

## **The impact of green bond financing on the Egyptian green economy**

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### **Abstract:**

The current study deals with the issue of green bonds in Egypt as a new financial tool concerned with investing in environmentally friendly projects. Moreover, the possibility of Egypt's transformation through them into a green economy is regarded by studying the environmental analysis for the possibility of Egypt's transformation into a green economy. The analysis requirements for the transition to a green economy in Egypt as well as the funding sources- internally and externally- of the green economy and measuring the impact of financing with green bonds on the green economy in Egypt will be discussed. The current study concluded that; external financing has an adverse effect on green bonds and the Egyptian green economy as a national project that can be financed internally with the participation of the private sector, especially in energy projects. This study recommends that Egypt strive to encourage investment in energy projects with the participation of the private sector and stimulating national investment.

**Keywords:** green economy, green bonds, green finance, sustainable development

### **1- INTRODUCTION**

The principle goal of sustainable development is to preserve the share of future generations of natural resources, so Egypt's Vision 2030 has played an important role in seeking to attract attention to the environmental issues, raising the level of environmental awareness of the Egyptians to protect nature and reducing the impact of climate changes to provide a clean, safe and sustainable environment for the coming generations and achieve a green economy. However; there is an increasing need for sources of financing to achieve a green economy, so the mechanisms of financing the green economy through green bonds have been reconsidered. The latter is a serious step to achieve Egypt's Vision 2030 as the sixth strategic goal of the energy axis, working to reduce greenhouse gas emissions, rationalizing energy, and relying on clean renewable energy (**Financial Supervisory Authority, 2018**).

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### **1.1. The study scope**

The problem is the limitation of the financing sources of green bonds, especially internal finance, and its impacts on the transition towards a green economy in light of the global trend towards a sustainable economy.

### **1.2. Hypothesis**

- There is a positive impact of financing green bonds internally and externally on the green economy.
- External financing has a positive impact on green bonds.
- Financing in energy with the participation of the private sector has a positive impact on green bonds.
- Financing in transportation with the participation of the private sector has a positive impact on green bonds.
- Financing in water and sewage amenities with the participation of the private sector has a positive impact on green bonds.

### **1.3. Objectives**

The main objective of the research is to measure the impact of green bond financing on the Egyptian green economy by analyzing the possibility of switching to the green economy and its requirements and measuring its indicators to know Egypt's position on this and measuring the impact of that financing on the Egyptian green economy.

## **2. MATERIAL AND METHODS**

The research methodology relied on the use of the deductive and statistical method, which was carried out in several stages, as follows

First: The stage of collecting data and indicators from official sources, which was achieved by visiting the Ministry of Planning, the Tax Authority, the Ministry of Environment, and decent living centers, in addition to scientific research sites, where data that achieve the research goals related to the transition to a green economy were collected.

Second: the stage of sorting, classifying and scheduling data

Third: The stage of data analysis using qualitative and quantitative analysis, where computer statistical programs were used

## **3. RESULTS AND DISCUSSION**

### **3.1. The possibility of Egypt turning into a green economy**

The GDP per capita indicator is one of the most important economic indicators that show the extent of competitiveness that the national economy possesses to offer its products and services at a high level through which it can grow and raise the standard of living for citizens. Competitiveness is the way to confront and recover from economic crises and increase economic well-being and sustainable growth (**National Competitiveness Observatory, 2011**), in addition to the growth rate in green investments, employment rate and poverty level, and inflation.

### 3.1.1. GDP per capita (at current prices)

It is clear from (Table 1) that the per capita GDP at current prices is estimated at \$2.8 thousand in 2011 and increased to about \$3.5 thousand in 2016. The minimum per capita GDP is estimated at \$2.4 thousand in 2017, as a result of the increment in the annual inflation rate in 2017. The government has adopted several measures to correct foreign exchange circulation by liberalizing exchange rates to give operating Egyptian banks flexibility in pricing the purchase and sale of foreign exchange to restore its circulation within legitimate channels and end the parallel market for foreign exchange. The maximum limit was estimated at 3.9 thousand dollars in 2021, which indicates that there is stability in the average per capita GDP for the period from 2011 to 2016. Besides, there is a recovery in 2018 and stability also until 2021. Hence, it can be noted that; the economy is competitive if it can achieve growth without violating the balance of payments, which is reflected in increased economic well-being and sustainable growth. Therefore, it can be said that; the Egyptian economy can enhance economic competitiveness. The latter is the way to face the current economic crises and achieve economic welfare towards sustainable growth.

**Table (1):** Per capita GDP (at current prices) during the period (2011-2021)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	geometric mean
<b>GDP per capita</b>	2.8	3.2	3.3	3.4	3.6	3.5	2.4	2.5	3	3.6	3.9	3.1 <sup>v</sup>

(Compiled and calculated from <https://data.worldbank.org/country/EG>).

### 3.1.2. Growth rate in green investments:

The growth rate in green investments can be expressed by the size of the eligible green expenditures that were mentioned in Egypt's portfolio of green projects, as shown in (Table 2). It shows the increment in the volume of green investments from about \$124.7 million in 2017 to about \$525.3 million in 2022. The arithmetic geometric mean was estimated to be about 276.42. Whereas the estimated growth rate was estimated to be about 300.2%, which reflects the increment in the volume of green expenditures, which is a catalyst for economic growth.

**Table (2):** The volume of green expenditures during the period (2017-2022)

Year	2017	2018	2019	2020	2021	٢٠٢٢	geometric mean
<b>The growth rate in green investments</b>	١٢٥	١١٧	٣٠٣	٤٤٩	٤٢٧	٥٢٥	276.42

Source: Compiled and calculated from <https://data.worldbank.org/country/EG>

### 3.1.3. Employment rate

The labor force represents the human element that can work in all the various productive service and consumer activities. The workforce is the most important part of the population, which bears the burden of achieving the economic and social development goals targeted by the state. Observing the labor market in Egypt, as shown in (Table 3), the unemployment rates of the total labor force increased by about 11.85% in 2011 and increased to about 13.10% in 2014. In 2016, the unemployment rates began to decline and continued to reach about 7.84 % in 2019, which indicates that there is an improvement in the employment rates, yet because of the Covid

pandemic in 2020 and its adverse consequence on employment rates. It led to a rise in unemployment rates to reach about 9.17% and then 9.33% in 2020 and 2021, respectively. The reason for this considerable rise of unemployment rates may be attributed to the spread of the Corona virus (COVID 19). The precautionary measures and the loss of many individuals to their jobs.

**Table (3):** Total unemployment of the labor force during the period (2011-2021)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>Unemployment</b>	11.85	12.6	13.2	13.1	13.05	12.41	11.74	9.82	7.84	9.17	9.33

Source: Compiled and calculated from <https://data.worldbank.org/country/EG>

### 3.1.4. Poverty level

(Table 4) shows the poverty level in Egypt according to its rates, as it indicates that the poverty rate reached 16.7% in 1999-2000 and increased to 32.5% in the year (2017-2018). The poverty rate has decreased in 2019-2020 for the first time in 20 years, and this decrement in poverty rates affects the way of living standards, improving the utilization of natural resources, maintaining their sustainability and achieving economic welfare which is one of the most important policy priorities aiming to achieving sustainable growth adopted by Egypt's 2030 Agenda.

**Table (4):** Poverty rates in Egypt during the period (1999-2000) until (2019-2020)

Year	1999-2000	2004-2005	2008-2009	2010-2011	2012-2013	2015	2017-2018	2019-2020
<b>Poverty level</b>	16.7	19.6	21.6	25.2	26.3	27.8	32.5	29.7

Collected from the official reports of the Central Agency for Mobilization and Statistics

### 3.1.5. Inflation

The data manipulated in (Table 5) reflects a sharp rise in the annual inflation rate in 2017, as a result of taking several measures to correct foreign exchange trading by liberalizing exchange rates to give operating Egyptian banks flexibility in pricing the purchase and sale of foreign exchange values to restore its circulation within legitimate channels and end the parallel market for foreign exchange. The economic developments were in line with the expectations of the Central Bank, with a decrement in the inflation rate from about 29.80% in 2017 to about 14.40% in 2018 and the future outlook for inflation remained consistent with the targeted inflation rates. In 2019, the monetary policy of the Central Bank succeeded in containing inflationary pressures. This was demonstrated by recording the annual rate of inflation to 9.4%, and despite the spread of the Corona virus pandemic in 2020. The economic reform program managed in continuing to handle the inflationary pressures from the demand side and the secondary effects of supply shocks, and the annual rate of inflation decreased to 5.6%, achieving the desired goal.

**Table (5):** The development of the inflation rate in Egypt

Year	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
<b>inflation</b>	7.30	9.80	8.20	11.40	14.00	29.80	14.40	9.40	5.60

Source: Compiled and calculated from the official reports of the Central Bank of Egypt

### 3.1.6. Environmental analysis of Egypt's situation in terms of the possibility of transition to a green economy

It is clear from Table (6) the internal and external environment Analysis of the state of the Egyptian economy through the previous presentation of indicators of the possibility of transition to a green economy that Egypt enjoys an acceleration in GDP per capita over the period from (2011-2020). It can be considered that the continuation of this indicator is increasing regularly and rapidly as one of the most important indicators that show the extent of Egypt's ability to enhance economic competitiveness, a point in this regard in addition to the continuous rise in volume of green investments during the period (2017-2022), which confirms the existence of a competitive economic environment for the possibility of moving to a green economy.

However, the high rates of poverty over the period (1999/2000-2017-2018) and the increasing unemployment rates of the total workforce over the period (2011-2020) are considered among the most important weaknesses that fiscal and monetary policy must take into account to maintain Strengths and the continuation of the transition to a sustainable green economy, so Egypt must try to take advantage of all available opportunities as one of the pillars of environmental analysis that must be taken into account when transitioning to a green economy, according to the previous analysis, which is that the Egyptian economy enhances economic competitiveness and stimulates growth The economy, which helps create job opportunities while taking the threat posed by inflation in prices.

**Table (6):** Analysis of the possibility of Egypt's transformation into a green economy

The internal environment		The external environment	
<b>Strength points</b>	GDP per capita is accelerating. The high volume of green investment.	<b>Opportunities</b>	Enhancement competitiveness. Stimulating economic growth. Creating job opportunities. Rationalizing the use of resources. Eliminating poverty. Reducing carbon emissions.
<b>Weakness points</b>	High rates of poverty. Increasing unemployment rates out of the total workforce.	<b>Threats</b>	Inflation and exchange rate instability.

Source: compiled and calculated by the researcher.

### 3.2. Analysis of the requirements for the transition to a green economy in Egypt

The transition to a green economy and the achievement of sustainable development has become an inevitable necessity. Therefore, the Egyptian state has taken serious steps for long periods to support sustainable financing and the green economy, by facilitating the growth of investments that support sustainable development, as evidenced by what is included in the sustainable development strategy “Egypt Vision 2030”. The latter was extracted from the Egyptian state policies implemented by the Egyptian government in the economic reform program, and the extent of the impact of these reforms in correcting some structural imbalances in macroeconomic indicators by reducing subsidies and redirecting financial allocations to finance the health,

education and green projects sectors (**Hanafi, 2021**) Some of the requirements necessary for the transition to a green economy in Egypt can be reviewed as follows:

### **3.2.1. Environmental legislation**

Environmental legislation is one of the most important requirements for the transition to a green economy. The list of priorities of these legislations includes increasing the volume of green investments as the most important strengths that were addressed in the environmental analysis study, as previously mentioned in Table 6. The legislative framework for environmental protection in Egypt includes many international obligations, due to Egypt's membership and signature on regional and international environmental agreements (Rio Conference in 1992, Paris Climate Change Conference in 2015). The Egyptian Constitution of 2014 stipulated special provisions for the protection and preservation of the environment in Articles, 45 and 46, which stipulate imposing political and social obligations to protect the environment as a pillar of sustainable development. Recently, Egypt has issued several laws and legislations aimed at preserving the environment and natural resources. These legislations were represented in the issuance of Environment Law No. 4 of 1994, amended by Law No. 9 of 2009, Law 202 for 2020 promulgating the Waste Management Regulation Law, Amending Article 5 of the executive regulations of Law No. 48 of 1982 regarding the protection of the Nile River, which allowed the safe disposal of triple-treated sewage, Law No. 44 of 2002 regarding the discharge of liquid waste into Public sewage networks, Law No. 15 of 2017 on facilitating the procedures for granting licenses for industrial establishments, Egyptian Code No. 501 of 2015 regarding the use of treated sewage wastewater in agriculture, and Law No. 147 of 2021 regarding irrigation and water resources. Previous modern legislation In addition to a number of old laws such as the Nature Protection Law No. 102 of 1983 and Law No. 48 of 1982 regarding the protection of the Nile River from pollution, it represents an effective factor towards achieving green economy standards. (**Ministry of Planning and Economic Development, 2021**).

### **3.2.2. Attention to rural districts**

Attention to the development of rural areas is one of the sustainable development goals to alleviate poverty in the villages, as it is one of the most important opportunities available to the Egyptian economy, which helps it to shift towards a green economy and create opportunities. The cultural initiative seeks to provide job opportunities and rehabilitating the poor to join the labor market, such as (Opportunity “Forsa” – Hidden “Mastura” – Awareness “Waie” – Decent House “Sakan Kareem” - a Decent Life “Hayah Karima”). The following is a decent life initiative that can be analyzed by analysis as follows:

#### **A Decent Life initiative “Hayah Karima”:** -

The initiative aims to meet the needs of citizens in the neediest villages by expanding the umbrella of social protection and its objectives are represented in four main objectives: building people, improving the standard of living for the neediest citizens, improving their quality of life in addition to providing suitable job opportunities into achieving the first goal of sustainable development. It is the eradication of poverty in all its forms, as well as the tenth goal of reducing inequality within and among countries, which the United Nations has included among the best international practices. (**Ministry of Planning and Economic Development, 2021**).

### **3.2.3. Employing taxes to reduce environmental risks and encourage green investment**

Environmental taxes (green taxes) are one of the latest environmental policies initiatives to combat pollution that countries and governments use to reduce the production of environmental pollutants and behaviors harmful to the environment to make pollution more expensive for the polluter because if the production of pollution is more expensive, the polluter will produce less pollution (**El-Deeb, et al., 2021**).

After looking at China's pattern with environmental taxes, we find that China's Environmental Protection Tax Law took effect in 2018 as one of the latest environmental policy initiatives to combat pollution and the tax rate was set by the central authorities to be ten times the current base rates of 1.2 Yuan per unit of air pollutant and 1.4 Yuan per unit of water pollutant, providing the provincial government with the flexibility to set their tax rates according to local capabilities, targets and pollution conditions (**Khatab, 2020**).

As for the Egyptian side, we note the absence of tax legislation related to this aspect, with challenges and the difficulty of having measures (or lack of a standard) and the lack of planning for the implementation of environmental taxes that are taxed by the state between the General Tax Authority and the Ministry of Environment, (**El-Deeb, et al., 2021**).

Currently, the Egyptian state imposes some financial fines for some environmental damages and violations, but it does not include all environmental violations and is not under a single name. Therefore, we recommend issuing legislation allowing the imposition of an environmental tax on all environmental pollutants, and they are collected in one financial fund for spending and limiting the effects of pollution.

### **3.2.4. Paying attention to investments in the field of sustainable energy.**

Egypt has a distinguished geographical position, especially in the field of solar energy, as it is located in the global solar belt, so the Egyptian Solar Atlas was issued in 1991 explaining that the country enjoys 2900-3200 hours of sunshine annually, with an annual direct natural energy density ranging from 1970-3200 kilowatt-hours/square-meter, and solar electric energy generates a capacity of 73.6 petawatt-hours per hour. Egypt also has a stock of wind energy that can help it out of its energy crisis, (**Khatab, 2020**).

Egypt has a portfolio of eligible green projects worth \$1.9 billion, of which 16% are renewable energy, 19% are clean transportation, 26% are sustainable management of drinking water and wastewater and 39% are for the elimination and control of pollution (as of September 2020) (**Ministry of finance, 2020**), as shown in (Table 7).

**Table (7):** Participation rates of projects financed by green bonds

<b>Project</b>	<b>Renewable Energy</b>	<b>sustainable transport</b>	<b>sustainable water management</b>	<b>Pollution control</b>
<b>Ratio</b>	16%	19%	26%	39%

**Source:** compiled and calculated from (**Ministry of finance, 2020**).

It is clear from the previous analysis as shown in (Table 8) that the requirements for the transition to a green economy are available through legislation that encourages green investment, attention to rural areas and the presence of interest in investments in the field of sustainable energy, so

there is a promising opportunity for Egypt to transformation to a green economy. Moreover, the state needs to use green financing represented by green bonds to finance projects related to the green economy, which indicates that Egypt has started implementing plans to benefit from the experiences of countries.

**Table (8):** Analysis of the requirements for the transition to a green economy in Egypt

No	Requirements	Found	Not Found	expected	Unexpected
1	Environmental legislation	↑↑			
2	Attention to rural areas	↑↑			
3	Green Taxes.		↑↑		
4	Interest in sustainable energy investments	↑↑			

### 3.3. Financing green bonds in Egypt.

Several indicators could be reached during the experiences of some countries and related studies that are applied to measure the green economy, among them the economic parameters, the most important of which is the share of sectoral or aggregate forms that contribute to the efficiency of resources and energy utilization, or the reduction of waste and pollution, as well as the share of sectoral output. In addition, the aggregate or employment, which meet the established criteria for sustainability, including environmental parameters related to activity and by researching some Egyptian indicators related to the green economy, we conclude the following:

#### 3.3.1. Financing with the participation of the private sector

**3.3.1.1. Investment in transport:** Investment in transport projects with the participation of the private sector covers infrastructure projects in the field of transport that have reached the stage of financial closure and provide services to the public directly or indirectly. Except for movable assets and small projects. The types of projects covered by the data are operations and management contracts procedures and with major capital expenditures, new projects (where a private enterprise or a public-private joint venture builds and operates a new facility). As for investment commitments, they are the sum of investments in facilities and investments in government assets. While investments in facilities represent the resources that the project company is committed to investing during the contract period, either in new facilities or in expanding and modernizing existing facilities (**World Bank, 2022**), it is clear from (Table 9) that the start of investment in transport with the participation of the private sector in Egypt in 2017 with a value of 498 million dollars, then it decreased to 150 million dollars, then the value doubled to reach 5 billion dollars in 2020, with an annual growth rate of 907%.

**Table (9):** Investment in transport with the participation of the private sector during the period from 2011 to 2022

Year	2017	2018	2019	2020	2021
<b>Investment in transport with the participation</b>	498	0	150	5019	

Collected and calculated from World Bank data <https://data.worldbank.org/country/EG>



### 3.3.1.2. Investment in energy

Investment in energy projects with the participation of the private sector covers infrastructure projects in the field of energy (transmission and distribution of electricity and natural gas) that have reached the stage of financial closure and provide services to the public directly or indirectly. Except for movable assets and small projects such as windmills (**World Bank, 2022**), it is clear from (Table 10) that investment in energy with the participation of the private sector in 2012 amounted to \$276 million, then \$106 million in 2016, reaching the highest value in 2017 by \$2.4 billion, then \$335 million in 2019 and \$165 million in 2021, at an annual rate of -40%.

**Table No. (10):** Investment in energy with the participation of the private sector during the period from 2011 to 2022

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>Investment in energy with the participation of the private sector</b>	276	0	0	0	106	2400	0	335	0	165

Collected and calculated from World Bank data <https://data.worldbank.org/country/EG>

### 3.3.1.3. Investment in water and sewage

Investment in water and sewage projects with the participation of the private sector covers infrastructure projects in the field of water and sewage that have reached the stage of financial closure and provide services to the public directly or indirectly. Except for movable assets, incinerators, solid waste projects, and independent small projects (**World Bank, 2022**), Egypt has started investing in water and sewage with the participation of the private sector in 2021 at a value of \$48.5 million.

## 3.3.2. External funding sources:

### 3.3.2.1. Foreign direct investment

Foreign direct investment is one of the most important sources of external financing due to its ability to support economic growth, provide employment opportunities, increase production and other elements. It is clear from (Table 11) that foreign investment began to recover from 2014 due to the return of Political stability, which was a major reason for the decline in the values of foreign flows since 2011, then the values of net inflows decreased in 2017 to reach 7.41 billion dollars as a result of economic reform policies by liberalizing the interest rate. The net inflows returned to rise in 2018 to reach nearly 8.2 billion dollars, in 2018 and then to 9 billion dollars in 2019.

**Table (11):** Foreign direct investment during the period from 2011 to 2020

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Foreign direct investment</b>	-0.48	2.80	4.19	4.61	6.93	8.11	7.41	8.14	9.01	5.85

Collected and calculated from World Bank data <https://data.worldbank.org/country/EG>

### 3.3.2.2. Net official development assistance (ODA) received

Net ODA includes concessional loan payments (not including principal repayments), and grants from official institutions in DAC members, multilateral institutions, and non-DAC countries to stimulate economic development and prosperity in countries and regions in The Committee's list

of recipients of this aid. It includes loans with a grant component of no less than 25 percent (calculated at a discount rate of 10 percent) (World Bank, 2022), and it is clear from Table No. (12) the development of net development aid with an upper limit in 2013 of about 5.51 billion dollars, and with a maximum limit of \$5.51 billion. It was lower in 2017, by about \$0.03 billion, at an annual rate of 271.4%.

**(Table 12) Net ODA received during the period from 2011 to 2020**

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>net official development</b>	0.42	1.81	5.51	3.54	2.52	2.44	0.03	2.08	1.71	1.56

Collected and calculated from World Bank data <https://data.worldbank.org/country/EG>

### **3.4. The impact of green bond financing on a sustainable green economy.**

From the above, it became clear that Egypt needed funding sources to achieve a green economy, so the mechanisms for financing sustainable development were reconsidered by following an approach related to promoting alternative financing tools such as green bonds, which is a serious step to achieve what was mentioned in Egypt's Vision 2030 with the sixth strategic objective of the energy axis, by working on reducing greenhouse gas emissions, rationalizing energy, and relying on renewable energy (**Financial Regulatory Authority, 2018**).

#### **3.4.1. Green bonds in Egypt**

Egypt issued the first sovereign green bonds in the Middle East and North Africa, worth \$750 million, listed on the London Stock Exchange in November 2020, and this issue aims to provide sustainable funds needed for environmentally friendly projects in various fields such as housing, clean transportation, renewable energy, and reducing pollution. These bonds also target projects that deal with climate change, optimal use of energy resources, and sustainable management of water and wastewater resources (**Samak, 2021**). Asia and the Middle East, which indicates the diversity of the investor base, and crowns the efforts made in offering Egyptian bonds (**Ministry of Planning and Economic Development, 2021**).

#### **3.4.2. The most important projects financed by green bonds**

The proceeds of the Egyptian sovereign green bonds are used to finance green projects to achieve the sustainable development plan and to adhere to Egypt's vision 2030. At a total cost estimated at 447.3 billion pounds, equivalent to 14% of the total investments included in the plan. Here is a statement of the most important of these projects:

**Examples of green projects in Egypt are as follows:(Ministry of Finance, 2020)**

**3.4.2.1. The monorail sector project:** It is a major project to promote clean transportation in Cairo, where road traffic is particularly intense and causes negative environmental impacts. The first monorail line will extend 56.5 km from east Cairo to the New Administrative Capital (22 stations), while the second line will extend with a length of 42 km, it will link the 6<sup>th</sup> of October city to Giza, facilitating the movement of citizens. The passenger capacity is about 600,000 passengers per day. Egypt has secured financing and investments equivalent to more than 400 million dollars.

**3.4.2.2. El-Dabaa desalination plant:** It contributes significantly to improving water quality, which is one of the main challenges facing Egypt, especially with the climate change crisis. 200,000 citizens and the investments directed to it are estimated at more than 60 million dollars.

**3.4.2.3. The wind power project (250 MW) in the Gulf of Suez:** It is located about 12 km west of Ras Shukair in an arid coastal area between the Gulf of Zayt and Zafarana, with a size of 57 km<sup>2</sup>, and the project aims to implement a 250 MW wind farm, the project produces energy of about 1000 gigawatt-hours annually. It contributes to reducing greenhouse gas emissions by about 491,000 tons of carbon dioxide per year and the investments directed to the project are estimated at more than \$30 million.

**3.4.2.4. Solid waste management:** Solid waste treatment is considered one of the main environmental issues, especially with the increase in population growth rates and the search for urbanization. Therefore, Egypt plans to improve the solid waste management process through: (increasing collection rates - increasing waste recycling - reducing rates of burial) and the annual capacity of the collected solid waste is estimated at 28.4 million tons, and the investments directed to the project are estimated at more than 750 million dollars.

### 3.5. The impact of green bond financing on the green economy in Egypt

It was possible to estimate the economic relations quantitatively by building a mathematical relationship between the variables associated with the use of a specific time series, and then give results that help the economic policymakers to formulate holistic policies consistent with the economic reality of the countries, and to prove the research hypothesis represented in the existence of a positive or negative impact of green bonds on sustainable green economy

**Table (13):** Study variables during the period (2012-2021)

Year	Inv in transport	Investing in energy	Investment in water	External financing	net official development	Total investment with (P.S)
2012	—	276	—	2.8	0.42	276
2013	—	—	—	4.19	1.81	—
2014	—	—	—	4.61	5.51	—
2015	—	—	—	6.93	3.54	—
2016	—	106	—	8.11	2.52	106
2017	498	2400.03	—	7.41	2.44	2899.03
2018	—	—	—	8.14	0.03	—
2019	150	335	—	9.01	2.08	485
2020	5018.85	—	—	10	1.71	5020.85
2021	—	165	48.5	11	1.56	213.5

Collected and calculated from World Bank data <https://data.worldbank.org/country/EG>

In order to achieve the aims of the study; a standard model was designed to measure the impact of green bonds on a sustainable green economy, using the dummy variable method (Dummy Variables), in which the volume of green bonds represents a dependent variable, while the independent variables were represented in time, investment in energy with the participation of the private sector, and investment in Transport with the participation of the private sector, investment

in drinking water and sewage with the participation of the private sector, foreign direct investment, net development aid as follows:-

$$GB_{it} = \beta_0 + \beta_1 T + \beta_2 Inv\_E + \beta_3 Inv\_w + \beta_4 Inv\_T + \beta_5 Inv\_F + \beta_6 H + U$$

GB	The volume of green bonds	Inv_E	Investing in energy
$\beta_0$	Constant	Inv_w	Investment in drinking water and swege
T	Time	Inv T	Investment in transport
H	net official development	Inv F	Foreign direct investment

The data in (Table 14) indicates that financing by investing in energy with the participation of the private sector has a statistically significant effect and that the increase in energy investment with the participation of the private sector by about 0.0002 monetary units leads to an increase in the volume of green bonds by one monetary unit, while there is an opposite negative effect (Statistically significant) for investment in transport, water and sewage with the participation of the private sector, as well as foreign direct investment.

(Table14): Results of the multiple linear regression estimation of the study variables during the period from (2012-2021)

R(Square)	F	Equation	Sample
0.99	56.75	$GB = 0.40 + 0.38T - 0.00024 Inv T + 0.0002 Inv\_E -$ $(8.30) ** \quad (-4.78) ** \quad (5.04) **$ $- 0.060 Inv\_w - 0.25 Inv\_F - 0.055 H + U$ $(-5.54) ** \quad (-5.24) ** \quad (-2.84) *$	Multiple

\*\*Significant at 1% level of significance \*Sentimental at 5% morale level.

Source: collected and calculated from the data of Table No. (13)

And by estimating a model in which the volume of green bonds represents a dependent variable, while the independent variables are represented in time, investment in the participation of the private sector, and external financing as follows: -

$$GB_{it} = \beta_0 + \beta_1 T + \beta_2 Inv\_S + \beta_3 Inv\_F + U$$

: GB- :Volume of green bonds       $\beta_0$  :Constant  
 T- :Time      Inv F :External financing  
 Inv S- :Investing with the participation of the private sector

The data in (Table 15) indicates that both external financing and internal financing, which include both investment in energy with the participation of the private sector, investment in water and sewage with the participation of the private sector and investment in transport with the participation of the private sector combined on green bonds shows that there is an opposite effect. External financing on green bonds (statistically confirmed), which is what was reached in the previous model, while the significance of the effect of internal financing was not statistically

confirmed, which indicates that external financing has an adverse effect on green bonds and the Egyptian green economy as a national project that can be financed internally with the participation of The private sector, especially in energy projects, and this was confirmed by measuring the impact and analyzing the proposed model. Accordingly, the state must strive to encourage investment in energy projects with the participation of the private sector, and stimulate national investment in it, taking into account that such projects have a long-term impact due to their returns. society and the state in the form of a clean environment and a sustainable green economy with which economic welfare and prosperity are achieved and with which the national economy improves and the progress of A country that is among the countries that have transitioned to a green economy, which is the focus of Egypt's 2030 strategy.

**Table (15):** Results of the multiple linear regression estimation of the study variables during the period from (2011-2021)

<b>R(Square)</b>	<b>F</b>	<b>Equation</b>	<b>Sample</b>
<b>0.89</b>	<b>17.55</b>	<b>GB =0.4r + 0.3T-0.0003 Inv S+-0. 29 Inv_F (3.94) ** (0.61) (-2.62) *</b>	Multiple

\*\*Significant at the 1% level of significance \*Significant at the 5% morale level

**Source:** collected and calculated from the data of Table. (13)

#### 4. Conclusion

By examining the Egyptian experience, the research reached the following results:

- Egypt has huge potential to transform into a green economy, where the per capita GDP is accelerating, which shows the extent of Egypt's ability to enhance economic competitiveness, in addition to the continuous rise in the volume of green investments, which confirms the existence of a competitive economic environment for the possibility of transition to a green economy. The high rates of poverty and the increase in unemployment rates among the total workforce are considered one of the most important weaknesses, with the threat caused by inflation in prices.

The requirements for transition to a green economy are available through legislations that encourage green investment, attention to rural areas and interest in sustainable energy investments; so there is a possibility for Egypt to transition to a green economy and that the state needs to use green financing represented in green bonds to finance projects related to the green economy.

- External financing hurts green bonds and the Egyptian green economy as a national project that can be financed internally with the participation of the private sector, especially in energy projects, and this was confirmed by measuring the impact and analyzing the proposed model.

#### 5. Recommendations

The Egyptian state should strive to encourage investment in general, and to invest in energy projects with the participation of the private sector in particular, and stimulate national investment in them, and benefit from the experiences of countries in applying green taxes and

increase investment in water, sustainability and in the transport sectors, taking into account the increased interest in investing in Projects that have a long-term impact.

Because this benefits the society and the state in obtaining a clean environment and reaching a sustainable green economy, in which economic well-being is achieved, the national economy improves, and the state moves with it in the ranks of countries that have converted to a green economy, which was emphasized in Egypt's Vision 2030 strategy.

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