A carbon tax is a tax that explicitly states a price on greenhouse gas emissions or that uses a metric directly based on carbon (that is, price per t CO2)." (World Bank G. , March 2017, p. 27).

II -3- How would a Carbon Tax Affect the Environment?

Climate change resulting from an increase in average temperatures is a long-term problem with global causes and consequences, including effects on humans and ecosystems. Significantly limiting the extent of future warming would require a concerted effort by countries that are major emitters of greenhouse gases. Nonetheless, U.S. efforts to decrease emissions would produce incremental benefits, in the form of incremental reductions in the expected damage from climate change.

Researchers have attempted to estimate the monetary value of the future damage from climate change associated with an increase in CO2 emissions in a given year and thus the value of the benefits from a commensurate reduction in emissions- a measure referred to as the social cost of carbon (SCC). An interagency working group of the federal government estimated the SCC associated with a 1-ton reduction in CO2 emissions in 2010 at about 21$ (in 2007 dollars). Estimates of the SCC are highly uncertain, and researchers have produced a wide range of value. Those values are highest when researchers attach significant weight to long-term outcomes and when they incorporate a small probability that damage from climate change could increase sharply in the future- causing very large, or even catastrophic, losses.
Delaying efforts to reduce emissions increases the risk of such losses. Given the inherent uncertainty of predicting the efforts of climate change, and the possibility that it could trigger catastrophic efforts, lawmakers might view a carbon tax as a reflection of society′s willingness to pay to reduce the risk of potentially very expensive damage in future. (Congress of United States, May 2013, p. 03). On the other hand, the following figure shows the effects of the carbon tax on labor, investment and output:

Figure n °2: effects of a carbon tax on labor, investment and output.



Source: (Congress of United States, May 2013, p. 07)

II-4- Carbon pricing in the European Union:

Increasing the price of carbon emissions through carbon taxes or emissions trading systems (ETS) is a core element of climate policy. Before 2005, hardly any emissions were covered by carbon taxes or trading systems.
Coverage increased to about 5 percent of global greenhouse gas (GHG) emissions between 2005 and 2010, primarily because of the introduction of the European Union's ETS.

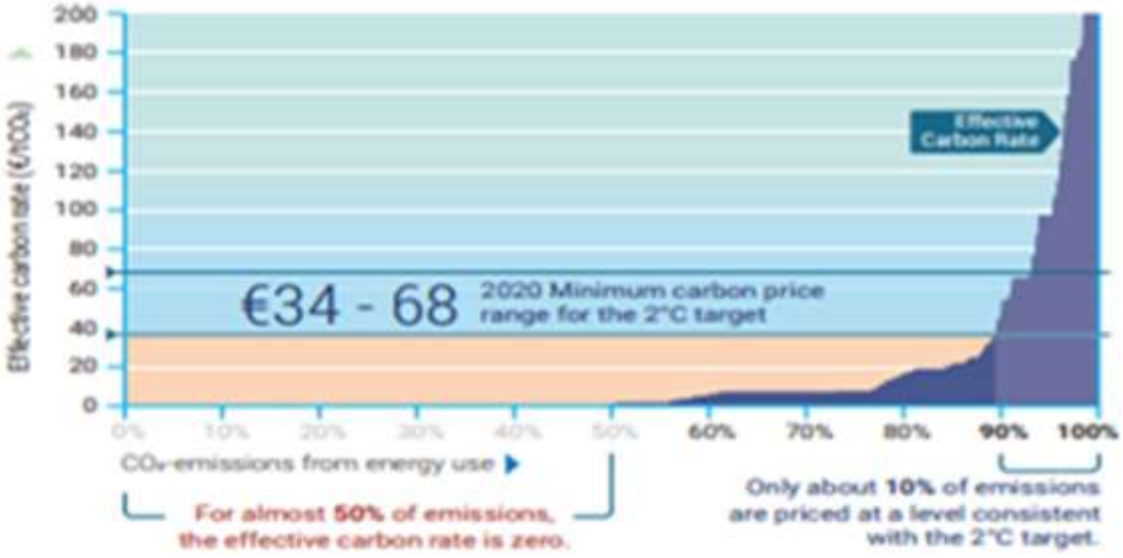
Between 2010 and 2018, coverage has risen to about 15 percent of global emissions, with 51 carbon pricing initiatives now installed or scheduled. If china implements carbon pricing as announced, coverage would rise to about 20 percent of global GHG emissions. While coverage, price levels, and coordination and cooperation efforts are increasing. Carbon prices are often low and inconsistent, as illustrated in figure 03.

This depicts the distribution of carbon rates for energy use across all sectors and fuels for 42 Organization for Economic cooperation and Development (OECD) and G20 countries, which together represent 80 percent of global CO2, emissions from energy use (OECD, 2018).

Effective carbon rates are policy-induced increases in (relative) fossil fuel prices, expressed per tonne of CO2 they include carbon taxes and permit prices related to existing ETS, as well as excise taxes on energy. (Matthias , Brigitte, & Kurt Van, November 2018, p. 43)

The following figure shows the effective carbon rate on energy applied by OCDE countries for 2018, in addition to the minimum carbon prices required to apply for the year 2020 in order to achieve the underlined goals:

Figure n°3: Effective carbon rates on energy use across 42 OCDE and 20 countries (estimate for 2018) and the minimum carbon price range needed in 2020 for the 2°C target.



Source: (Matthias , Brigitte, & Kurt Van, November 2018, p. 43)

This figure shows the distribution of effective carbon rates over energy-related CO2 emissions for 42 OCDE and G 20 countries, representing 80 percent of global CO2 emissions. Carbon rates include carbon taxes, permit prices related to existing ETS and excise taxes on energy (also including those not motivated by a climate policy objective).

III -International experiences

In many OECD countries, increased use of fiscal instruments for environmental management has been rooted in the recognition that environmental challenges are beyond the remit of environment ministries alone and that fiscal instruments can reinforce traditional regulatory approaches in helping curb environmentally damaging consumption and production patterns. (OECD, 2005, pp. 26-27)**.**

III-1- Example Carbon Taxes within the EU Energy Taxation Framework

Example Carbon Taxes within the EU Energy Taxation Framework The bulk part of all commercially available fuels is subject to excise duty in the EU Member States. Following the choice of the Member State, the excise duty may include a specific carbon tax, currently seven Member States have chosen to do this. Such carbon taxes are in principle chargeable at the time of:

• Production, including, where applicable, their extraction, of taxable goods within the territory of the EU

• Importation of taxable goods into the territory of the EU. However, a carbon tax in an EU country does not become chargeable until it is released for consumption the Member State. This means:

• The departure of taxable goods, including irregular departure, from a tax suspension arrangement.

- The holding of taxable goods outside a tax suspension arrangement where carbon tax has not been levied pursuant to the applicable provisions of EU law and national legislation.

• The production of taxable goods, including irregular production, outside a tax suspension arrangement.

• The importation of taxable goods, including irregular importation, unless the goods are placed, immediately upon importation, under a tax suspension arrangement. (Commitee of Experts, Cooperational in tax , & Eighteenth, 2019, pp. 21-22)

Environmental taxes were introduced in Europe in the beginning of the 1990s and they have become one of the most commonly used environmental policy instruments. The impact of taxes on environmental quality and on economic performance is a topic addressed by numerous studies. (Concetta, Davide, Maria Teresa, & Janna, 2014, p. 02)

The following shows the beginnings of the application of carbon taxes to various countries, starting with Finland and Poland in 1990:

Table n°3: Milestones in Adoption of Carbon Taxes

1990	Finland adopts first carbon tax Poland carbon tax
1991	Sweden carbon tax Norway carbon tax
1992	Denmark carbon tax
1995	Latvia carbon tax
1996	Slovenia carbon tax
2000	Estonia carbon tax
2008	Switzerland carbon tax British Columbia carbon tax
2010	Ireland carbon tax India carbon tax
2012	Australia carbon pricing mechanism repealed
2013	United Kingdom carbon price floor
2014	France Carbon tax Mexico carbon tax Australia carbon pricing mechanism repealed
2015	South Africa publishes carbon tax bill
2016	Canada announces national carbon price floor
2017	Alberta carbon tax Chile carbon tax Colombia carbon tax Singapore carbon tax announced

Source: (World Bank G. , March 2017, p. 29)

Finland (1990), Sweden (1990), Norway (1991) and Denmark (1992) have been frontrunners in launching specific CO2-taxes to curb CO2 emissions. Concerns over climate change coincided with policies in these countries aiming at reducing income taxes—and by addressing these two issues in combination a series of tax shifting packages were created, which have been in the main revenue-neutral. Netherlands (1996) and Slovenia (1997) followed the policy trend a few years later, and towards the close of the 1990s two of the largest EU economies, Germany (1998) and UK (2000) introduced carbon-energy taxation policies too, adding more weight and significance to the approach. While UK introduced a specific climate change levy on fossil fuels, Germany increased more broadly its energy taxes as part of a so-called 'ecological tax reform'. (Anderson & Gaell, 2010)

III -2- Structure of energy taxation in United Kingdom:

Energy taxes in United Kingdom are levied within the framework of the 2003 European Union (EU) Energy Tax Directive, which sets minimum rates for the taxation of energy

products in EU member states. Within this framework, as at 1 July 2018, the main taxes on energy use in United Kingdom are the following:

- Climate Change Levy (CCL) applies to solid fossil fuels, LPG, natural gas and electricity when supplied to business and public sector users.
- Fuel Duty, classified as a "fuel excise" according to the TEU methodology, applies to liquid fuels (including bioethanol and biodiesel), as well as to LPG and natural gas (including biogases) when used as motor and heating fuels.

The United Kingdom participates in the EU emissions trading system (ETS). Permit prices, which apply in addition to energy and carbon taxes, are not shown in the energy tax profiles.

- The Carbon Price Floor (CPF) – implemented through Carbon Price Support (CPS) rates of CCL and Fuel Duty – is a domestic instrument which sits alongside EU ETS and has the effect of setting a floor price for carbon used in electricity generation. The CPS, which is classified as a carbon tax according to the TEU methodology, is set at a nominal rate of GBP 18.00 per tonne of CO2. (OECD, 2019, p. 01). These taxes are included in the energy tax profiles of the United Kingdom, but the tax on electricity output is only included when separately indicated. Where more than one tax rate applies to an energy user or fuel, the energy tax profile shows their sum. (OECD, 2018, p. 06)

III-3- France

The France carbon tax was set last year on an increasing price trajectory towards €86.2/tCO2 (US $97/tCO2) in 2022, but this plan has been modified after social protests. Since November 2018, large scale protests have been taking place, spurred by opposition to the carbon tax rate in a period when fuel prices are rising. Since its introduction in 2014, the carbon tax has increased six-fold from €7/tCO2 e (US$8/tCO2 e) to €44.6/tCO2 e (US$50/tCO2 e) within four years. Agriculture, taxis and trucks are exempted from the carbon tax to protect their competitiveness. In addition, the government is using part of carbon tax revenues to cut labor and corporate taxes and provide financial assistance for low-income households on their energy bill. Whilst in general France does not earmark revenues, the reform was accompanied by some support to the energy transition, including support for alternatively-source vehicles and tax credit to households improving energy efficiency of their residence. Originally, the French carbon tax would have increased by 23 percent in 2019 and as much as 19 percent by 2020. However, the tax rate in 2019 now remains at the 2018 rate of €44.6/tCO2 (US$50/tCO2). (World Bank G. , State and Trends of Pricing 2019, june 2019, p. 38). The following table represents France's carbon tax reforms:

Table n°4: Carbon tax reforms in France:

	Energy/ Carbon Characteristics	**Non energy/ carbon characteristics**	**Compensation measures (for households and/ businesses)**
2000 (proposal)	Energy tax on all fuels	Reduction in social security charges. Increase in business tax	Certain businesses exempted from the tax.
2009/2010 (proposal)	Carbon tax on fossil fuel consumption (17€ /ton)	Reduction on social security charges	EU ETS industries exempted from tax. Green cheque to below median households
2013/2014 (proposal)	Carbon tax (22€/ ton in 2016)	Reduction in employers social contributions, increase in VAT	To be defined

Source: (Lucas & Simon, 2012, p. 23)

The threshold for the application of the ecological malus has been lowered from 120 g to 117 g CO2/km and the scale is defined gram by gram between 117 and 191 g.
There are therefore 75 slices of malus. The amount is €35 for emissions of 117 g of CO2/km and rises to €10,500 for emissions of 191 g of CO2/km.
Above 191 g of CO2/km, a lump sum of €10,500 is systematically applied. (Alphabet, 2019, p. 08)**.**

III-4- Germany:

"Ecological tax reform" in Germany, EFR was first conceptualized in 1983, and reached the political agenda during parliamentary election campaigns in 1990, when one Party prepared a concept based on raising energy taxation, and simultaneously reducing the tax burden for low income earners and raising transfers to pensioners. After a long delay, due notably to the reunification of Germany, EFR was again examined in 1998, after a government change. This generated fierce political debates. Potential losers from the reform, including energy-intensive industries (chemical industry, steel producers etc.) as well as employers' associations and labour unions were resisting the introduction of EFR. In contrast, labor-intensive sectors and firms, especially service industries, were more open to reform. In 1999, the parliament agreed upon the "Law on the Introduction of Environmental Tax Reform".
This reform i) raised taxes on gas and oil products; ii) raised taxes on electricity; and iii) reduced social security contributions. Contributions of both, employee and employer, to the public pension system were lowered significantly, thus reducing the cost of labour. The reform was designed as a stepwise introduction; until 2005, the initially low taxes will be raised annually, while the contributions to the public pension systems will be lowered. (OECD, 2005, p. 35)

The OECD's Taxing Energy Use (2015) publication compares taxes on energy use (excise and carbon taxes) across 34 OECD and 7 partner economies. The bubble size represents the weight of the sector in total energy use. Germany has higher average tax rates on transport fuels (15.39 EUR/GJ) than on fuels used for heating and process purposes (0.94 EUR/GJ) or electricity generation (1.84 EUR/GJ).
In Germany, 10% of carbon emissions from energy use face no price signal at all; 88% face a price at or above EUR 5 per tonne of CO_2 ; and 48% face a price at or above EUR 30 per tonne of CO_2 . This compares to a zero price for 60% of emissions across all countries, a price at or above EUR 5 per tonne for 30% and at or above EUR 30 per tonne for 10% of emissions. Excluding road use, 12% of carbon emissions from energy use in Germany face no price signal at all; 85% face a price at or above EUR 5 per tonne of CO_2 ; and 37% face a price at or above EUR 30 per tonne of CO_2 . This compares to a zero price for 70% of emissions across all countries, a price at or above EUR 5 per tonne for 19% and at or above EUR 30 per tonne for 4% of emissions. (Bradbury & Dender, 2014, p. 02), The following table represents Germany's carbon tax reforms:

Table n°5: carbon tax reforms in Germany

	Energy/Carbon characteristics	**Non energy/ carbon characteristics**	**Compensation measures (for households and/ businesses)**
1999-2003	Eco-tax package targeting transport sector/mineral oil, electricity tax(+9 Mds €),EEG law(For energy consumers), Total env. Taxes: +1.4 %	Reduction of labour tax rates and social security(-8 Mds €).	Electricity tax exemptions for high-energy consumption industry
2005-2009	Retention of energy and electricity taxes, progressive	Increase of general TVA from 16 % to	Slight expansion of business tax exemptions

	Phase-out of coal, total env. Taxes: -1%	19%	
2009-2013	New taxes on air traffic, nuclear fuel(+2.3 Mds €), nuclear phase –out(+EEG levy), fossil fuel subsidies (-5 Mds €), total Env.Taxes: +0.3 %	Clean energy reaches 27% of energy mix in 2012, electricity prices for households over proportionally high, relative high labour tax.	Expansion of electricity, carbon, EEG exemptions for poor households, KFW credit for energy efficiency renovation.

Source: (Lucas & Simon, 2012, p. 22)

III-5- Denmark

Denmark has a differentiated carbon tax system, where business pays a lower carbon tax rate than households. The British Columbia Government provides carbon tax relief to commercial vegetable, floriculture, wholesale nursery and forest seedling greenhouses. The Greenhouse Carbon Tax Relief Grant (GCTRG) covers 80 per cent of the carbon tax paid on natural gas and propane used for greenhouse heating and carbon dioxide production to be used for crop fertilization. The UK as well as several jurisdictions applying a specific carbon tax, such as Denmark, also give businesses tax reliefs on the condition that they enter into voluntary agreements leading to the achievements of environmental protection objectives. (Commitee of Experts, Cooperational in tax , & Eighteenth, 2019, p. 34)

Denmark introduced a co 2 tax on fuels in 1992 and has been engaging in a general reform of its tax system with a continuing evolution of energy- related taxes planned until 2002. The main objectives of the reform are: the reducing of marginal tax rates in all income brackets, the elimination of a series of loopholes in the tax law, and a gradual transfer of tax revenue from income and labour to pollution and scarce environmental resources. (OECD, 2001, p. 51). In Denmark, taxes on energy represented 59% of total environmentally related tax revenue, compared to 70% on average among the 39 countries. Contacts Environmentally related tax revenue as a percentage of GDP, 2014 2 Data from Taxing Energy Use are for 2012 and include all OECD countries (except Latvia) and Argentina, Brazil, China, India, Indonesia, Russia and South Africa. Taxes on energy use in Denmark The OECD's Taxing Energy Use (2015) publication compares taxes on energy use (excise and carbon taxes) across 34 OECD and 7 partner economies. The bubble size represents the weight of the sector in total energy use. Denmark has higher average tax rates on transport fuels (13.46 EUR/GJ) than on fuels used for heating and process purposes (2.2 EUR/GJ) or electricity generation (7.12 EUR/GJ). Denmark has the 2nd highest tax rate on energy on an economy-wide basis, at EUR 5.95 per GJ, compared with EUR 2.7 per GJ on a simple-average basis across the 34 OECD and 7 partner economies.

In Denmark, 33% of carbon emissions from energy use face no price signal at all, 67% face a price at or above EUR 5 per tonne of CO_2 ; and 52% face a price at or above EUR 30 per tonne of CO_2 . This compares to a zero price for 60% of emissions across all countries, a price at or above EUR 5 per tonne for 30% and at or above EUR 30 per tonne for 10% of emissions. Excluding road use, 41% of carbon emissions from energy use in Denmark face no price signal at all; 59% face a price at or above EUR 5 per tonne of CO_2 , and 39% face a price at or above EUR 30 per tonne of CO_2 . This compares to a zero price for 70% of emissions across all countries, a price at or above EUR 5 per tonne for 19% and at or above EUR 30 per tonne for 4% of emissions. (Bradbury & Dender, 2014, p. 01).

III-6-Sweden

In 1991 Sweden enacted a tax on carbon emissions. It was part of a fiscal reform process (Environmental Tax Reform) primarily aimed at shifting the tax burden away from taxes levied on labour and to compensate for the loss in revenues by an increase in environmental

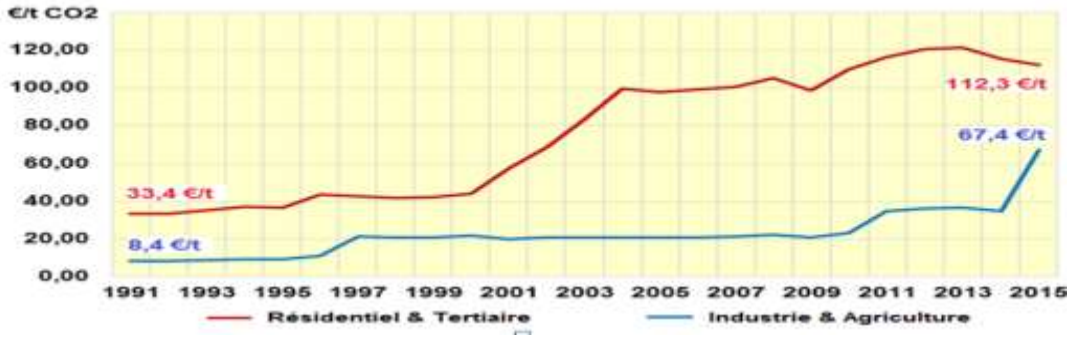
taxes. The reduction in income taxes amounted to a 4.6% in GDP in that year and was only partially offset by the proceeds levied via the CO2 and SO2 taxes (1.2% of GDP). Energy taxes were lowered to compensate for the introduction of the CO2 tax. The CO2 tax is based on the carbon content of the fossil fuel. In 1991 the tax rate was around 43 Euros and increased to approximately 100 Euros per ton in 2007 and to 106 Euros in 2008. In 2017 the Swedish carbon tax rate was 120 Euros per ton of CO2.

The CO2 tax underwent several changes which were at times motivated by competitiveness concerns. As special tax reductions have not been granted to the Swedish industry, this led to an increase in the overall tax burden. Until 1993, industry and households had been charged with the same high energy and CO2 tax rates but the energy and CO2 tax burden was dramatically lowered for industry, agriculture, forestry and fisheries in 1993 in the wake of the economic crisis. From 1993 onwards, these economic sectors were exempt from the energy tax payments and were only subject to a reduced CO2 tax. Since 1998 the CO2 tax rates for industry have remained constant in real terms.

The CO2 tax was reduced for fuels used in installations covered by the EU ETS in reduced in 2008 and abolished in 2011.As presented above the CO2 tax was first introduced in Finland. While the Finish tax scheme was designed to be revenue raising it only placed a modest cost upon emissions. The CO2 taxes in Denmark and Sweden were higher but unlike its Finish counter-part quickly included substantial derogation schemes for industry. It is also noticeable that all CO2 tax schemes were adapted on several occasions. In 2009 the Swedish government proposed a series of climate and energy measures that were phased in subsequently. The CO2 tax on natural gas and LPG was increased successively to the full CO2 tax amount in 2015, and the reimbursement of the CO2 tax on diesel used in agriculture reduced. The tax rate reduction for industry was increased to 60% of the CO2 tax and the special provisions on tax reliefs for industrial and horticultural companies phased out. (Stefan & weishaar, 2018, pp. 5-6).

The following figure shows the evolution of Sweden′s carbon taxes from 1991 to 2015, during which period saw a marked development of this type of environmental related tax:

Figure n °4: The evolution of carbon taxes from 1991 to 2015



Source: (Michel , juin 2016, p. 15)

A carbon tax implemented within wider fiscal reforms. The Swedish government led by Nils Daniel Carl Bildt (Moderate Party) introduced a carbon tax reform in 1991. The energy tax sat up in the 1970s to raise public revenues, was then complemented by a tax on carbon dioxide and on sulphur. The CO2 tax was introduced on all major fossil fuels at rates equivalents to 27€ per tonne of CO2. At the same time, existing energy tax rates were reduced by 50%. The carbon tax was part of a wider fiscal reform package, which consisted in lowered marginal tax rates on labour and capital, the suppression of tax shelters and the broadening of the value added tax base. The overall reform was globally regressive: tax reductions on upper income groups incomes were more important than on lower income groups. Estimates show that tax reductions amounted to 6% of GDP while energy-related tax increases to about 1% of GDP22 .The reform thus implied a reduction in fiscal pressure for

the average household or business, which facilitated the introduction of the carbon tax. (Lucas & Simon, 2012, pp. 11-12). The following table represents Sweden's carbon tax reforms:

Table n°6: Carbon tax reforms in Sweden:

	Energy/ Carbon Characteristics	**Non energy/ carbon characteristics**	**Compensation measures (for households and/ businesses)**
1990/1991	Increased VAT on energy (+1.6Mds €)	Reduction and simplification of labour tax rates (-6 Mds €)	Strong public support for the development of district heating and renewable energy production networks
2001/2006	Carbon tax, combined With 50 % reduction in energy tax (+0.3 Mds €) Increased tax rates on energy and carbon	Reduction in low income households ′taxes rates	Reduced tax rates for vulnerable industrial sectors.
2007/2012	Increase in environment taxes (+0.5 Mds €)	Reduction in employers social contributions(-8.6 Mds)	Reduction tax rates for vulnerable industrial sectors.

Source: (Lucas & Simon, 2012, p. 22).

III-7- Switzerland

In Switzerland, the main taxes on energy use are the following:

- A mineral oil tax applies to oil products and natural gas at uniform statutory rates across all sectors.
- A surtax is added to the mineral oil tax for fuels used in road and offroad transport.
- A CO2 tax applies to oil products, coal, coke and coal products, and natural gas when used outside of road transport, at rates varying in proportion to fuels' carbon content.
- Electricity output is taxed, at a fixed rate across all electricity use. The rates at which these taxes apply can further differ across different fuels and users.

These taxes are included in the energy tax profiles of Switzerland, but the levy on electricity output is only included when separately indicated. Where more than one tax rate applies to an energy user or fuel, the energy tax profile shows their sum.

Effective tax rates on energy use for different fuels and users

The tax rates on different fuels and uses are linked to Switzerland's energy use3 to calculate effective tax rates on energy use (in CHF/TJ and EUR/TJ) or CO2 emissions from energy use (in CHF/tCO2 and EUR/tCO2). Energy use and the CO2 emissions associated with it are shown for six economic sectors: road transport, domestic offroad transport, industry, agriculture and fishing, residential and commercial, and electricity. (OECD, 2018, p. 06).

III-8- Carbon Tax Rates:

The following table gives an overview of all nominal carbon tax rates which were in force in November 2018:

Table n°7: Carbon tax rates for European Union countries

Jurisdiction covered	**Tax rates November 2018 US $/ t CO2**
Alberta	22.92
Argentina	10

British Columbia	26.74
Chile	5
Colombia	4.92
Denmark	27.07
Estonia	2.28
Finland	70.64
France	50.81
Iceland	28.87
Ireland	22.79
Japan	2.56
Latvia	5.13
Liechtenstein	95.71
Mexico	2.73
Newfoundland and Labrador	15.27
Norway	59.87
Portugal	7.80
Singapore (in force 2019)	3.07
Slovenia	19.71
Spain	22.79
Sweden	126.83
Switzerland	99.71
United Kingdom	23.25
Ukraine	0.01

Source: (Commitee of Experts, Cooperational in tax , & Eighteenth, 2019, p. 48)

IV -Analysis of financial revenues for energy taxes

IV-1- Revenue use from excise taxes on carbon emissions.

As for excise taxes on fuels, carbon taxes are sometimes introduced (and their rates subsequently increased) as part of broader tax policy packages that generally aim to shift the tax burden away from labour and capital. The Canadian provinces of British Columbia and Alberta, Finland, France, Norway, Portugal and Switzerland use carbon tax revenues to support other tax policy measures. In Norway, the 2015 and 2016 tax programmes indicate a "clear shift" towards green and environmentally related taxes Furthermore, since the 2008 financial crisis, carbon tax revenues in Ireland have been used to maintain or reduce payroll taxes, and Portugal helps relieve large families from paying personal income tax, In France and until 2016, all carbon tax revenues were earmarked to a business tax credit.

Carbon tax revenues are also earmarked for green purposes. In Ireland, a portion of revenues (EUR 50 million) fund per annum the National Energy Efficiency Retrofit Programme, and a third of revenues in Switzerland mostly fund energy efficiency measures in buildings (capped at CHF 300 million in 2016). The Tax for Climate Change Mitigation in Japan is also largely earmarked for energy efficiency and renewable energy programmes. Finally, all revenues raised from the carbon tax applied to petroleum activities in Norway flow to the Government Pension Fund, which is a part of the Norwegian fiscal framework that delinks the earnings of petroleum revenue from the use of petroleum revenue. Revenues from the Carbon Levy in Alberta are also partly used to regulate electricity prices, understood as a form compensation to energy users. (Melani & Kurt Van, 2019). The following table represents the allocation of tax revenues with an environmental dimension, especially carbon tax, for some European countries:

Table n°8: Carbon Tax Revenue use, by jurisdiction

Jurisdiction	**Use of Carbon Tax Revenue**

Denmark	Reduced taxes on labor Energy efficiency and environmental programs General budget
Finland	Income tax reductions Decreased employer social security payments General budget
France	Reduced corporate income taxes Reduced labor taxes Energy assistance for low-income households
Sweden	General budget Reduced labor and corporate taxes
Switzerland	Reduced health insurance premiums Decreased social security contributions Building energy efficiency Technology development
United Kingdom	General budget

Source: (World Bank G. , june 2019, p. 128)

IV -2- Revenue from Environmental and Energy taxes:

At the beginning of the 1990s, carbon energy taxes were applied, especially in some European countries, which had not applied this category of taxes before, but did not record significant revenues compared to subsequent years. Energy taxes are high compared to pollution, transport and resource taxes.

On the other hand, As a percentage of TSC, the trend of environmental taxes has been downward throughout the period 1995 to 2008, with environmental tax revenue dropping by 1 percentage point of TSC to 5.92 % in 2008. A brief rise to 6.23 % occurred in 2009 due to the fall in government revenue which resulted from the financial crisis. In 2010, however, the percentage again decreased to 6.20 % of TSC, reaching 6.17 % in 2011. (Eurostat Statistics Explained, 2018) .When comparing 2009 revenue from environmental taxes as a share of GDP to the revenue in 1999, all western and southern European countries show a marked reduction (at least -15%). Central and eastern European countries show a smaller decrease and/or an increase in environmental taxes as a share of GDP. (Stamatova & Steurer, 2011, p. 03) The following Figure shows the environmental tax revenue by categories in EU:

Figure n°5: Environmental tax revenue by category, EU – 27, 2002-2018

(billion EUR and % of Taxes and social contributions and % of GDP)

(Eurostat, 2020, p. 134)

In 2018, the governments in the EU collected environmental tax revenue of EUR 324.6 billion. The value represents 2.4 % of the EU gross domestic product (GDP) and 6.0 % of the EU total government revenue from taxes and social contributions ('TSC').

A very large portion of the 2018 EU environmental tax revenue – 77.7 % - comes from energy taxes. The share of transport taxes is 19.1 %, and the share of taxes on pollution and resources is still very small in the EU (3.3 %). For the latest available year 2017, the tax burden varies by environmental tax category. While households and corporations pay a nearly

equal share of energy taxes (49.1 % and 48.1 % respectively), households are the main payer of transport taxes (accounting for almost two thirds of the total at 66.7 %), and they pay a larger portion of pollution and resource taxes (55.7 %). Residents pay a very large majority of the environmental taxes, with a relatively small share (below 2.5 %) payable by non-residents. (Eurostat Statistics, Europa.eu, 2020)

Environmental tax revenue varies across the EU Member States, but energy taxes remain its main source in most of the countries. Across the EU, the environmental tax revenue-to-GDP ratios ranged in 2018 from 1.6 % (Ireland) to 3.7 % (Greece). The share of environmental taxes in TSC also varied significantly across the EU Member States, with Latvia reporting the largest share (at 10.9 %). At the opposite end of the scale, Luxembourg (4.4 %) had the lowest share of environmental taxes in TSC in the EU.

Regarding the United Kingdom, it achieved the largest revenues from environmental taxes in general compared to other European Union countries, and it is increasing every year, amounting to 56 796.01 (million / EUR) in 2018 according to Eurostat statistics dated 12/12/2020. (Eurostat, europa.eu, 2019). we will look at the side of the study, which is energy taxes through its revenues for this category during the years 1997 to 2018, so that the following figure represents:

Figure n°6: government tax revenue from energy taxes in the United Kingdom (UK) from 1997 to 2018(in million British pounds).

Source: (Ian, 2019)

This statistic shows the amount government revenue from energy taxes in the United Kingdom (UK) from 1997 to 2018, in million British pounds. It shows that tax revenue grew steadily over this period and reached a peak of 37.4 billion British pounds in 2018. (Ian, 2019).

Conclusion:

Through our research, we concluded the following:

- Air pollution is considered as one of the most dangerous environmental problems for mankind and its economic and social aspects.
- The carbon tax in the energy sector is a part of the broad Programme of the financial reforms.
-Carbon energy tax is considered as one of the most economically effective means. This type of tax has been used by many European countries that seek to improve the efficiency of their tax system by recycling their revenues.
- The carbon tax aims to reduce the use of fossil fuels and reduce carbon emissions.
- Carbon tax revenues can be used to improve competitiveness by investing in education and strengthening employment or infrastructure skills, or by reducing taxes on capital and labours.
- Carbon pricing is a financial and economic policy by imposing an effective set of taxes to mobilize public revenues on one hand, reduce carbon dioxide emissions and preserve the environment on the other.

- Many European countries have implemented carbon energy taxes that have an impact on carbon dioxide emissions and reduce global warming, starting with Finland and Poland in 1990.
- The French government uses a part of the carbon tax revenues to reduce business and corporate taxes and provide financial assistance to low-income families.
-Agriculture, taxis and trucks are exempted from the carbon tax to protect their competitiveness in France.
- In addition to many States which apply a specific carbon tax, the United Kingdom grants tax exemptions to companies provided that they enter into voluntary agreements which lead to the achievement of environmental protection objectives.
- Energy tax revenues account for more than 75% of the total tax revenues of the environmental dimension in the countries of the Union.

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