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“The Nexus of Finance, Investment, and Green Economic Growth: The Role of Green Finance in Egypt”

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The Nexus of Finance, Investment, and Green Economic Growth: The Role of Green Finance in Egypt

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Abstract

Recently, the global economy has been negatively affected by one crisis after another, in addition to the negative consequences associated with climate change. Therefore, the issue of how to achieve resilience in the face of the negative repercussions of climate change and other crises has a high place in research and studies to adapt traditional policies or to develop new policies. The main objective of this research is to study the three angles of the issue of finance, investment, and green economic growth and the relationship among them in the context of green transition. Within this context, it's evident that Egypt has made admirable progress towards greening its fiscal policy instruments to achieve higher green investment economic growth, however, the absence of a strategic green fiscal framework to decide upon tools and instruments is considered a challenge. The paper presents two practices; Germany and China, and study the fiscal measures introduced by them to drive lessons learnt for Egypt.

Keywords: green finance, green fiscal policies, green bonds, carbon trading, carbon tax

الملخص

في الآونة الأخيرة تأثر الاقتصاد العالمي سلبًا بأزمة تلو الأخرى بالإضافة إلى العواقب السلبية المرتبطة بتغير المناخ، لذا تحوز قضية كيفية تحقيق الصمود في مواجهة التداعيات السلبية للتغير المناخي والأزمات الأخرى على مكانة عالية في الأبحاث والدراسات لتطويع السياسات التقليدية أو لتطوير سياسات جديدة، وعليه فإن الهدف الرئيسي من هذا البحث هو دراسة الزوايا الثلاث لمسألة التمويل والاستثمار والنمو الاقتصادي الأخضر والعلاقة فيما بينها في سياق التحول الأخضر. وفي هذا السياق، يشار إلى أن مصر قد أحرزت تقدمًا هامًا نحو تخضير أدوات سياستها المالية لزيادة الاستثمار في القطاعات والمشاريع الصديقة للبيئة وتحقيق النمو الاقتصادي، ولكن مع ذلك، فإن عدم وجود إطار مالي أخضر استراتيجي لاتخاذ قرار بشأن الأدوات والأدوات يعتبر تحديًا ملحًا. تقدم الورقة تجربتين في التمويل الأخضر والأدوات المالية الخضراء وهما تجربة ألمانيا والصين، وتقوم بدراسة الأدوات المالية الخضراء التي اعتمدوها وذلك لدراسة وتوضيح الدروس المستفادة لمصر.

الكلمات المفتاحية: التمويل الأخضر، السياسات المالية الخضراء، السندات الخضراء، تجارة الكربون، ضريبة الكربون

Introduction

Recently, the global economy has been affected negatively by a crisis after another. The health crisis of COVID 19 and the military one of Russia-Ukraine crises have been having deleterious impact on the economic activities and the international trade and they don't seem to be ending soon. Such succession of crises increases the uncertainty that all economies operate within, specially, emerging markets and the developing countries.

As well, the inevitability of the negative consequences of climate change, environmental pollution, and exhaustion of non-renewable natural resources imposes a legitimate obligation of green transition as a sustainable development approach. However, green transition activities, such as reducing emissions activities and increasing the renewable energy share of country's energy mix, can be costly.

While OECD estimates that 6.9 trillion USD per year, up to 2030, of investment in infrastructure is needed to meet the Paris Agreement Goals (OECD et. al., 2018), data and reports point out that there's a relatively low and insufficient flow of funds from developed countries to support the transition in developing ones.

As well, many developing countries have relatively low domestic resources which impose a financing constraint towards green transition. Therefore, New innovative financial frameworks, namely "Green Finance" has emerged to achieve its SDGs.

As for Egypt, as a developing country, "Finance" represents an obstacle in the pathway of green transition and achieving sustainable development. Egypt already suffers from chronicle budget deficit.

Egypt has started the path by issuing green bonds in 2020 to get funds for projects such as increasing the share of renewable resources and the number eco-friendly projects and enhancing the sustainable management of non-renewable resources in agriculture, industry, and service sectors. However, green finance falls short in Egypt.

Green finance can play a vital role specially after Covid 19 and the Russian-Ukraine war have highlighted the urgent need, for developing countries, not to depend only on the international flow of Official Development Assistance (ODA) and Foreign Direct Investment (FDI) as the only sources of green fund.

Green Finance not only limited to finance provided by the private sector or banks, governments have a great role to play with their fiscal and monetary instruments to

(1) contribute to the efforts and (2) provide the incentive for other stakeholders to well channel the mobilization of resources into the sustainable development targets. The main objective of this research is to examine the three angles of the issue of finance, investment, and green economic growth and the relationship among them in the context of green transition. Two other objectives are reviewing the literature on this matter and study the current and potential prospect of green finance tools in the Egyptian fiscal policy in the context of best international practices.

Therefore, there are several questions that are meant to be answered by the end of this research. These would be:

1- What is the role of Green Finance in achieving Green Economic Growth?
2- What are the green projects in the Egyptian investment plan and is there evidence that green bonds issued in 2020 financed part/ all of this investment?
3- What are the best practices of green finance and what could be the lessons learned of them for Egypt?

This research employs the inductive methodology and logical deduction to study role of Green Finance in achieving Green Economic Growth and identifying the opportunities and Challenges before Egypt in exploiting the potential advantages of green finance tools. In addition, the descriptive analytical methodology is employed through collecting and analyzing the data related to the above-mentioned nexus.

Finally, Comparative Methodology is used to find the lessons learned for Egypt from the best practices of Germany and China.

The rest of the paper is organized as follows: the first section presents an overview on the topic of green finance and how it relates to climate change and sustainable development through theoretical framework and literature review. The second addresses the emerging markets and the Egyptian efforts towards integrating the green finance in its financial policy. The last reviews the practices of Germany and China in green finance to deduce the lessons learned.

First: Theoretical Framework of Green Finance and literature review

Climate change, environment degradation and the mandate towards doing well by the Paris Act Agreement require (1) innovating new and (2) developing the current financial instruments to cater for the transition process sustainable development. (Sachs et. al., 2019).

1 Concepts and definitions

Before proceeding, a light must be shed on the different definitions in the context of climate and environment related finance. There're various concepts that may be used interchangeably but yet they are not the same. That includes sustainable finance, Environmental Finance, Carbon Finance, and Climate Finance, and Green Finance (Noh, 2018).

a) Sustainable finance

This concept has a more comprehensive scope that addresses the issues of the environmental, social and governance (ESG) in order to enhance the long-term sustainable investment (European Parliament, 2021). Sustainable finance includes green finance, blue finance, social finance, and digital finance, among other forms (Ozili, 2022).

b) Environment finance

It refers to apply the principles adapted from the economics of environment on finance and investment to address the environment protection aspects (Tao, et.al., 2022)

c) Climate finance

It is considerably related to funding projects that aim to reducing the emissions of Green Houses Gases (GHGs) and those that aim to adapt to the negative consequences of climate change (UNEP, 2017).

d) Green Finance

Lastly, the concept of green finance can have two possible aspects; the first is "Green Financing" which is related to how to raise funds to finance the sustainable development projects, and the other is "Greening Finance" which is related to how to optimize climate and the environment related financial risk management.

Green finance is used to fund eco-friendly projects such as renewable energy and energy efficiency, pollution prevention and control, biodiversity conservation, initiatives of circular economy, sustainable use of natural resources and land

(Cheberyako, 2021). Figure (1) illustrates the difference and overlapping between some of these definitions.

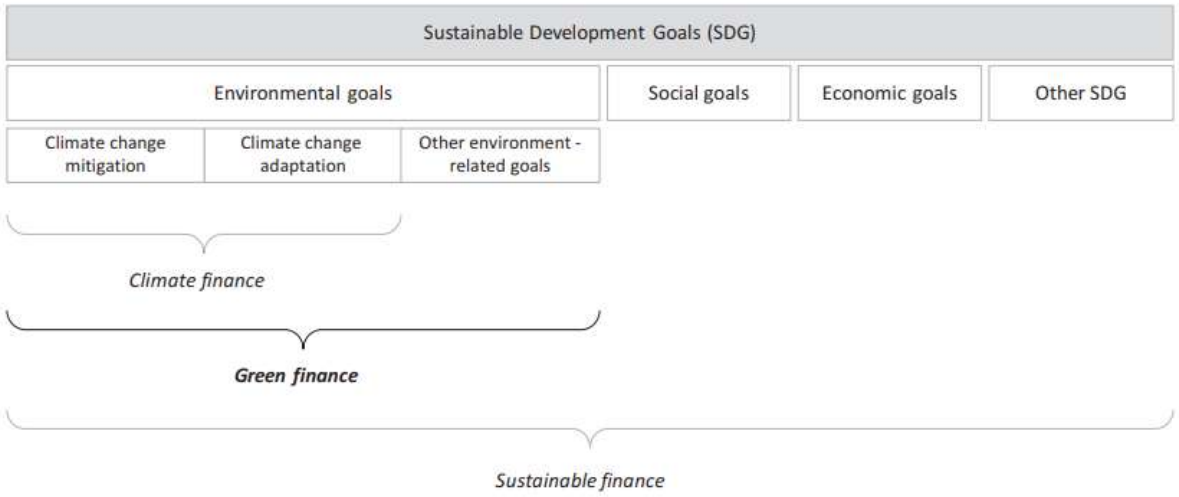

Figure 1 Green finance and its contribution to the Sustainable Development
Source: Berrou, Romain et. al. (2019). The Rise of Green Finance in Europe. Palgrave Studies in Impact Finance (SIF).

2 Green finance instruments

Green finance includes many instruments. The most prominent are green expenditure or environmental protection related expenditure, green bonds, carbon pricing, tax-incentives for green projects (IISD, 2015).

a) **Fiscal incentives for investors**: An example would be the feed-in premium program in Thailand to scale up the use of renewable energy (Tongsopit & Greacen, 2013).
b) **Carbon finance:** A term is used to summarize all the financial instruments used to pricing the carbon or trading it (Kaifeng & Chuanzhe, 2011).
    i. **Carbon Tax:** It is applied by imposing a tax rate on the fossil fuel content. (World Bank, 2020) and it is used to achieve the Net zero emission target of Paris Agreement, in theory is used to decrease the emissions of GHGs. However, little evidence is found on that matter (Green, 2021). Few countries have presented the carbon tax in their taxation system to curb the external costs of carbon emissions under the principle of "polluter pays". Such revenue can be used to finance green transition. For example, Ireland levies a carbon tax since 2010 on kerosene, marked gas oil, liquid petroleum gas, fuel oil, natural gas and solid fuels and it updates the charged rates when needed. The

government has committed to use this revenue to finance initiatives to prevent fuel poverty, partially fund a socially progressive national retrofitting program, and present incentives to encourage farmers to adopt a greener and more sustainable farming (Citizen Information, 2021).

ii. **Carbon trading systems:** Carbon trading works by setting a cap on the industry CO2 emissions and each emitter buy a credit that allow him to pollute. The logic behind trading is that the extra cost paid by the emitter to buy credits are going to force him to reduce his emissions.
For each economic activity, there're two types of actors, an emitter and a green actor who implement a green project). The green actor can release a green credit to finance his new or expansion projects. the polluter can buy this credit in exchange for his emissions or he can implement a carbon offsetting project(s).

c) **Green bond**: it's defined as a debt instrument designed to mobilize funds towards financing ecofriendly projects. (World Bank, 2015). Green Bonds are used to decrease the relatively high cost of green projects and reallocate the saving in the economy towards green business models (Karpf & Mandel, 2018). As well, according to literature, there're many other benefits of green bonds to different stakeholders which include the buyer, the issuer, the government, and the rest of the world (Azhgaliyeva et.al., 2020).

d) Other

i. **Monetary incentives for banks**: For example; in Bangladesh, banks can get a refinance at a reduced interest rate provided that they give loans to projects within the sustainability priorities of the country's (UNEP, 2015).

ii. **Green credit**: it has been proven to have a positive direct impact and spatial- spillover on promoting the green economy (The local-neighborhood effect) (Lei, et. al., 2021).

3 The role of Green Finance in achieving Green Economic Growth

Theoretically, the gross domestic product (GDP) of a country consists of households' consumption (C), private investment (I), government spending (G), taxes (T), imports (M), and exports (X). It takes on this formula

$$GDP = C+I+G-T+X-M$$

Government spending and taxes are arbitrary called the Fiscal policy. Government uses these instruments to affect the level and the structure of GDP and its growth (Horton & El-Ganainy, 2020).

Given the green transition the economics go through, governments needed to update or enhance the current fiscal measures and develop new ones to mobilize financial resources to serve the green investment purposes and achieve green growth. As mentioned, these measures can be listed under the concept of green finance.

Green Finance by the government or green fiscal policy has been widely argued to have a positive impact on the economy given it is characterized by rationality or else it may hinder the private sector's role in driving the economic growth.

Therefore, green finance can achieve the various targets of promoting green innovation and investment, enhancing the environment quality, positively impact the economic growth, and achieving sustainable development goals or the extent by which it can be effective.

By levying a tax, charging a price, or presenting an incentive, production modes shift to greener modes and technology is induced towards ecofriendly practices. (Green Policy platform, 2014).

The origin of the idea that green finance can play a role in achieving green economic growth dates back to the economist "Pigou (1932)". Through his theory of "externalities", Pigou made a clear argument that government can use the "extraordinary" instruments, such as "bounties and taxes", to mitigate or eliminate the social cost of externalities (Gramkow, 2020).

Later, Baumol and Oates (1971) discussed the "how". They argued that government should set a "cap" for the acceptable level of pollution and accordingly charge tax or offer a subsidy to achieve on the excessive emissions discharged above that cap (Baumol & Oates, 1971).

On the empirical level, studies that investigated the relationship between green finance and economic growth have come to contradictory results (Singh & Mishra, 2022). However, many studies concluded that there's a positive relationship between green finance and economic growth on both the country level and the regional level. As well, research findings stated that it's vital to integrate and coordinate the fiscal measures to achieve emissions targets and economic growth (Catalano, 2021).

4 Literature Review

Green finance, as a field of research, has started relatively lately in 2010 but has been increasingly under investigation (Tao, et.al., 2022). The significance of such field emerges from the fact that the efforts towards greening business models and investing in green projects, especially renewable energy ones, are heightened as we approach 2030 with little potentiality to achieve the SDGs set targets.

Literature has tried to present a comprehensive definition to the concept of green finance. Although most of these definitions have their limitations; either because they are focusing on the instrument of green finance or because they are focusing on the financing institution but there's a mutual agreement that green finance is a framework that includes instruments to finance green investments and climate-related product (Lindenberg, 2014).

As well, some papers have mentioned different challenges that must be taken into such as determining the right projects, developing a finance strategy that ascertain the partnership between public and private sectors (Sachs, et. al., 2019).

As for the green finance practices, some papers have presented some practices by the financial sector; mainly the banking one, while others have focused on the private-led green finance. The role of the government, in such context, is mostly a guiding one (Volz, 2018).

Empirically speaking, many studies have tried to apply econometric models to study the impact of green finance or analyze the relationship between it and other economic indicators.

A study analyzed the impact of green finance on economic growth in Vietnam using data from 1986 to 2019 to apply ARDL approach amid COVID 2019 confirmed the positive effect of Green Finance (green loans and green investment) on economic growth (Ngo, et. al., 2021).

Another study emphasized on the role of green finance in assuring the High-Quality economic Development of China using a VAR model. It also indicated that green investment has a positive impact on the environment by increasing the rationality and advancement of the Chinese industry through three channels; enhancing innovation, increasing coordination, and advancing the greening aspect (Yang et. al., 2020).

Another study on G7 countries that used the technique of panel data to investigate the dependence structure of green finance, energy efficiency, and CO2 emissions

concluded that green finance and energy efficiency has a negative impact on CO2 emissions (Fang, et. al., 2022).

A study on Turkey, Indonesia, Mexico, and Nigeria showed that green finance can mitigate the impact of environment pollution (Li, et. al., 2022) and another study concluded that it can have negative impact on CO_2 emissions (Meo & Karim, 2022). On the regional level, a study on provinces of China showed that green finance has a positive impact on the environment quality and it contributes to improving the relationship between economic development and environment. (Zhou, et. al., 2020) and (Wang & Zhi, 2016).

To sum up, green finance instruments have proven to be effective in putting a country on the pathway to sustainable development. Therefore, many emerging and developing countries are seeking to adapt green finance mechanisms.

Second: Egyptian efforts towards adapting green finance as a policy

Egypt is not one of the high emissions' countries, however, there're some environmental issues that must be addressed, for example, Egypt suffers from severe heat waves and pollution is one of the main concerns in the country. Therefore, it made a strong commitment towards the green transition (State Information Service, 2021). This section is devoted to present an overview over the environment statue in Egypt and the Egyptian efforts to face the climate change with a greater focus on the financial aspect.

1 The current status of Green Economy in Egypt

1.1 Environment status in Egypt

Egypt's emissions average around 2.5 metric tons per capita which is considered relatively low compared to MENA region (Figure 2). However, by comparing the ecological footprint index with the Biocapacity one, it turns out the Egypt suffers from an ecological deficit that requires great attention and fast movement (Figure 3).

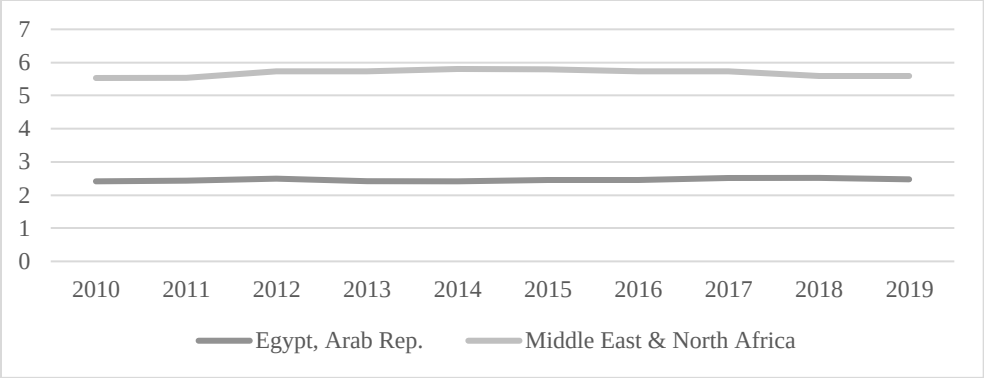

Figure 2 Co_2 emissions in Egypt and MENA region (2010-2019) Metric Ton/ Capita
Source: World Bank. WDI. Last access 23rd July, 2022

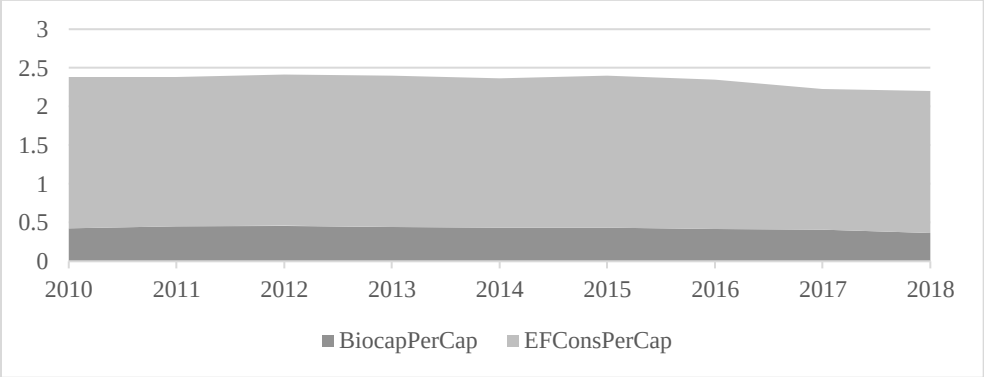

Figure 3 Ecological Footprint Vs Biocapacity (2010-2018) * gha per person
Source: Global Footprint Network (2022). Country Trends. Last access 23rd July, 2022

* Ecological Footprint (EFConsPerCap)
* Biocapacity (BiocapPerCap)

Poor air quality is one of the most persistent environmental degradation problems in Egypt due to reasons that are related to population growing number, poor urban planning, geographical aspects (Egypt is surrounded by deserts), and polluting transportation system (The Ministry of Environment, 2017).

Other environmental issues include water scarcity (UNICIF, 2021), costal erosion (Elsharkawy et. al., 2009), poor waste management system (Ibrahim & Mohamed, 2016), degradation of arable land (Desert Research Center, 2018), and endangered biodiversity life (CBD, 2022).

1.2 Reviewing Egypt's efforts towards greening the economy using green finance

Egypt has made a relatively great progress towards green transition, however, much more is needed to be done and it's noticed that finance is on top of the challenges needed to be addressed to continue on this pathway. (UNEP, 2015)

Eco-friendly oriented efforts by Egypt are diverse. These efforts include measures to promote green economy using green finance measures. This section provides a brief insight on some of these measures.

1.2.1 Public Investment in environment-related program

The starting point is government plans. Although the are no explicit section in the plan for environment protection, there are studies that tried to extract the environment related programs. Table (1) shows the total estimated investment directed at the enhancement of the environment and the associated programs in 2018/19 plan.

Table 1 total estimated investment directed at the enhancement of the environment and the associated programs in 2018/19 plan

Program	Investment (Million EGP)
Disposing waste	393.8
Natural reserves development	87.7
Enhancing the role of the regional branches of the Ministry of Environment	20.1
Improve air quality	50.7
Improving the environment in the villages most in need	34.2
Improve Water quality	8.9
Training, media, awareness and environmental inspection	5
Institutional and legislative development of the environment system	1.3
Sustainable development	4.8
Reducing industrial pollution	2.3
Climate change	2.5
A Supporting Program	14.9

Source: Abo Al Soud, Nefisa et. al. (2020). Investing in Environmental Projects in Egypt and Development opportunities. Planning and Development Issues Series. No: (314)– May 2020.

From table (1), we can conclude that investment policy is directed towards facing the most pressing environmental problems, however, there's little data on the extent to which such investments have a positive impact on the environment degradation.

In addition, a report by the Ministry of Planning and Economic Development (MPED) has indicated that the finance is the most pressing issue towards actually realizing the full potential of green transition on the sustainable development (League of Arab States, 2022).

1.2.2 National and Mega projects

Mega projects in the field of generating electricity from renewable energy are another measure taken by the Egyptian government to achieve greener energy mix.

Five new renewable energy-based stations were established through Egypt (Jabal Al-Zayt wind power plant, Burullus power station, Benban station 1, Beni Suef power station, and the new administrative capital power station) (SIS, 2018).
In the agriculture sector, another nationally important green mega project is the New Delta Project which aims to add one million acres of farmland in the northwest coast and it includes two sub-projects, Mostaqbal Misr, and South El-Dabaa axis (SIS, 2022). As well, Egypt's Canal lining is another mega project that incorporates rehabilitation of canals to save 5 billion cubic meters of water and improves irrigation at a cost of EGP18 billion (SIS, 2020).

1.2.3 Pro-environment Fiscal policy

1.2.3.1 Phasing out energy subsidy

Energy subsidy in MENA region is a major economic, social, and environmental concern. Removing such subsidy is politically and socially difficult, although these subsides contributes with a relatively high percentage to the budget deficit. Figure (4) shows the Value of fossil-fuel subsidies by fuel in the top 25 countries, 2020.

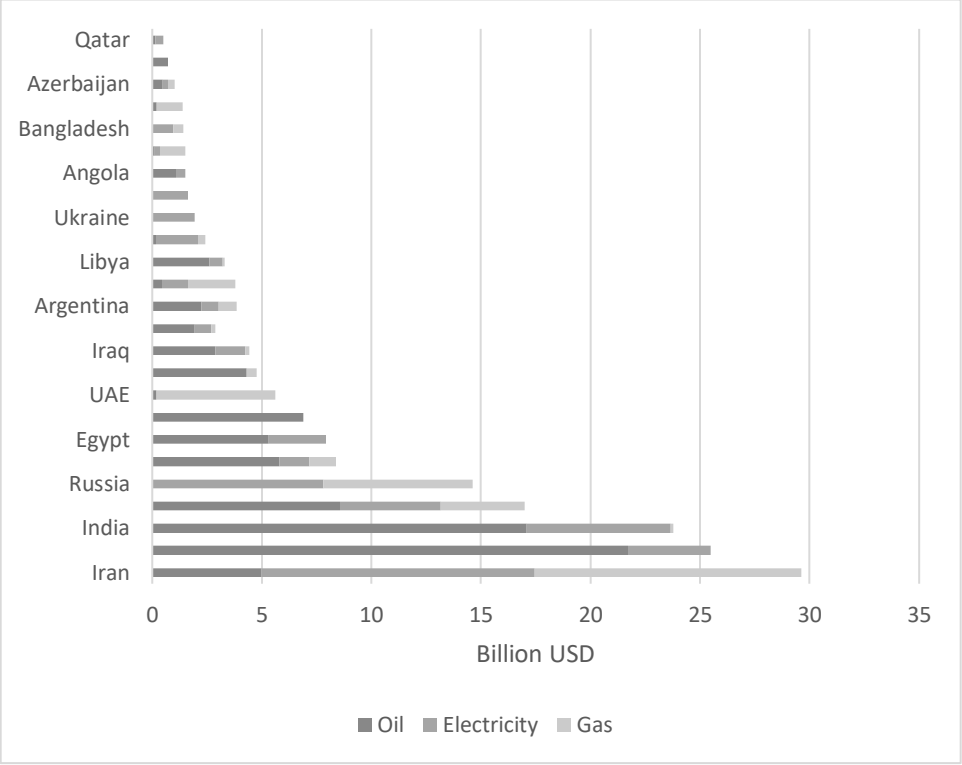

Figure 4 Value of fossil-fuel subsidies by fuel in the top 25 countries, 2020
Source: IEA (2020). Value of fossil-fuel subsidies by fuel in the top 25 countries. IEA. Paris.

According to the figure shown above, Egypt's is ranked 7th among the top 25 countries in Value of fossil-fuel subsidies in 2020. In that year, Egypt provided a

subsidy of around USD 5 billion to oil and approximately USD3 billion to electricity. As well, the total subsidies as share of GDP recorded 2.18% in the same year (IEA, 2020).

In 2014/15, the government have implemented an energy subsidy reform program to phase out the subsidy on energy products and electricity gradually to achieve economic stability and inclusive growth (Breisinger, et. al., 2018). Figure (5) enables us to descriptively compare between electricity consumption before and after the reform took place in 2015 and 2019, respectively.

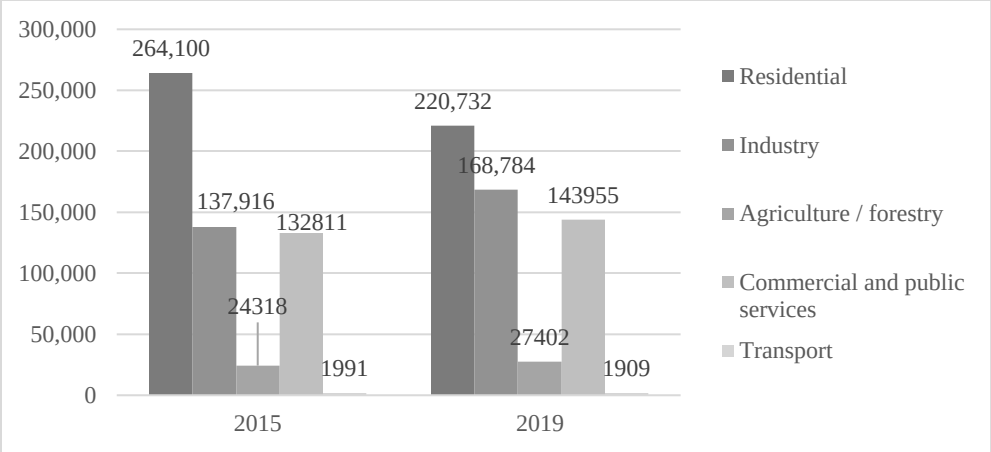

Figure 5 Electricity consumption by sector in 2015 and 2019 in Egypt, TJ
Source: IEA (2020). Country: Egypt. IEA. Paris.

As the figure shows, the reform effectively reduced the electricity consumption only by the residential and transport sectors, while in other sectors, it increased. The reason is that coal and diesel continued to have pre-tax sales (OECD, 2018), which presented a more profitable chance for industrial sector to switch to these energies (Hussein, 2018).

Data on emissions shows that emissions increased from 199.54 metric ton of CO_2 equivalent in 2015 to 225.48 in 2019 which may suggest the reform had little impact on the GHG emissions (IEA, 2020).

1.2.3.2 Pro-environment tax incentives and PPP mechanism

Egypt vehicles scrapping and recycling program is a national eco-friendly program that aims at replacing the aging taxies with newer ones that are conformed with the Egyptian environmental laws.

The program presents tax incentive and customs examination which amounted to $1300 per taxi. It aimed at reducing air pollution from transportation in greater Cairo by an average of 60,000 ton annually. Ministry of Finance, which is responsible for

implementing the project, has signed an agreement of supply with 5 local car dealers and assemblers in Egypt (CEDARE, 2013).

1.2.3.3 Sovereign Green Bonds (SGB)

In 2020, Egypt issued five-year green governmental bonds worth of $750 million at a 5.25% interest to various finance green projects (Samak, 2021). Such issuance made Egypt the first country in MENA region to present such financial tool.

The proceeds of green bonds were segmented as follows; $346.74Mn to clean transportation and $403.26Mn to Sustainable water & waste water management.

One example of the projects is the project of Cairo Monorail which received $347Mn from the Green Bond proceeds. As well, green bonds presented finance to 14 projects in Sustainable Water and Wastewater Management (MOF, 2021).

These bonds have been used to finance 691 projects with an overall cost of EGP 447 billion in 2021 which represents 14% of total public investments in that year. Figure (6) shows the sectoral Distribution of Green Projects in the investment plan of 2020/2021.

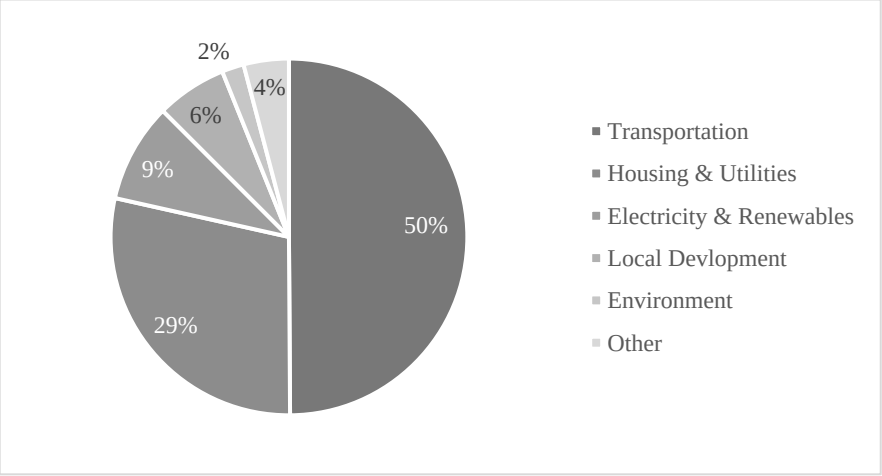

Figure 6 The Sectoral Distribution of Green Projects in the investment plan of 2020/2021
Source: Ministry of Planning and Economic Development (2021). Egypt's 2021 Voluntary National Review. UN.

From the figure above, it can be concluded that green bonds' proceeds in Egypt have been used to finance environmental investment and that only highlights the great potentiality of fiscal policy tools to achieve sustainability targets.

Third: International practices in green finance

Green finance is a relatively recent approach that countries, especially the developing ones, may not have a solid experience on how to adapt and apply. Therefore, it's important to explore lessons learnt from best practices to tailor a better and more coherent green financial systems achieving by that the Paris Agreement targets of net-zero emissions and SDGs, broadening the scale of it, and mobilizing the financial resources where they are needed (PESME, 2021). Therefore, two practices were chosen to be explored; Germany and China.

1 Germany

Germany has been working to achieve the goal of climate neutrality by 2050. It managed to cut down its emissions of GHGs by 35.7% since 1990 and it intends to reduce such emissions further to achieve a total of 55% cut by 2030.

Although Germany has made considerable efforts to reduce its carbon emissions on the legislative, financial, social, national, and sectoral levels, it is still one of the largest polluters in the world (Black, et. al., 2021). In this section, the paper goes through the policy framework of environment and climate action and then studies the main tools of green finance in Germany's climate work.

1.1 The Environment and Climate action Policy Framework in Germany

Since 2000, Germany has adapted a pro-climate change institutional framework called "National Sustainable Development strategy". Later, it launched the "Integrated Energy and Climate change Program" to identify the measures required to achieve the reduction target of GHG by 40%.

Germany also maintains a strategic focus to address the environmental degradation upon multiple aspects such as biodiversity (Comprehensive nation strategy on biological diversity within the NHS), water (Water Act in 2010), and resource efficiency (MaRess Project 2007-10 and the National Resource Efficiency program in 2012).

As well, the government launched the "Climate Action Programme 2030" and the "Climate Action Act (Klimaschutzgesetz)" to ensure Germany achieves its climate target, reduce the GHG by 55%, by 2030 by mainly support the renewable energy and phasing out the coal use in electricity generation. As well, Co_2 pricing would increase by more than 100% by 2025 (The Federal Government, 2022).

There’re two main drivers towards this target; namely, the Climate Action Act and the Climate Action Programme 2030 (Figure 7).

Under the climate action act, Germany would take measures to reduce GHG emissions on one hand and increase natural sinks on the other. Green finance is presented in terms of 8 billion euros to implement the action programme approved by the federal government. Germany also plays a vital role to align climate action at the continent level (The Federal Governmnet, 2021).

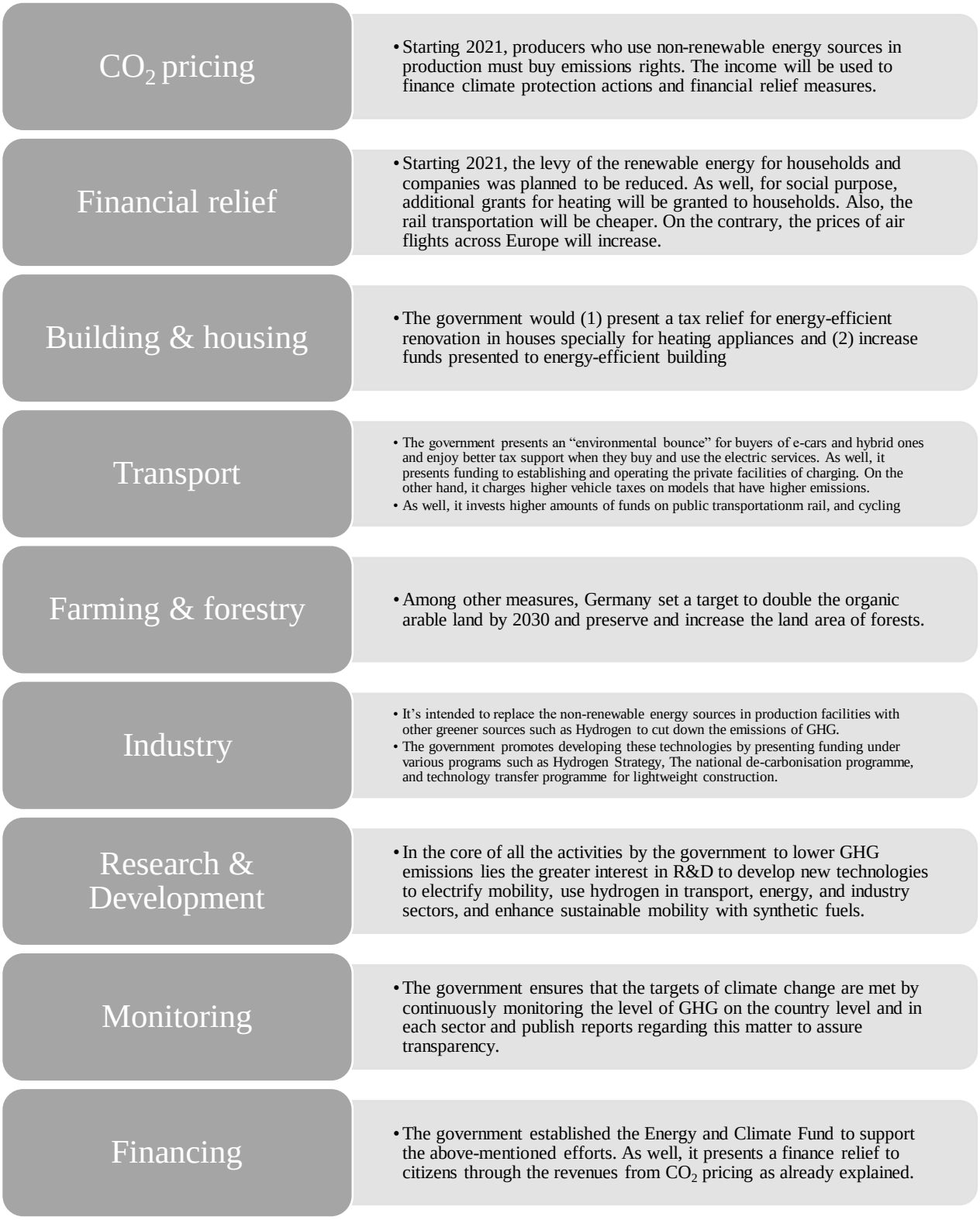

Figure 7 The Climate Action Programme 2030

Source: The author's based on The Federal Government (2022). Climate action. The Federal Government website.

The previous demonstration assures the importance of the strategic component to set and fulfil the targets in the climate change action. It's very important to set achievable targets on the country level and on the sector one and coordinate the doable actions under national wide programs.

The noticeable three features of Germany efforts towards the environment and climate change are

A. the comprehensive national strategic aspect of policies and programs,
B. the involvement of stakeholders on the regional, national, and subnational levels, and
C. the act of allowing the public to get updated information on the environment continuously (Environmental Information act) (OECD, 2012).

The ambition orientation of Germany to decrease the CO_2 emissions has witnessed a successful decreasing trend in the last decade and figure (8) shows the CO2 emissions (metric tons per capita) in Germany. Measures taken by the government have been various, among which is green finance, which is the focus of this paper. Various tools have been used such as green bond, environmental tax, and national expenditure on environmental protection, fossil fuel support, and contribution to the commitment of USD100 billion to climate related work internationally (The Federal Government, 2022).

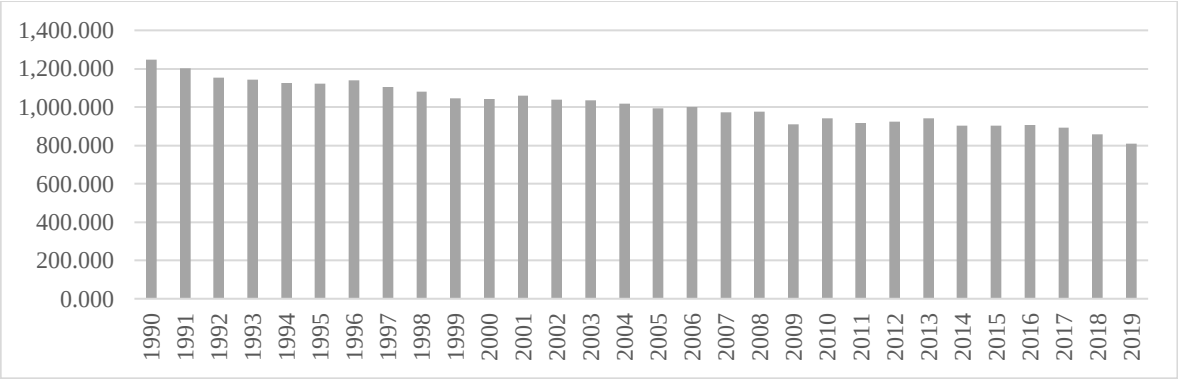

Figure 8 GHG emissions in Germany (2010-2019) Million tonnes of CO2 equivalents
Source: Deutsche Bundesbank. Green finance dashboard. Last accessed on 22nd July, 2022.

During the period of 2010 to 2019, GHG in Germany witnessed a steady reduction expect for the years of 2013 and 2016. In 2013, the emissions increased due to increasing the coal used to generate electricity and oil to heat homes to overcome the colder weather in that year (UBA, 2014). In 2016, transportation sector's emission and emissions from coal-based electricity generation increased driving the total emissions up (UBA, 2018). The rest of this section is dedicated to briefly

demonstrate the components of Green Finance in Germany and how they contribute to enhancing the investment and the economic growth.

1.2 Green Finance in Germany

1.2.1 National green expenditure

Germany has been allocating relatively higher expenditure on environmental protection programs to achieve the neutrality objective of 2045 (Figure 9). Post Covid 19 pandemic negative economic consequences, Germany mobilized a debt financed fund source to allow for higher incentives and more public spending and investment in climate change related programs. The mentioned fund amounted to €60 billion (Federal Ministry of Finance, 2022).

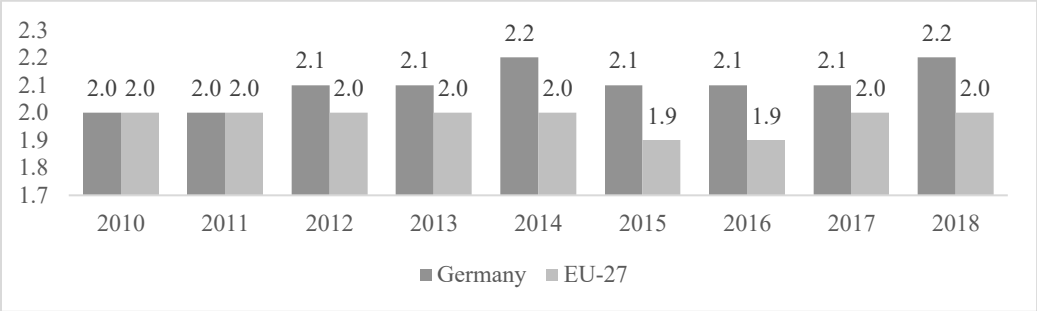

Figure 9 National expenditure on environmental protection in Germany and the EU-27 as % of GDP

Source: Deutsche Bundesbank. Green finance dashboard. Last accessed on 22nd July, 2022.

The above figure shows that, from 2010 to 2018, Germany's expenditure on environment related programs is mostly increasing and higher than EU, in all year except for 2010 and 2011. However, high expenditure is not the only factor in Germany leadership in climate action. As mentioned, the institutional framework, the comprehensive legal aspect, and the promotion of R&D to yield eco-friendly technology play a significant role to the success of the Germany practice (Weidner & Mez, 2008).

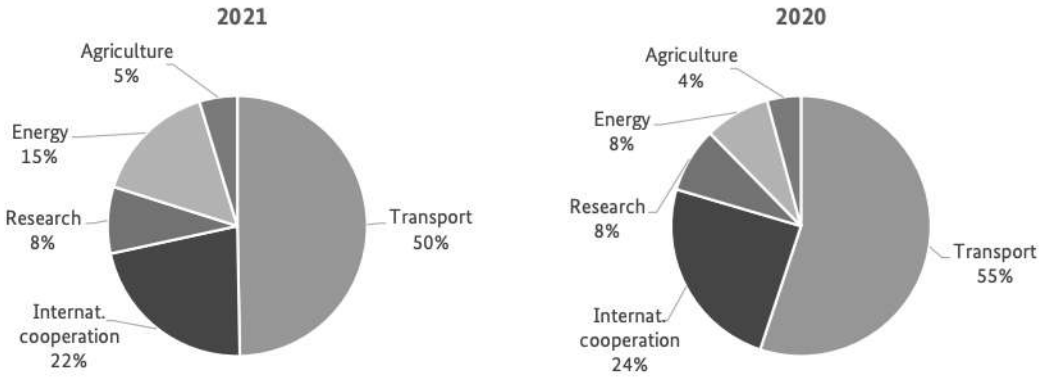

Figure 10 breakdown of green expenditure by the sector in 2020 and 2021

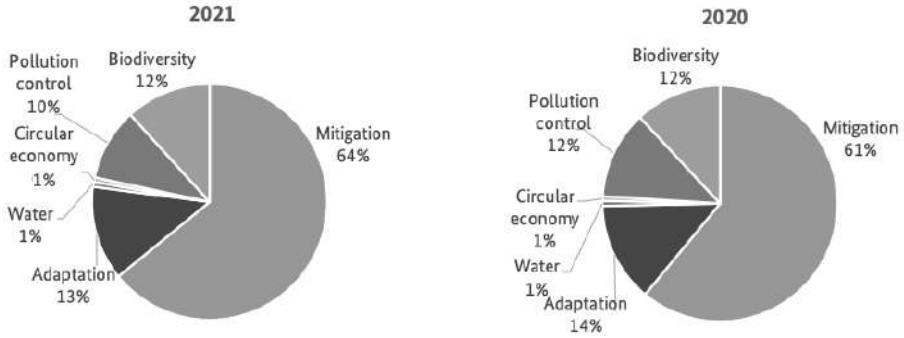

Figure 11 breakdown of green expenditure by EU Environmental Objective in 2020 and 2021
Source: German Finance Agency (2022). Federal Republic of Germany Green Bond Investor Presentation. German Finance Agency https://www.deutsche-finanzagentur.de/

Figure (10) and (11) show the breakdown of the green expenditure in 2020 and 2021 by sector and environmental objective. Transportation and internet cooperation are the highest sectors that funding is directed at. As well, mitigation is the main objective the receives green expenditure.

1.2.2 National green revenues

1.2.2.1 Green taxes' system in Germany

Taxes have been used as a vital instrument to curb CO_2 emissions and to mobilize funding resources to finance green expenditures. During the period of (1999 – 2003), the government applied an ecological taxes reform to vary the items taxed and increase the rate according to the CO_2 emissions reduction targets. Figure (12) shows the revenues from environmental taxes as a percentage of GDP.

Energy taxation revenues as a percentage of total taxes increased from 5.1% to 5.6% during the same period. It's worth mentioning that, on the other hand, taxes on labor income decreased to mitigate the economic burden on households.

Although some literature referred to the eco-tax design flaws claiming that it didn't actually reflect the true environmental externalities, the final energy use actually declined in both transport sector and the households' sector by 8.6% and 3.5%, respectively (OECD, 2012).

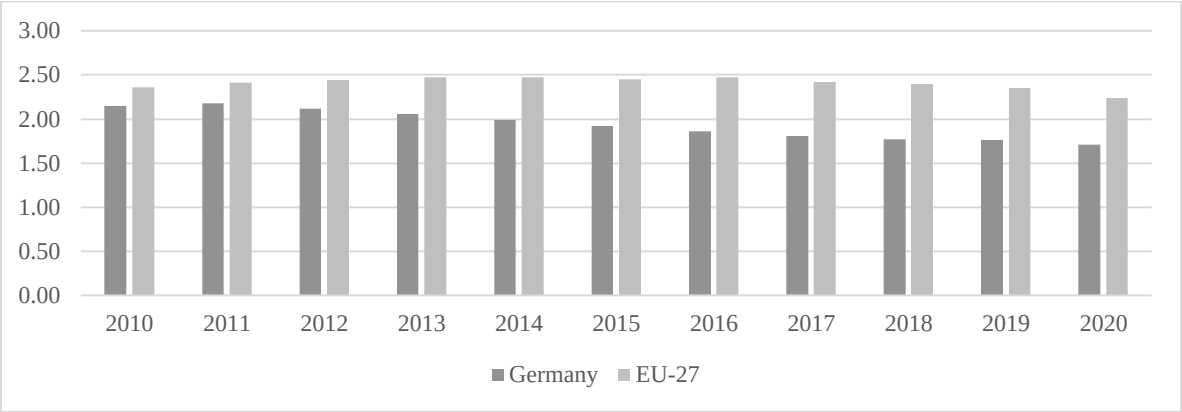

Figure 12 Environmental tax revenues in Germany and the EU-27 % of GDP
Source: Deutsche Bundesbank. Green finance dashboard. Last accessed on 22nd July, 2022.

In Germany, environmental tax revenues in Germany as a percentage of GDP declined from 2.15% in 2010 to 1.7% in 2020 which was mainly due to two reasons (1) poor adjustments of tax rates given the higher inflation rates and (2) introduction of further tax exemptions (OECD, 2012).

As for the type of the taxes, energy taxation was the main source of tax revenues in Germany. The sectors of households and services accounted for 68% of the energy taxes. (Eurostat, 2022). Germany didn't have an explicit taxation system on the carbon content of products and services (OECD, 2021a). Recently, it joined the EU Emission trading system (ETS) and then in 2021 it introduced its national ETS (nETS), as discussed next (OECD, 2021b).

1.2.2.2 Carbon ETS

EU ETS focused on large emitters. However, within its nETS, Germany additionally priced the carbon emissions form fuels of heating and transport in the framework of nETS. The nETS covered gasoline, kerosene (except for jet kerosene), diesel, fuel oil, natural gas, LPG, and NGL but it didn't cover Coal emissions (it's planned to be covered by 2023). The price was set at a fixed rate of EUR 25/ CO_2tonne and it is planned to be raised to EUR 55/ CO_2tonne in 2025. (OECD, 2021b).

According to the nETS, the logic behind how the ETS is applied is considered as follows; (1) a "cap" is set to determine how much of emissions are permitted by the emitter (2) the emitter then has to buy a "certificate" at a price set according to the

market mechanism (3) as the quantity of allows is decreased annually, the certificate price gets higher and costly which would drive the emitter to invest in carbon decrease measures (4) to protect the Germany companies' competitiveness in the international markets and to prevent leakage of carbon (i.e., companies move the business to countries with more relaxed environmental legal framework), these companies get a financial compensation provided they prove it and given that they actually adopt measures to increase the energy efficiency.

The Energy and Climate Fund (EKF) benefits from the revenues of EU ETS and nETS which amounted to EUR7 billion in 2021. This fund supports investment in energy efficiency and climate protection projects.

1.2.2.3 Green Sovereign Bonds

In 2020, Euro11.5 billion worth 10-year green bonds were issued in Germany (Figure 13). Different maturity terms bonds are issued for different parties; Short-term green bonds are directed to central banks and medium-term ones are to investment funds and for pension funds, long-term ones are issued (Federal Ministry of Finance, 2020).

In order to deal with the liquidity issue, green bonds in Germany are all twinned with other identical conventional bonds to admit investors the right to shift between the two types (Liebich, et. al., 2020). Figure (13) illustrates the twin bond concept framework and Figure (14) shows the volume of green bonds issued in Germany.

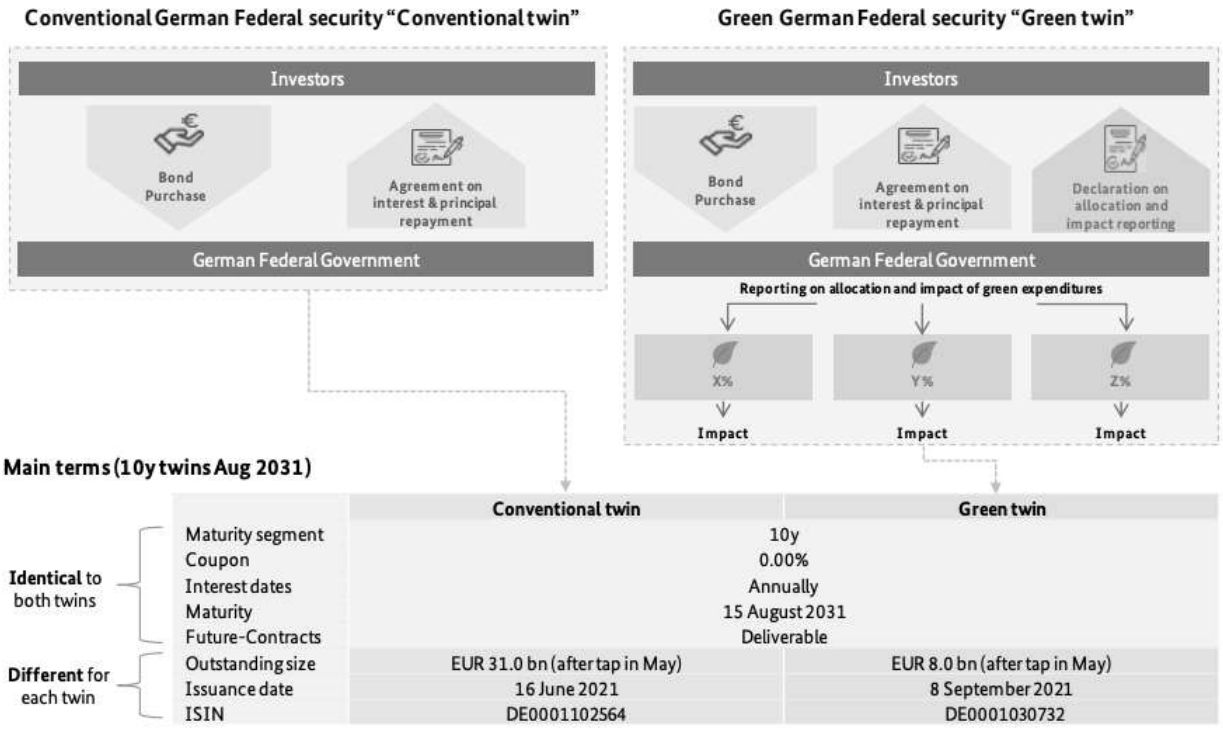

Figure 13 Twin Bond Concept in Germany Illustration
Source: German Finance Agency (2022). Op. Cit.

It's worth mentioning that the use of the fund generated from the green bonds' issuance is not tied to specific green expenditure that is due to two main reasons; the first is about the twin nature of green bonds to conventional bonds and the second is to preserve the credibility of the financial institutions because if the projects are to be determined upfront and then cancelled due to any reason, it would negatively reduce the trustworthiness of the government (Liebich, et. al., 2020).

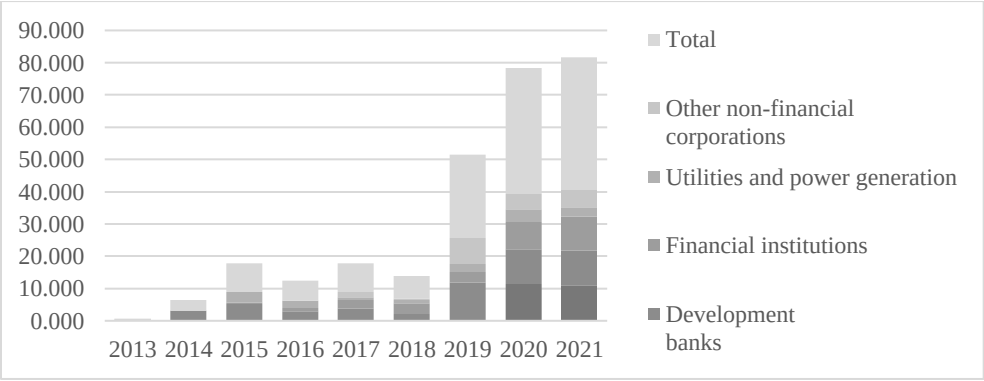

Figure 14 Volume of green bonds issued in Germany, € billion
Source: Deutsche Bundesbank. Green finance dashboard. Last accessed on 22nd July, 2022.

A group of six ministries, chaired by the ministry of finance, decide upon the selection of eligible green finance using the proceeds of these green bonds. Figures

(15a) and (15b) show the breakdown of allocation green bond proceeds by sector and EU environmental objective.

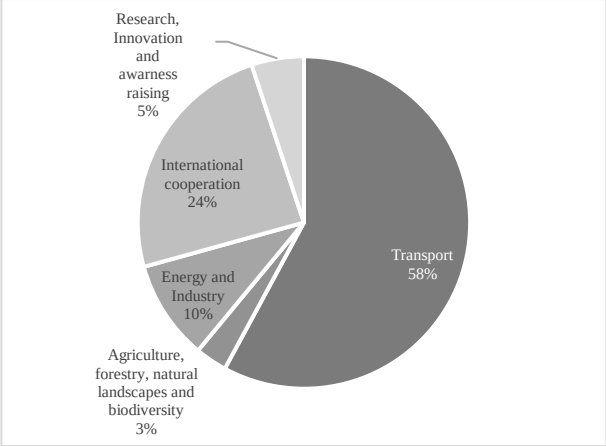

Figure 15.a Breakdown of the allocation Green Bond Proceeds by sector

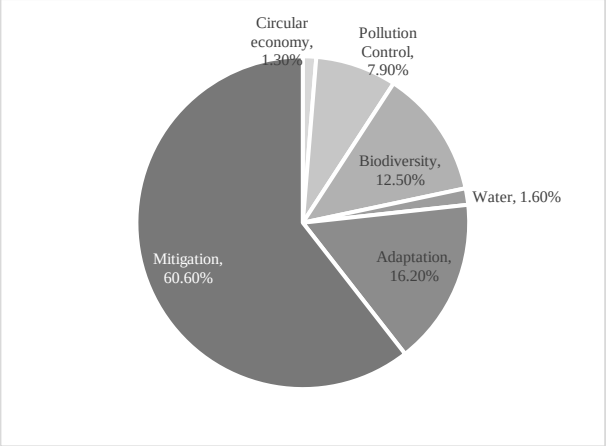

Figure 15.b Breakdown of the allocation Green Bond Proceeds by EU Environmental Objective

Source: Federal Ministry of Finance (2021). Green bond allocation report 2020. https://www.deutsche-finanzagentur.de

As shown, transportation sector receives around half of the proceeds in accordance to its higher priority on meeting the carbon neutrality target by Germany. Rail transportation investment receives the highest amount allocated in form of subsidies in rail infrastructure improvement and expansion.

2 China

China, as a developing populous country, faces many environmental issues and suffers from the relatively low natural capital resources per capita. Therefore, since 1980, China has made greater efforts to assure better environment and greater growth potentiality in order to keep prosperity and sustainability.

The framework within which China operates to achieve sustainability depends on formulating policy and implementation programs that coordinate between developing the economy, achieving better life standards, and preserving the environment and natural resources on the national and subnation levels.

China adapted three main guiding principles to enhance the quality of environment, as follows:

a) Making prevention a priority,
b) Polluter must pay,
c) enhancing measures of the environmental management.

2.1 The Environment and Climate action Policy Framework in China

Best practices are characterized by having a comprehensive all-inclusive environment protection policy that is supported by law and a vital role of the government. Figure (16) illustrates the main pillars of the Chinese environment protection that the government has adopted and communicated.

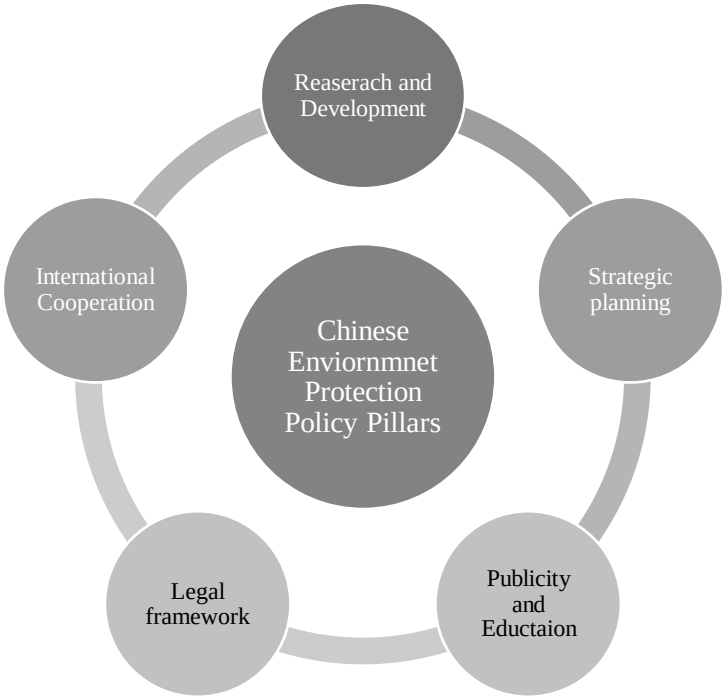

Figure 16 Environmental Protection in China pillars

Source: The author's illustration based on Information Office of the State Council of the People's Republic of China (1996). Environmental Protection in China. Available on https://www.mfa.gov.cn/ce/cegv//eng/bjzl/t176940.htm

As shown in the previous figure, the legal framework has been developed to strictly apply the prevention and control measures to improve the environment and protect it. That also includes an increasing role of the state and its organizations to play.

The second important pillar is integrating the principles and guidelines of the environment protection in the national plans of development on the macro level to assure better coordination among the three dimensions of sustainable development; economic, social, and environment.

The government also emphasizes on the role of Research and development in the fields of developing technologies to prevent pollution and support the ecofriendly industries.

Another important part of the Chinses policy is rising awareness through educating students in all types of schools and briefing the public on the environment management systems and agendas.
As well, China pays great attention to the international role in environment related work it must play and considers the collaboration fields with other countries and organizations. (Information Office of the State Council of the People's Republic of China, 1996).

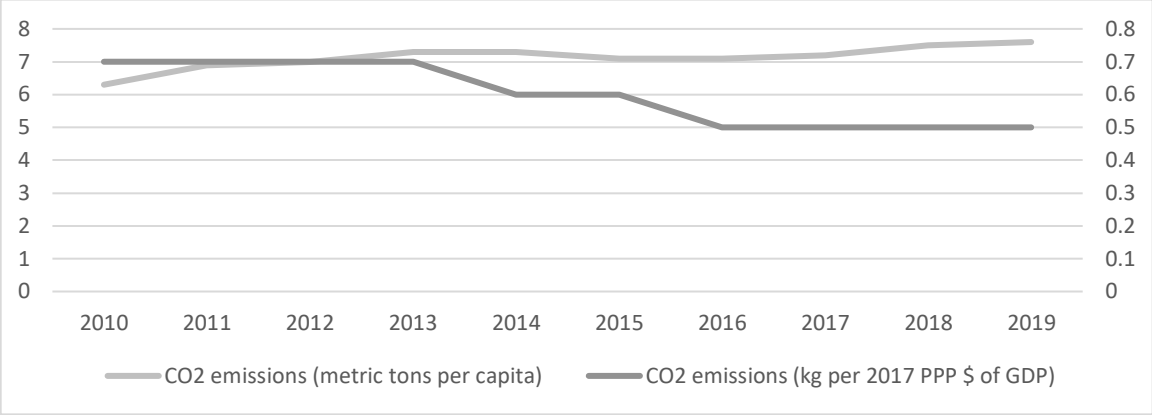

Figure 17 CO2 emissions (kg per 2017 PPP $ of GDP) – China
Source: World Bank. WDI. World Bank database. Last accessed 21th August, 2022

As shown in Figure (17) emissions in China has been increasing, mainly, due to the increase in electricity demand which in turn is caused by economic development and population growth (Zheng, 2019). In 2021, the demand for electricity rose by 10%. Electricity production in China depends heavily on combusting coal (IEA, 2022). This trend of GHG emissions increase continues to persist as the graph shows.
China plans to achieve Peak Carbon Emissions by 2030 and neutrality by 2050. Therefore, in October 2021, ahead of COP 26, it released a policy framework called the 1+N. The number "1" represented the inclusive guiding principles of policies and the letter "N" stands for the sub-policies by which the targets would be achieved (UNDP, 2021). Figure (18) shows a demonstration of the action plan targets.

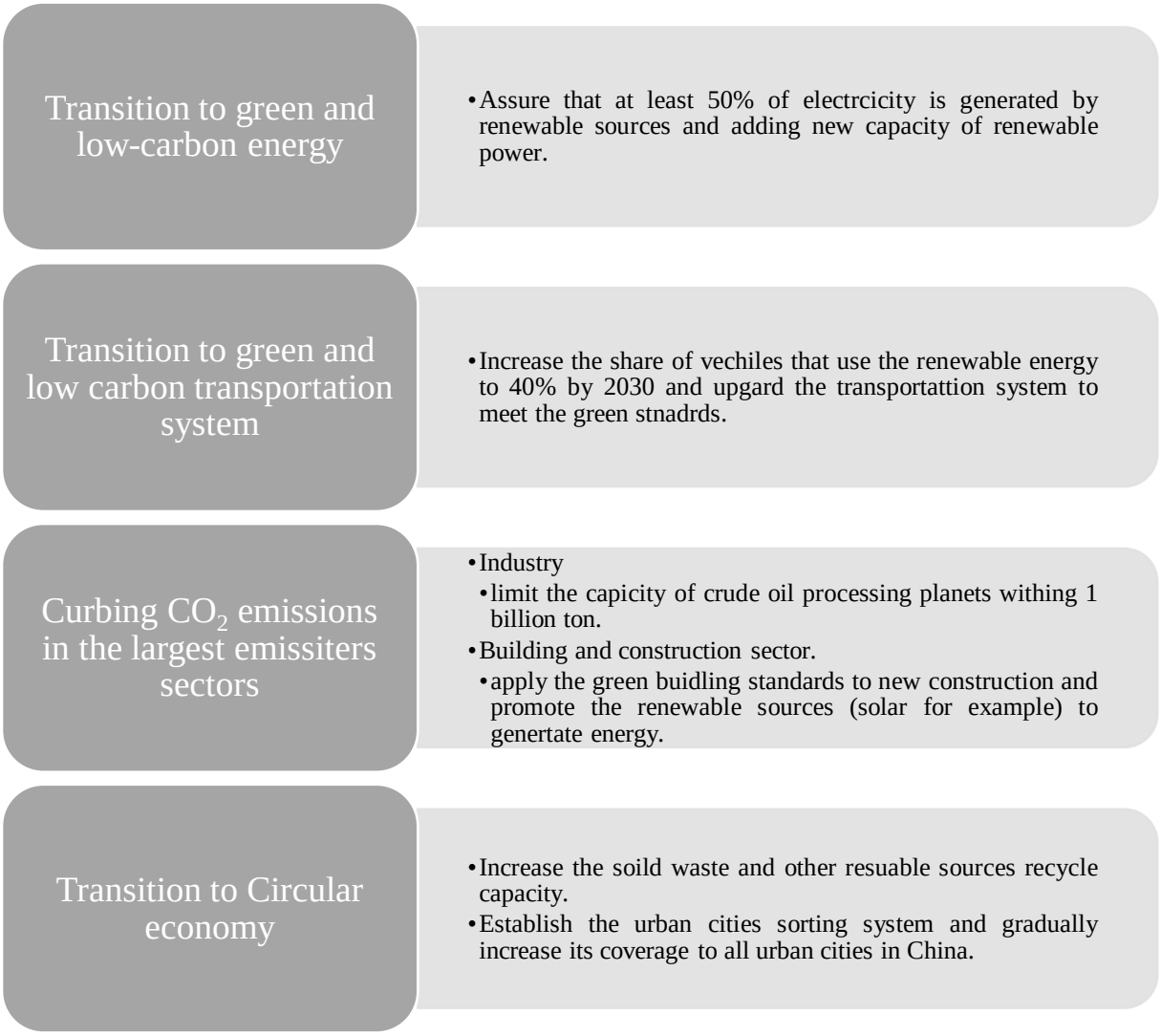

Figure 18 A demonstration of the action plan targets in China

As the demonstration shows, China studied the current situation, set the targets, and drew the plan. The starting point is clearly focusing on the largest CO_2 emitting sectors to decrease the emissions then promoting other greener practices such as the use of renewable energies and the circular economy.

Within this outline, China's recent five-year plans postulates the commitment of balancing the human needs and the environment preserving. In its 14th five-year plan, part 11, China emphasizes on the green development by improving the Ecosystem, continuously improve the Environmental, and adopting a faster green development transition.

Accordingly, China implements a green finance system to value the natural resources in a way that reflects their relative limitations and improve the pricing of them (The people Government of Fujian Province, 2021).

2.2 Green Finance in China

China uses a variety of conventional and modern green finance instruments. These instruments include pricing, taxes, fund, investment, public expenditure, and carbon ETS.

2.2.1 National green expenditure

Public expenditure is a main component of the Chinese green orientation. The government has increased environment protection investments annually in absolute terms and as a percentage of total expenditure as table (2) shows during the period of 2010 to 2018.

Table 2 Investment in environmental pollution control

Year	Social Expenditure		Economic Expenditure		S&T and Environmental protection Expenditure		Administrative Expenditure	
	100 million Yuan	%	100 million Yuan	%	100 million Yuan	%	100 million Yuan	%
2010	34,600.26	48.83	11,740.58	15.89	**3961.38**	**5.36**	13,142.24	17.79
2011	45,268.83	48.82	16,687.68	18.00	**4452.67**	**4.80**	15,352.03	16.55
2012	54,515.73	50.86	18,803.96	17.54	**5142.01**	**4.80**	17,630.27	16.45
2013	60,510.30	50.53	21,448.47	17.91	**6050.20**	**5.05**	19,243.42	16.07
2014	67,192.69	52.00	23,303.42	18.03	**6348.69**	**4.91**	19,096.54	14.78
2015	79,154.02	52.65	28,144.98	18.72	**7786.66**	**5.18**	20,288.28	13.50
2016	88,022.30	54.89	27,494.88	17.15	**8317.19**	**5.19**	22,871.44	14.26
2017	96,372.77	55.63	27,897.81	16.10	**9706.79**	**5.60**	25,851.23	14.92
2018	103.273.08	54.88	30,462.34	16.19	**11,076.43**	**5.89**	28,610.98	15.20

Year	Social Expenditures		Economic Expenditures		S&T and Environmental Protection Expenditures		Administrative Expenditures	
	Size	Proportion	Size	Proportion	Size	Proportion	Size	Proportion
	100 Million yuan	%	100 Million yuan	%	100 Million yuan	%	100 Million yuan	%
2010	34,600.26	46.83	11,740.58	15.89	3961.38	5.36	13,142.24	17.79
2011	45,268.83	48.82	16,687.68	18.00	4452.67	4.80	15,352.03	16.55
2012	54,515.73	50.86	18,803.96	17.54	5142.01	4.80	17,630.27	16.45
2013	60,510.30	50.53	21,448.47	17.91	6050.20	5.05	19,243.42	16.07
2014	67,192.69	52.00	23,303.42	18.03	6348.69	4.91	19,096.54	14.78
2015	79,154.02	52.65	28,144.98	18.72	7786.66	5.18	20,288.28	13.50
2016	88,022.30	54.89	27,494.88	17.15	8317.19	5.19	22,871.44	14.26
2017	96,372.77	55.63	27,897.81	16.10	9706.79	5.60	25,851.23	14.92
2018	103,273.08	54.88	30,462.34	16.19	11,076.43	5.89	28,610.98	15.20

Source: Zhao, Weixiang, and Yankun Xu. 2022. "Public Expenditure and Green Total Factor Productivity: Evidence from Chinese Prefecture-Level Cities" International Journal of Environmental Research and Public Health 19, no. 9: 5755. https://doi.org/10.3390/ijerph19095755

Research findings confirm that green expenditure has a significant role in enhancing the environment quality (Li et. al., 2022). Industrial sector contributes to almost 50% of China CO_2 emissions. Thus, this sector requires more focus to green the production and practices in it to reduce the emissions. In 2020, public investment in the industrial pollution amounted to 45.43 billion Yuan (Statista, 2022). As well, it's worth mentioning that China announced the "Industrial Green Development Plan (2016-2020)" to postulate the guidelines to transform to greener low carbon industrial sector (UN, 2016).

2.2.2 National green Revenues

2.2.2.1 China's environmental protection tax (EPT) or green tax

Since 2018, the Chinese government charges public and private entities for polluting the air or water, causing noise, and generating solid waste (Hu et. al., 2020). EPT is considered an upgrade to the pollution discharge fee (PDF) that was applied before. Researchers thinks that EPT is much better instrument than the PDF as it forces polluters to pay higher rates for their pollution which would induce them to lower the pollution and invest more in greener technologies and practices (Wen et. al., 2021). Figure (19) shows the mechanism by which China apply the EPT.

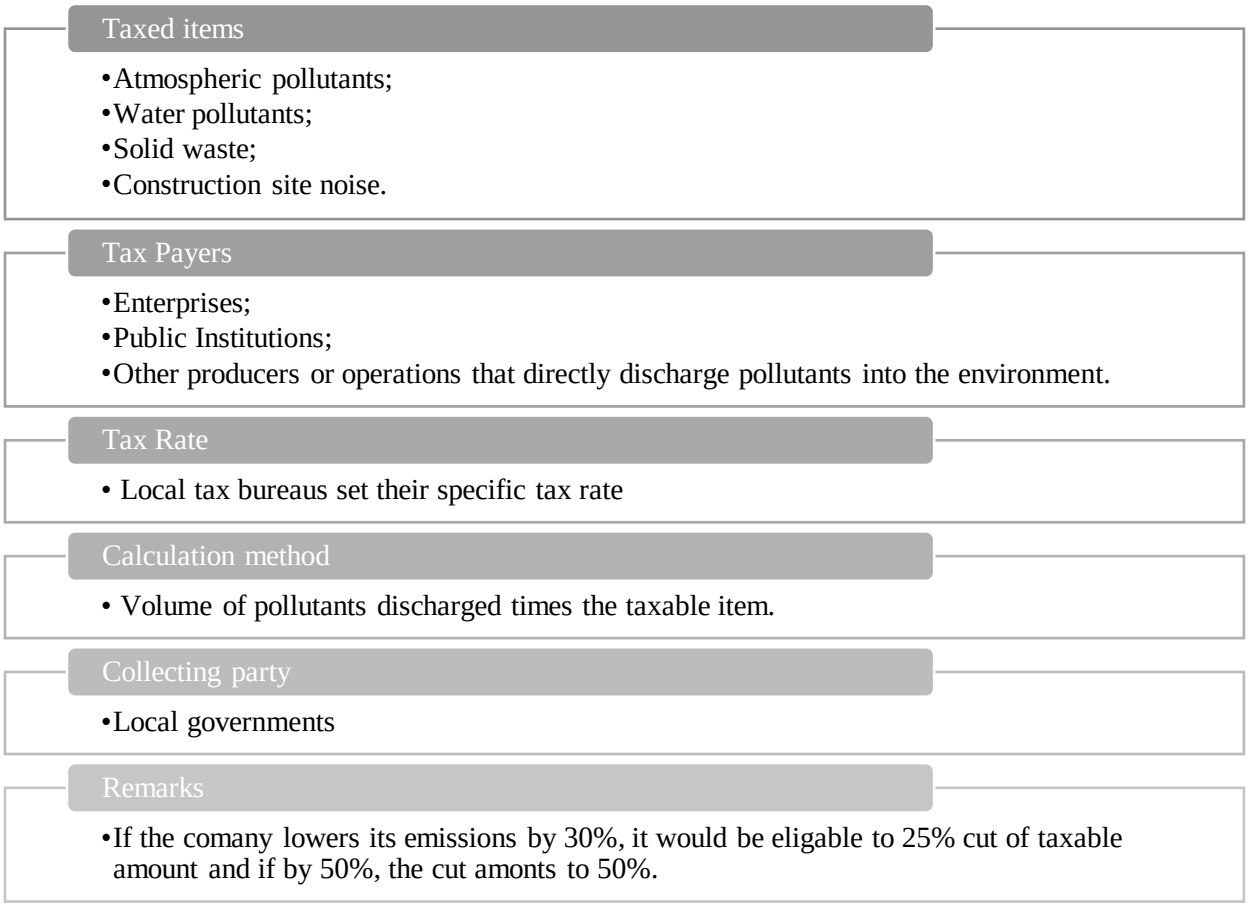

Figure 19 Investment in environmental pollution control
Source: The author's based on China Briefing (2018). China's Environmental Protection Tax. https://www.china-briefing.com/news/china-environmental-protection-tax/

The figure shows that the EPT is an easy system to apply, emphasis on the role of local bureaus (practice of decentralization), and covers a wide array of pollutants. Revenues from environmental protection tax amounted to 221,160 million yuan in 2019 compared to 151,380 million yuan in the previous year with a 46% increase (National Bureau of statistics, 2019-2020).

On the other hand, tax incentives are also used to reduce the emissions. For example, renewables enjoy a relatively high tax incentive. For example, wind enjoys 50% reduction in VAT, import duty exemption on equipment, and other income tax reductions for the generation stations.

As well, consumers enjoy a price reduction when purchasing new vehicles according to the New Energy Vehicle (NEV) with a subsidy amounted to around US$ 15,000 per vehicle in 2016. However, this subsidy was planned to be phased out after 2020 to prevent market failures. (UNEP, 2017).

2.2.2.2 China National ETS

China has gone through to phases of ETS, the first started in 2011 when a seven pilot ETS were launched and the second started in 2021 when the national ETS was announced (Cao, 2016). Figure (20) shows the phases of the Chinese pilot ETS.

Figure 20 Phases of the Chinese pilot ETS
Cao, P (2016). Carbon Trading in China: Progress and Challenges. Environmental Law Institute.

The pilot programs were launched in 7 provinces which led to differences between each pilot ETS. For example, in the first phase, the cap is decided in accordance to the regional carbon-intensity criteria. As well, the sector to be covered varied from a province to another. As for allowances, they depend on several criteria, for example, the history of emissions "grandfathering" and the possibility that producers may transfer the costs to consumers, among other criteria, and they are distributed for free. Reserve allowances have two purposes; to stabilize prices by the government and to preserve the capacity of economic growth for the entities in the pilot phases. The last phase requires the entities to monitor and report their emissions and get it verified by a third party (Cao, 2016).

The national ETS was set to cover more than 2000 companies in the power sector. This national ETS aims at cutting about 40% of the nation-wide emissions (International Carbon Action Partnership, 2022).

There's a major difference between Chinese ETS and other ETS, EU for example. The Chinese ETS sets the benchmarks of CO_2 emissions in power plants operating using coal or gas. However, the EU ETS set the absolute cap on the emissions (IEA, 2022).

While it would be early to assess the system and study its effectiveness, the evidence from the previous seven pilot programs signals the high potential for this program to achieve its target. (Wang et al., 2019).

3 Conclusion

This paper has addressed the green finance concept from a theoretical and practical point of view. Findings show that green finance instruments can be an integrated part of the climate work policies and strategies and may form better resources to fund Egypt's green transition.

Egypt has made admirable progress towards greening its fiscal policy instruments to achieve higher investment in ecofriendly projects and achieve economic growth, however, there're challenges still are to be dealt with. The main challenge is the absence of a strategic green fiscal framework to decide upon tools and instruments. As well, the urgent need to mobilize sufficient and efficient funding to expand the spending on the climate change work and how to manage it, especially in the presence of global successive crisis that adversely impact the resilience of the economy.

From studying the practices of Germany and China, it can be concluded that the strategic component plays an important role in presenting the framework within which policy makers can decide upon the instruments and their designs.

Germany has managed to utilize many green finance instruments successfully, in terms of lower emissions shown through data. However, the strategic component of plans, the policy frameworks, and legislative aspect and how they all integrate with each other have been very important strength points in the Germen practice. As well, rising awareness and maintaining transparency and accountability have a vital role to play in keeping all the stakeholders aligned and updated. Finally, it's very important to plan on how to mitigate the economic negative consequences of the adapting the green fiscal measures on households and industries that suffer from poor competitiveness.

The main lesson to be learnt from the Chinese practice is the importance of well design of the instruments and the customization of each instrument to better suit each economy and society. As well, the commitment of all stakeholders to achieve the set targets is a main driver of success. Furthermore, the coordination between the central and local governments and between them and other stakeholders is also vital.

4 Recommendations

Egypt must study and plan to introduce more green fiscal policies instruments as part of adopting the green finance tools. As practices shows the green tax is very promising to reduce the emissions and promote the green technology and

development. Green tax can be applied to the CO_2 emissions content in products and service in coordination with other taxes' types so that the burden wouldn't increase and have negative social consequences.

As for carbon trading, it's highly recommended to introduce it on a sector basis, gradually. The proposed mechanism should include both carbon trading and carbon offsetting tools to mitigate the negative impact this extra cost may have on the competitiveness of companies. It's a must to be implemented in coordination among the Ministry of Environment and the Ministry of Industry, and General Authority for Investments on the domestic and foreign investment projects.

Since there's a relatively high level of uncertainty and/ or risk in implementing green mega projects and since the government's financial resources are relatively inadequate to solely implement such projects, proposed here is to apply the PPP through a strategy that allows for (1) identifying the sectors of interest and the partnership modes, (2) deciding upon the institutional framework. Lastly, it is evident that the government must present greater emphasis on the role green fiscal instruments in the national Strategies and policies.

5 Further research areas

Before deciding on the green fiscal instrument, a DSGE model can be formulated to study the economic, social, and environmental impact of each instrument. On the other hand, this paper kept it focus on the green fiscal policy, therefore, a future research area would be studying the impact of green monetary policy instruments on the economic growth in Egypt.

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